Variation in chain-length of leaf wax *n*-alkanes in plants and soils across Australia

Thesis submitted in accordance with the requirements of the University of Adelaide for an Honours Degree in Geology.

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VARIATION IN CHAIN-LENGTH OF LEAF WAX N-ALKANES IN PLANTS AND SOILS ACROSS AUSTRALIA

RUNNING TITLE

ACL of *n*-alkanes in plants and soils

ABSTRACT

Long chain *n*-alkanes are produced as part of leaf epicuticular wax and are ideal biomarkers for palaeoclimatology and palaeoecology due to their persistence in soils and sediments. Sedimentary records often show shifts in average chain-lengths (ACL) of *n*-alkanes, both across geologic time and modern-day climate gradients and this shift may be climate driven.

Australia spans a broad range of different climate conditions providing an ideal study area for investigating the relationship of ACL to climate. The Terrestrial Ecosystem Research Network (TERN) has developed a network of biodiversity monitoring plots (AusPlots and TREND) at which plant and soil samples are collected and made available to the research community. By analysing *n*-alkane ACL present in plants and soils collected from these sites and comparing with each site's respective climatic conditions, this study examines whether ACL of leaf wax n-alkanes varies systematically in modern plants and soils in relation to climate over a N-S transect of Australia.

Specifically, this study examines whether:

(1) ACL in plants correlates with different climate variables.
(2) ACL measured in soil represents a weighted average of the ACL of the dominant plant species at each site.
(3) ACL signature in the soils correlates to different climate variables.

This study finds no relationship between the different climate variables to ACL of modern Further, the weighted average of the dominant plant species ACL from each site analysed is a poor predictor of the actual ACL present in the soils. In contrast to ACL from plants, the ACL from the soils shows a strong relationship with temperature and aridity measures. Soils may correlate better with climate because they integrate a long-term average of highly variable ACL values from all contributing organisms. This study supports climate as a driver of ACL in sediments across space and time.

KEYWORDS

VARIATION, N-ALKANE, SOILS, PLANTS, CLIMATE, PALAEOCLIMATE, AUSTRALIA, ACL, BIOMARKERS

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INTRODUCTION

Human induced climate change due to increased CO_2 emissions from burning of fossil fuels and land use change is of great societal concern, with present day concentrations nearly 100ppm higher than they have been for the last 800,000 years (IPCC 2013, Masson-Delmotte et al. 2013). However, similar CO_2 induced greenhouse warming has occurred previously in the Earth's geologic history. For example, the Paleocene-Eocene Thermal Maximum (PETM) was a period of extreme and rapid warming driven by an increase in atmospheric CO_2 (Smith et al. 2007, McInerney and Wing 2011). Reconstructing these analogous past climates is important for understanding how climate functions and what sort of environmental and socio-economic impacts we can expect as a result of climate change in to the future (Berger et al. 2012). There is therefore a need to develop new tools that can be used for reconstructing past terrestrial climates.

A number of proxies are available for reconstructing past climates, including chemical analyses of continuous lake and marine sedimentary records, ice cores and speleothems. Recent workers have proposed that certain plant biomarkers such as long chain *n*-alkanes may provide an effective proxy for climatic variability as they are sensitive to ambient climate conditions (Eglinton and Eglinton 2008, Bai et al. 2009, Castañeda and Schouten 2011) and are persistent in the sedimentary record on geologic timescales (Gagosian and Peltzer 1986). Long chain *n*-alkanes are non-polar, unbranched, straight chained hydrocarbon molecules that form a component of plant leaf waxes found on the leaf cuticle (Diefendorf et al. 2011). Each carbon atom contained within an *n*-alkane forms four single bonds (Olah et al. 2011) resulting in the general saturated formula of C_nH_{2n+2} (Jones 2000) and take on a form as given in **Figure 1**.

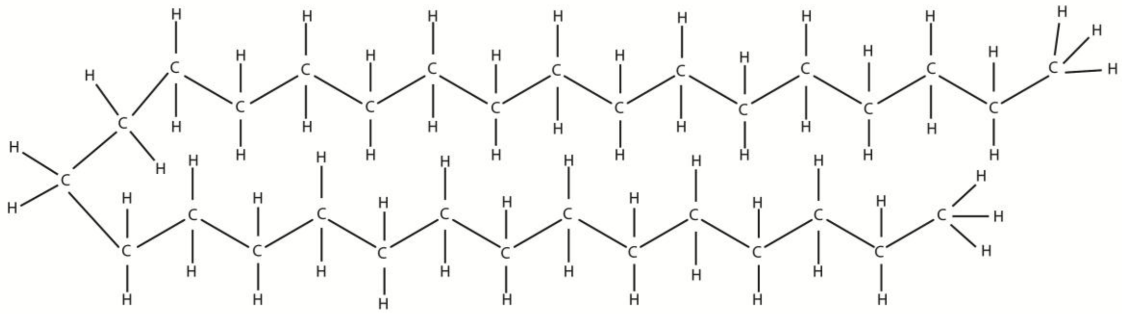


Figure 1: Structural diagram of an *n*C_{31} straight chain *n*-alkane, *n*-Hentriacontane ($C_{31}H_{64}$), a common *n*-alkane found in the cuticular waxes of most higher plant species.

The different *n*-alkane chain lengths demonstrate different physical properties, with longer chain lengths having greater hydrophobicity and higher melting point (1-3°C for each carbon unit) than shorter chain lengths (Gibbs 2002, Rommerskirchen et al. 2003). Plants use these compounds to regulate their water balance by preventing water loss through the surface of their leaves (Eglinton and Hamilton 1967, Dodd and Poveda 2003). They also form a photoprotective layer, limiting leaf tissue damage from UV radiation (Shepherd and Griffiths 2006, Koch et al. 2009), as well as helping to resist fungal infection and herbivory (Banthorpe 2006).

n-Alkanes are ideal for palaeoclimate reconstruction due to their continuous accumulation and relative persistence in soil and sediment records (Smith et al. 2007, Diefendorf et al. 2011), where they accumulate as a result of wind ablation and leaf fall (Rommerskirchen et al. 2006, Shepherd and Griffiths 2006, Zech et al. 2013). The decomposition of these molecules requires the presence of specific co-metabolising compounds and decomposer enzymes along with optimal soil properties, such as pH, which may explain their persistence in sedimentary environments (Schmidt et al. 2011). While high quantities of *n*-alkanes are present in modern day soils, they have also been extracted from Cretaceous-Paleogene boundary sediments (Yamamoto et al. 2010) as well as Eocene (Smith et al. 2007), Miocene (Huang et al. 2001) and Holocene sediments (Schwark et al. 2002). *n*-Alkanes present in the sedimentary record are useful for reconstructing past climates because they are representative of the effects of climate on the organisms that contribute them.

The chain length of *n*-alkanes differs between different groups of organisms. Generally, short chained, even-numbered *n*-alkanes ($nC_{12} – nC_{22}$) found in sediments are associated with bacteria, whereas odd-numbered, short-chained *n*-alkanes, particularly nC_{17}, are produced by algae or photosynthetic bacteria (Sachse et al. 2004). Medium chained, odd-numbered *n*-alkanes ($nC_{21} – nC_{25}$) are associated with aquatic plants, and longer chained, odd-numbered *n*-alkanes ($nC_{25} – nC_{31}$) are representative of leaf waxes from terrestrial plants (Sachse et al. 2004). Plants produce greater quantities of odd than even chain lengths due to synthesis by sequential elongation or condensation of a C_2 primer, where even-numbered fatty acid chains become decarboxylated to produce odd chain length alkanes (Khan and Kolattukudy 1974, Shepherd and Griffiths 2006). Higher plants produce different chain lengths of *n*-alkanes, ranging from nC_{21} to nC_{35} (Sachse et al. 2004, Pu et al. 2011) and their distribution is best represented by the average chain length (ACL) parameter (Rommerskirchen et al. 2003). It is calculated using the below equation:

$$ACL = \frac{(25nC_{25}+27nC_{27}+29nC_{29}+31nC_{31}+33nC_{33}+35nC_{35})}{(nC_{25}+nC_{27}+nC_{29}+nC_{31}+nC_{33}+nC_{35})}$$ (Diefendorf et al. 2011),

(1)

Where nC_x is the total chromatographic peak area of each *n*-alkane with x carbon atoms.

ACL was initially considered to provide information on plant type, such as woody species versus graminoids and this was the main way in which variation in ACL in the sedimentary record was interpreted (Brincat et al. 2000, Smith et al. 2007). Recent workers have investigated whether the ACL of plant *n*-alkanes is determined by plant functional type and have demonstrated no differentiation between woody species and graminoids, although *Sphagnum* mosses are distinct (Schefuß et al. 2003, Bush and McInerney 2013). A proposed alternative explanation for variation in ACL is that climate is an influencing factor (Bush and McInerney 2013, Tipple and Pagani 2013).

A number of different observations have been made in regards to the relationships between modern day climate and ACL. Light intensity and temperature affect leaf wax composition (Shepherd and Griffiths 2006), including ACL, as does aridity and humidity (Tipple and Pagani 2013). Studies have shown that ACL demonstrates a spatial variance with climate, with longer chain lengths (nC_{34} – nC_{37}) being found in sediments from warmer and more arid regions than in those from cooler and more humid climate conditions (Dodd and Poveda 2003, Leider et al. 2013). Plants may increase *n*-alkane production in dry conditions to reduce their water loss (Hoffmann et al. 2013). The sensitivity of *n*-alkane ACL to changes in these parameters may thus provide a robust record of climate variability through time, in particular changes in temperature and aridity.

Similar systematic shifts in ACL distribution of *n*-alkanes have also been recorded in the past where they couple with other proxies supporting climatic perturbations. For example, the PETM was a period of extreme warming that demonstrated an increase in ACL from 28.6 to 30.1 in the Bighorn Basin, Wyoming (Smith et al. 2007). Similarly, Lake Baikal sediments indicate a shift from longer chain lengths (nC_{31}) in the last glacial maximum, to shorter chain lengths (nC_{27}) in Holocene aged sediments (Brincat et al. 2000). Further developing our understanding of how ACL is influenced by climate variations in modern systems allows us to better characterise extreme climate perturbations in the geologic record.

Australia supports a broad range of climate conditions and thus provides an ideal study area in which to examine the relationship of ACL with climate. The Terrestrial Ecosystem Research Network (TERN) has developed a network of biodiversity monitoring plots (AusPlots) at which plant and soil samples are collected and made available to the research community (White et al 2012). By analysing the ACL of *n*-alkanes present in both the dominant plants and the soils collected from these sites and comparing with each site's respective climatic conditions, this study tests whether ACL of leaf wax *n*-alkanes varies systematically in modern plants and soils under a range of climate conditions over a N-S transect of Australia. The climate variables examined are mean annual precipitation (MAP), mean annual temperature (MAT), annual moisture index (MI), lowest quarter mean MI, radiation, driest month precipitation and maximum month vapour pressure deficit, in order to test the response of *n*-alkane ACL response. A relationship between ACL and latitude is also considered.

Specifically, this study examines:

(1) Whether *n*-alkane ACL in plants correlates with each climate variable.

(2) Whether the *n*-alkane ACL measured in soil represents a weighted average of the ACL of the dominant plant species at each site.

(3) Whether the *n*-alkane ACL signature in the soils shows a relationship with each climate variable.

We show that although *n*-alkane ACL is highly variable in plants, *n*-alkane ACL in soils covaries with temperature and aridity and is suitable as a proxy for recording climate change in the sedimentary record.

Climate and ecological setting

Australia's climate varies widely and encompasses tropical monsoonal in the north, to dry arid in the centre, and wet temperate conditions in the south. The Interim Biogeographic Regionalisation for Australia (IBRA), who work in conjunction with the Department of Sustainability, Environment, Water, Population and Communities, identifies 89 distinct bioregions across Australia, based on their climate, geology, landform, native vegetation and species information (Department of Sustainability Environment Water Population and Communities 2012). This study examines plants and soils from the Gulf Fall and Uplands, Darwin Coastal, Burt Plain and Finke bioregions in the Northern Territory and the Flinders Lofty Block, Kanmantoo and Stony Plains bioregions in South Australia.

METHODS

Selection of samples

Plant and soil samples from 20 AusPlots and TREND sites were all obtained from the Terrestrial Ecosystem Research Network (TERN), a national organisation that are involved in the collection, storage and use of ecosystem data for sharing with universities and government agencies for research purposes (White et al. 2012). Detailed descriptions of TERN's sampling procedures are provided in **Appendix A** to this study and in their survey protocols manual (White et al. 2012). Selection of AusPlots sites and TREND plots for subsampling was determined by plotting the MAT, MAP and MI data provided by TERN for each site, against one another to determine the broadest spread of this data, as per **Figure 2**. Subsequent subsampling of each plot was based on selection of the top three dominant plant species from each plot, where available. The information regarding percentage cover of each plant species was obtained from the Soils to Satellites website produced by TERN. Sample number five of the available nine soil samples was taken from each plot, for a total of 59 plant samples and 20 soil samples.

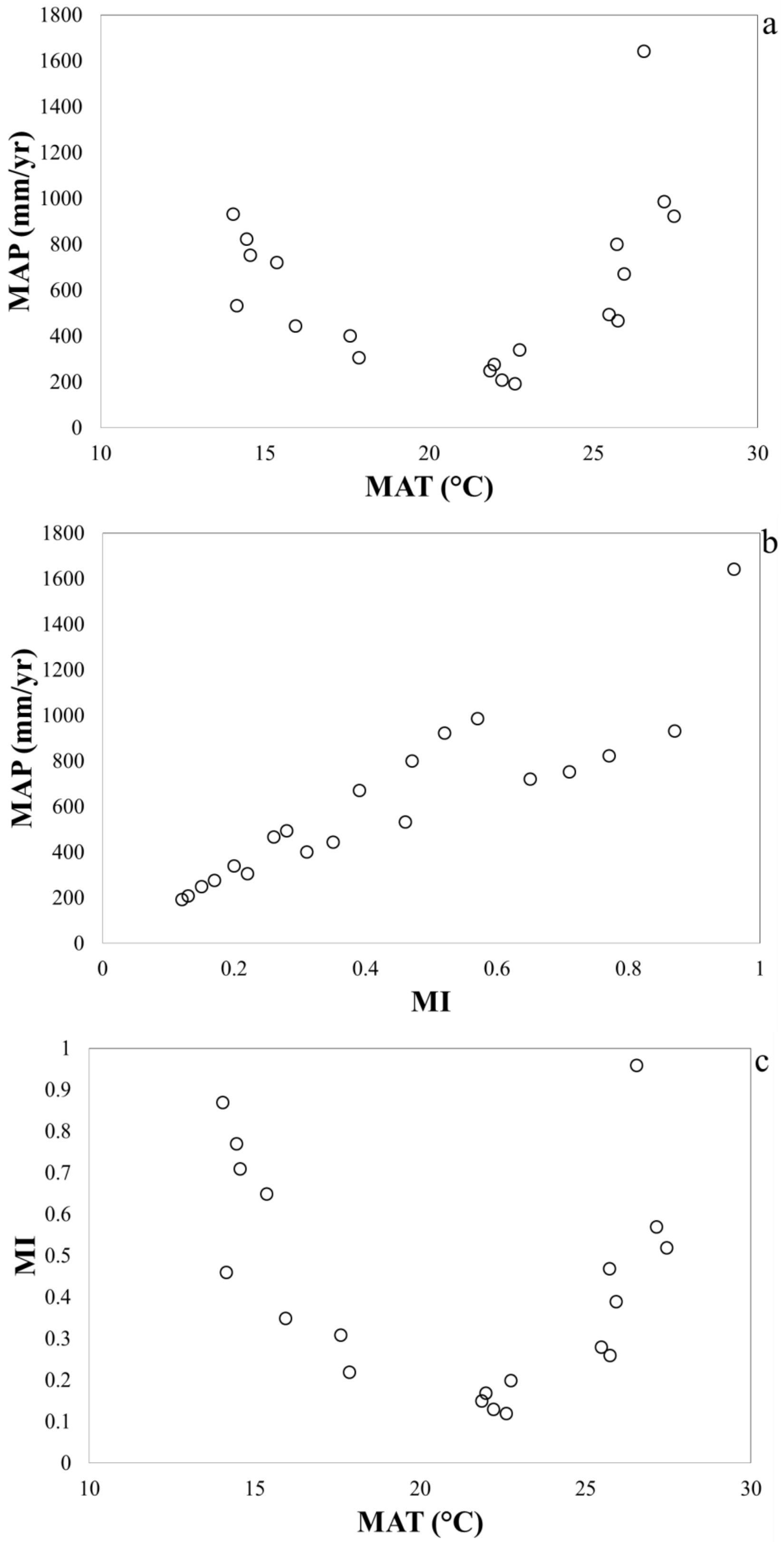


Figure 2: (a) Mean annual precipitation (MAP) versus mean annual temperature (MAT), (b) MAP versus moisture index (MI), and (c) MI versus MAT of selected sites.

Climate data

TERN provided climate data including mean annual temperature (MAT), mean annual precipitation (MAP) and annual moisture index (MI) data as per **Table 1**. **Figure 3** shows the relationship between the selected sites and their position with respect to MAP and MAT data, obtained with permission from the Bureau of Meteorology. Further ANUCLIM climate data, including lowest quarter mean MI, highest period radiation and month maximum vapour pressure deficit (VPD) was obtained from the Atlas of Living Australia website, with kind permission from CSIRO (Williams et al. 2012) and the Fenner School of Environment and Society who worked together to produce the ANUCLIM data. The driest month precipitation data was obtained from the Atlas of Living Australia website and was produced and made freely available for academic use by WorldClim. **Table 1** describes each of the climate variables and **Table 2** provides all data for each climate variable.

Table 9: Description of climate variables (Williams et al. 2012, Prentice et al. 2014).

Climate Variable	Description
MAP	Mean annual precipitation (mm/yr)
MAT	Mean annual temperature (°C)
Annual MI	An annual average moisture index. Moisture index is a measure of relative soil moisture available to plants, calculated from precipitation and evaporation and in conjunction with soil type. Dimensionless values from 0.0-1.0.
Lowest Quarter Mean MI	The lowest yearly quarter MI. Dimensionless values from 0.0-1.0.
Radiation – highest period	Solar radiation is a function of longitude, latitude and rainfall. Rainfall is associated with cloud cover which reduces radiation ($MJ/m^2/day$)
Precipitation – driest month	Amount of lowest month of rainfall (mm)
VPD – month maximum	Month of maximum vapour pressure deficit. Vapour pressure deficit is the difference between the amount of moisture in the air and how much moisture the air can hold when it is saturated (dew point). The dew point increases with temperature. This variable affects the ability of plants to transpire and with increased VPD, transpiration also increases (KPa).

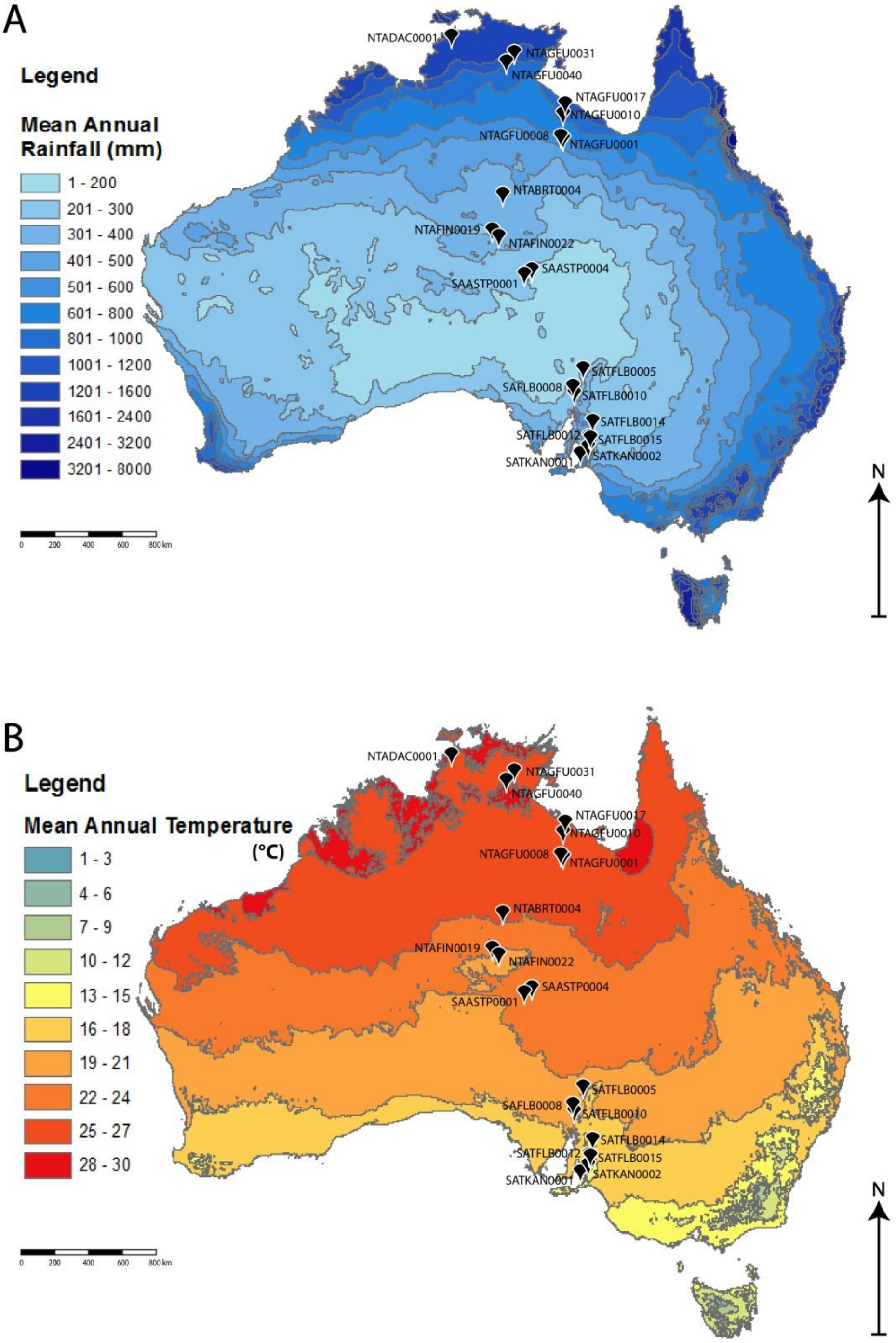


Figure 3: Location maps of selected Ausplots sites (black pins) provided by TERN, across Australia including the TREND sites located in the southern half of South Australia. (A) Shows where the selected sites sit with respect to mean annual rainfall and (B) shows where the selected sites sit with respect to the mean annual temperature. Climate data based on a standard 30-year climatology (1961-1990) and reproduced with permission from Bureau of Meteorology (© Commonwealth of Australia).

Table 10: Table showing the different sites with respect to their bioregion, along with the mean annual precipitation (MAP), mean annual temperature (MAT), annual moisture index (MI), lowest quarter MI, aridity index, radiation, highest month precipitation and vapour pressure deficit for each site.

SITE	Bioregion	MAP (mm/yr)	MAT (°C)	MI (annual) (dimensionless)	MI - lowest quarter mean (dimensionless)	Aridity index - month max (dimensionless)	Radiation - highest period ($MJ/m^2/day$)	Precipitation driest month (mm)	Vapour Pressure Deficit - month max (KPa)	Presence of Cryptogams
NTAGFU0001	Gulf fall and uplands	468.81	25.73	0.26	0.01	0.45	27.9	1	2.27	Y
NTAGFU0008	Gulf fall and uplands	494.62	25.47	0.28	0.02	0.48	27.8	1	2.24	Y
NTAGFU0010	Gulf fall and uplands	673.05	25.92	0.39	0.01	0.76	27.5	1	2.02	Y
NTAGFU0017	Gulf fall and uplands	800.91	25.71	0.47	0.02	0.98	27.3	1	1.84	Y
NTAGFU0031	Gulf fall and uplands	988.65	27.14	0.57	0.01	1.35	26.2	1	1.85	Y
NTAGFU0040	Gulf fall and uplands	923.53	27.44	0.52	0.01	1.23	26.1	0	2.11	Y
NTABRT0004	Burt plain	341.05	22.74	0.20	0.04	0.20	29	7	2.30	Y
NTAFIN0019	Finke	278.92	21.97	0.17	0.04	0.13	29.4	10	2.39	Y
NTAFIN0022	Finke	251.51	21.85	0.15	0.04	0.13	29.5	9	2.34	Y
SATFLB0005	Flinders lofty block	306.95	17.85	0.22	0.07	0.54	28.9	18	1.50	Y
SATFLB0008	Flinders lofty block	446.71	15.92	0.35	0.07	0.82	28.9	22	1.33	Y
SATFLB0010	Flinders lofty block	402.76	17.59	0.31	0.06	0.68	28.6	19	1.29	Y
SATFLB0012	Flinders lofty block	722.62	15.35	0.65	0.11	3.05	27.4	21	0.97	N
SATFLB0014	Flinders lofty block	533.39	14.14	0.46	0.10	1.68	27.7	22	1.02	Y
SATFLB0015	Flinders lofty block	933.83	14.03	0.87	0.16	3.85	27	26	0.76	Y
SATKAN0001	Kanmantoo	753.76	14.55	0.71	0.13	2.87	27.1	23	0.45	Y
SATKAN0002	Kanmantoo	823.48	14.44	0.77	0.14	2.97	27.2	27	0.65	N
SAASTP0001	Stony plains	209.25	22.21	0.13	0.05	0.11	29.7	5	2.42	Y
SAASTP0004	Stony plains	194.65	22.60	0.12	0.04	0.10	29.7	3	2.48	N
NTADAC0001	Darwin Coastal	1642.88	26.53	0.96	0.02	2.41	24.2	2	1.21	N/A

Preparation of plant samples

Plant samples were ground with a mortar and pestle in liquid nitrogen and stored in ashed scintillation vials ready for lipid extraction. The lipids were extracted from the plant samples was using a 9:1 optima grade DCM:MeOH eluent. Ground sample was used for extraction with weights ranging from 5.8 – 52.3mg; with 51 of the 59 plant samples ≥50mg. Approximately 5mL of eluent was added to the ground samples and was then sonicated in a Soniclean 250TD for 15 minutes. The resulting total lipid extract (TLE) was then pipetted off and filtered through ashed glass fibre filter paper. This process was repeated two times, for a total of three extractions. For the final extraction, the ground plant sample was also tipped in to the filter paper and rinsed with 9:1 DCM:MeOH. The TLE solvent was evaporated in a stream of 5.0 N_2 using a FlexiVap and transferred to 4ml vials with optima grade DCM and refrigerated in readiness for short column chromatography.

Preparation of soil samples

Soil samples were sieved with 1000 and 250 µm sieves to remove any obvious plant matter, such as leaves, bark and roots, and to remove any pebbles or other lithified material. Samples were then stored in labelled falcon tubes. The lipid extraction of the <250 µm soil fraction was conducted using a Thermo Scientific Dionex ASE 350 using a 9:1 optima grade DCM:MeOH solvent solution. TLE solvent was evaporated in a stream of 5.0 N_2 using a FlexiVap and transferred to 4ml vials with optima grade DCM and refrigerated in readiness for short column chromatography.

Short column chromatography and GCMS analysis

The polar and non-polar fractions of both the plant and the soil TLEs were separated by eluting them with, firstly, 4ml optima grade hexane to collect the non-polar, aliphatic hydrocarbon fraction, followed by 4ml 1:1 DCM:MeOH eluent to collect the polar fraction, through a silica gel glass short column. A Pasteur pipette was plugged with a small amount of glass wool was ashed and then filled with a slurry of activated silica gel and optima grade hexane (Bastow et al. 2007). The non-polar eluate was then quantitatively transferred to 2ml vials and dried on the FlexiVap and resuspended in 100µL of optima grade hexane Gas chromatograph mass spectrometry (GCMS) analysis was conducted using either a HP5973 MS coupled to a HP6890 GC (MS operated in scanning mode from 45 to 500Da), or by a Perkin Elmer Clarus 500 GCMS. Both machines had the following specifications: The capillary was an SGE CPSil-5MS, 60m (length) x 0.25mm (internal diameter) x 0.25udf (phase thickness). The carrier gas was helium with a 1ml/min constant flow. The injection temperature was 300°C, with a temperature program set to 50°C and held for 1 minute, then ramped at 8°C/min to 340°C and held for 7.75mins. Injection was set to 1µl in either split mode, with a 50:1 split for higher concentration samples, or pulsed splitless for low sample concentrations. The majority of samples were run on the HP5973 MS coupled to a HP6890 GC, and four samples that had previously been run on the Perkin Elmer Clarus 500 GCMS were re-run on the HP5973 MS coupled to a HP6890 GC to ensure there was no difference in the results between the two machines. Chromatograms and peak areas were integrated using Chemstation for the HP5973 MS coupled to a HP6890 GC, and Turbomass for the Perkin Elmer Clarus 500 GCMS.

Calculations

From the GCMS data, relative abundances of *n*-alkane chain lengths were characterised by calculating average chain length (ACL). See equation (1). Soil sample data used for regression analysis was selected based on the carbon preference index (CPI) for each sample, calculated using the below equation:

$$CPI = \frac{[\sum_{odd}(C_{21-33}) + \sum_{odd}(C_{23-35})]}{(2\sum_{even} C_{22-34})} \text{ (Bush and McInerney 2013)} \quad (2)$$

Where $\Sigma_{odd}C_{x\text{-}y}$ is the sum of the peak area for *n*-alkanes with an odd carbon chain length inclusive of that range and $\Sigma_{even}C_{x\text{-}y}$ is the sum of the peak area for *n*-alkanes with an even number of carbon chain lengths inclusive of that range. Values where CPI>1.5 were considered to represent an *n*-alkane source of primarily plant origin (Bush and McInerney 2013). Soils that had a CPI<1.5 were analysed separately and in comparison to soils that had a CPI<1.5 because the source of the low CPI is unknown. **Figure 4** shows examples of GC results for soils with a CPI<1.5 and >1.5. ACL for both the plants and soils and CPI of the soils were plotted against the different climate variables and least squares regression analysis was conducted using Excel.

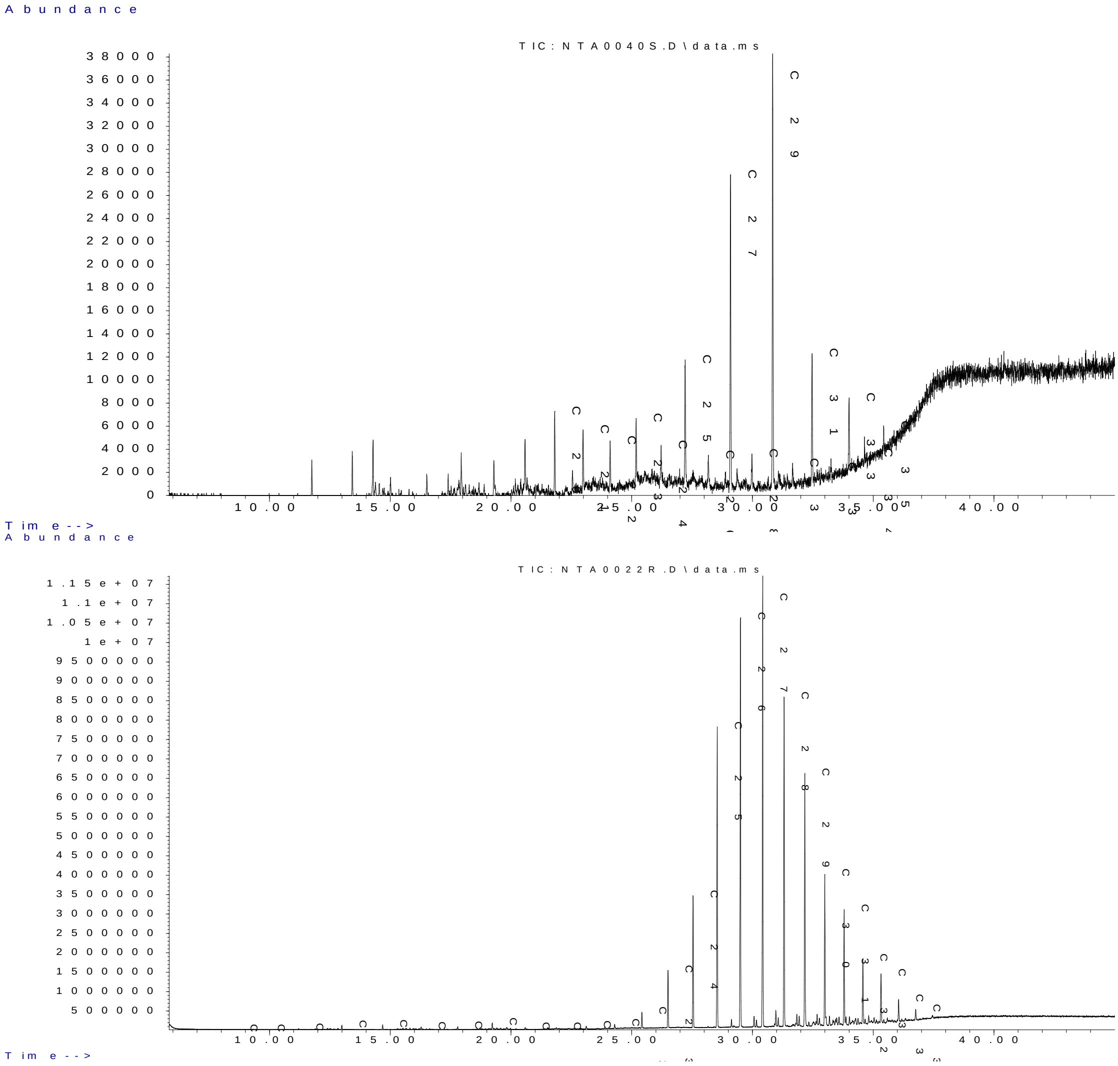


Figure 4: Two chromatograms of the GC results for two soils. NTAGFU0040, at the top, shows a high CPI=6.07 and NTAFIN0022 at the bottom has a CPI=1.1. NTAFIN0022 has a normal distribution of chain lengths and does not show a clear odd-over-even predominance of chain lengths as would be expected for a higher plant *n*-alkane source.

Predicted soil ACL was calculated from an average of the ACL of the plant samples for each site, weighted by their percentage cover (% cover).

$$Predicted\ Soil\ ACL = \frac{[(ACL_{Dom1} \times \%_{Dom1}) + (ACL_{Dom2} \times \%_{Dom2}) + (ACL_{Dom3} \times \%_{Dom3})]}{(\%_{Dom1} + \%_{Dom2} + \%_{Dom3})} \quad (3)$$

Where ACL_{Domx} is the ACL for the dominant plants species and $\%_{Domx}$ is the percentage cover of that dominant species. The calculated results were used to compare ACL with the different climate variables and latitude. More detailed methods can be found in **Appendix B**.

RESULTS

Plant samples show a clear odd-over-even carbon number preference, ranging from 1.5 – 238.3, and tend to have highest concentrations of chain lengths ranging C_{27}-C_{33}, with the most dominant chain length being C_{31}. These results are consistent with those chain lengths of a terrestrial higher plant origin for *n*-alkanes (Zhang et al. 2006). The average chain lengths for all plants ranges from 26.6 to 33.3, whereas the predicted soil ACL values range from 26.8 to 31.9 and the actual soil ACL values range from 27.7 to 31.1 (CPI of >1.5). (**Table 3).**

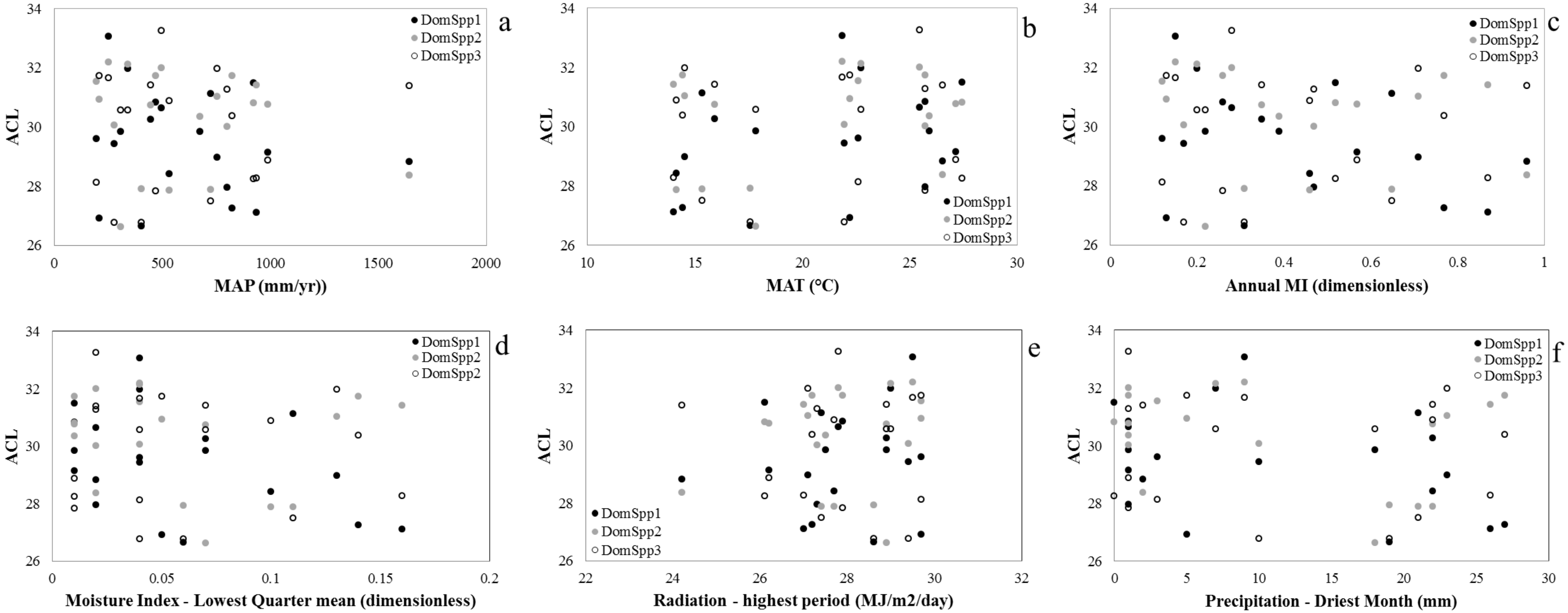
Table 11: ACL for plant and soil samples. The total plant cover (%) is the sum of the top 3 dominant plants % cover. Soil samples used for further analysis were determined based on their carbon preference index (CPI>1.5). The predicted soil ACL is a weighted average of the ACL of the top three dominant plants for each site, based on percentage cover. See Equation (3). There is no predicted soil ACL for NTADAC0001 because percentage cover data was not available for this site.

SITE	Dominant Plant Species 1	% Cover	ACL	Dominant Plant Species 2	% Cover	ACL	Dominant Plant Species 3	% Cover	ACL	Total Plant Cover (%)	Soil CPI	Predicted Soil ACL	Actual Soil ACL
NTAGFU0001	*Aristida pruinosa*	17.4	30.9	*Enneapogon polyphyllus*	13.3	31.7	*Eucalyptus pruinosa*	13.2	27.9	43.9	2.60	30.2	30.3
NTAGFU0008	*Triodia pungens*	45.4	30.7	*Aristida contorta*	19.5	32.0	*Fimbristylis dochotoma*	14.4	33.3	79.3	3.33	31.5	29.2
NTAGFU0010	*Triodia pungens*	62.7	29.9	*Eucalyptus leucophloia*	36.4	30.4	N/A	N/A	N/A	99.1	7.87	30.0	29.8
NTAGFU0017	*Melaleuca viridiflora*	34.5	28.0	*Chrysopogon fallax*	10.4	30.0	*Schizachyrium fragile*	7.7	31.2	52.6	5.19	28.9	30.3
NTAGFU0031	*Melaleuca viridiflora*	30.5	29.1	*Schizachyrium pachyarthron*	28.3	30.8	*Petalostigma banksii*	9.2	28.9	68	0.86	29.8	28.2
NTAGFU0040	*Acacia dimidiata*	26.8	31.5	*Heteropogon contorus*	15.9	30.8	*Eucalyptus tectifica*	9.7	28.3	52.4	6.07	30.7	28.8
NTABRT0004	*Acacia aptaneura*	56.8	32.0	*Aristida holathera*	24.4	32.1	*Triodia schinzii*	7.4	30.6	88.6	5.08	31.9	31.1
NTAFIN0019	*Cenchrus ciliaris*	68.6	29.4	*Acacia estrophiolata*	19.2	30.1	*Enchylaena tomentosa*	2.4	26.8	90.2	2.67	29.5	29.8
NTAFIN0022	*Eremophila freelingii*	50.5	33.1	*Enneapogon polyphyllus*	15	32.2	*Aristida contorta*	7.7	31.7	73.2	1.11	32.7	27.9
SATFLB0005	*Dodonaea viscosa subsp. angustissima*	21.9	29.8	*Eucalyptus flindersii*	18.8	26.6	*Chrysocephalum semipapposum*	13.2	30.6	53.9	2.32	28.9	28.5
SATFLB0008	*Triodia scariosa*	47.6	30.3	*Cassinia laevis*	23.7	30.8	*Casuarina pauper*	12.6	31.4	83.9	2.00	30.6	28.4
SATFLB0010	*Eucalyptus odorata*	67	26.7	*Rhagodia paradoxa*	10.1	27.9	*Enchylaena tomentosa var. tomentosa*	6.1	26.8	83.2	2.00	26.8	28.4
SATFLB0012	*Allocasuarina muelleriana subsp. Muelleriana*	42.1	31.1	*Hibbertia crinita*	15.5	27.9	*Eucalyptus fasciculosa*	12.6	27.5	70.2	1.44	29.8	28.1
SATFLB0014	*Eucalyptus odorata*	33	28.4	*Xanthorrhoea quadrangulata*	18.5	27.9	*Allocasuarina verticillata*	14	30.9	65.5	1.58	28.8	28.3
SATFLB0015	*Eucalyptus obliqua*	61.2	27.1	*Lepidosperma semiteres*	8.5	31.4	*Hibbertia crinita*	6.6	28.3	76.3	2.69	27.7	27.7
SATKAN0001	*Eucalyptus baxteri*	42.9	29.0	*Lepidosperma semiteres*	11.3	31.0	*Pultenaea involucrata*	10.3	32.0	64.5	6.21	29.8	28.7
SATKAN0002	*Eucalyptus obliqua*	55.2	27.3	*Lepidosperma semiteres*	9.2	31.7	*Hakea rostrata*	8.2	30.4	72.6	3.07	28.2	28.0
SAASTP0001	*Maireana aphylla*	34.6	26.9	*Eragrostis setifolia*	12.8	30.9	*Acacia aneura var. tenuis*	8.5	31.7	55.9	1.28	28.6	27.7
SAASTP0004	*Malvastrum americanum var. americanum*	25.6	29.6	*Rutidosis helichrysoides subsp. Helichrysoides*	18.5	31.6	*Sida fubulifera*	11.7	28.1	55.8	1.26	29.9	28.0
NTADAC0001	*Eucalyptus tetrodonta*	N/A	28.8	*Eucalyptus miniata*	N/A	28.4	*Sorghum plumosum*	N/A	31.4	N/A	1.31	N/A	28.0

Figure 5 shows all plant ACL data plotted against each of the climate variables. Plant ACL does not show a significant relationship to MAP, MAT, annual MI, Radiation, Driest Month Precipitation or Vapour Pressure Deficit ($p<0.05$). This is the case regardless of whether the plant is the top 1, top 2 or top 3 dominant species present at that site. **Table 4** shows the p-values and r^2 for each climate variable versus ACL and shows that all of the relationships with the climate variables are not significant ($p>0.05$). To further explore any relationships between chain length and climate, ratios between C_{27}/C_{31} and C_{29}/C_{31} for each plant species were both plotted against the different climate variables yet still no clear relationship was apparent. Eucalyptus genus ACL values were analysed separately, however there appeared to be no relationship between ACL and the different climate variables for this genus. Data for the C_{27}/C_{31} and C_{29}/C_{31} ratio results and the Eucalyptus genus results can be found in **Appendix B** to this document.

Table 12: Results of least squares regression analysis for the plant ACL

Climate Variable	r^2	P-value
MAP	0.01	0.48
MAT	0.04	0.13
Annual MI	0.02	0.25
Lowest quarter mean MI	0.03	0.20
Radiation – highest period	0.01	0.54
Precipitation – driest month	0.05	0.10
VPD – month max	0.06	0.07



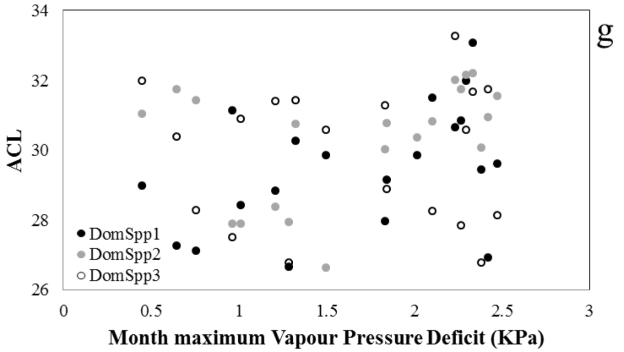


Figure 5: Plots of plant ACL against MAT (a), MAP (b), annual MI (c), lowest quarter mean MI (d), radiation (e), driest month precipitation (f) and maximum month vapour pressure deficit (g). From this data there appears to be no direct relationship between ACL and the above climate variables.

The total cover % of the top three dominant species at each site range from 43.9% to 99.1%, with 18 out of the 19 sites with a total % cover being represented by >50% of cover from these three top dominant plants. Predicted soil ACL values calculated from the top three dominant plants ranges from 26.8 to 31.9. The difference between predicted soil ACL and actual soil ACL range from 0.0006 – 2.22. Least squares analysis for the actual soil ACL versus the predicted soil ACL produced a P-value that is not significant ($p>0.05$). **Figure 6** shows the relationship between the predicted soil ACL and the actual soil ACL, with most predicted soil ACL results lower than the actual soil ACL results. All available soil results are included, including those samples with a CPI<1.5, in order to capture whether or not the dominant *n*-alkane contributors are the plants.

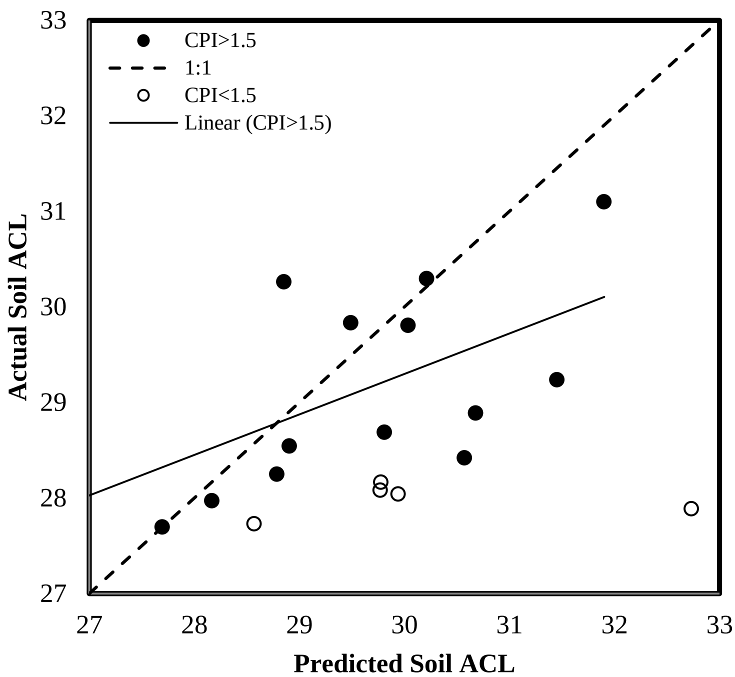


Figure 6: Predicted Soil ACL calculated from the weighted average of the top three dominant plant species at each site versus the actual ACL of the soils. The dashed line represents the 1:1 line. Most data points fall below this 1:1 line, showing that actual ACL is lower than predicted ACL. The slope of the trendline is much lower than 1.

Least squares regression analysis on the soil ACL data is presented in **Tables 5** and **6**. These show that where all soils are analysed (**Table 5**), the p-value is not significant (p>0.05) for all climate variables, except for the lowest quarter mean MI. However, for the soils with a CPI>1.5 (**Table 6**) all climate variables except for MAP and radiation – highest period, have significant p-values (p<0.05).

Table 13: Results of least squares regression analysis for the actual soil ACL for all soils. Rows in bold indicate variables with statistical significance (p<0.05).

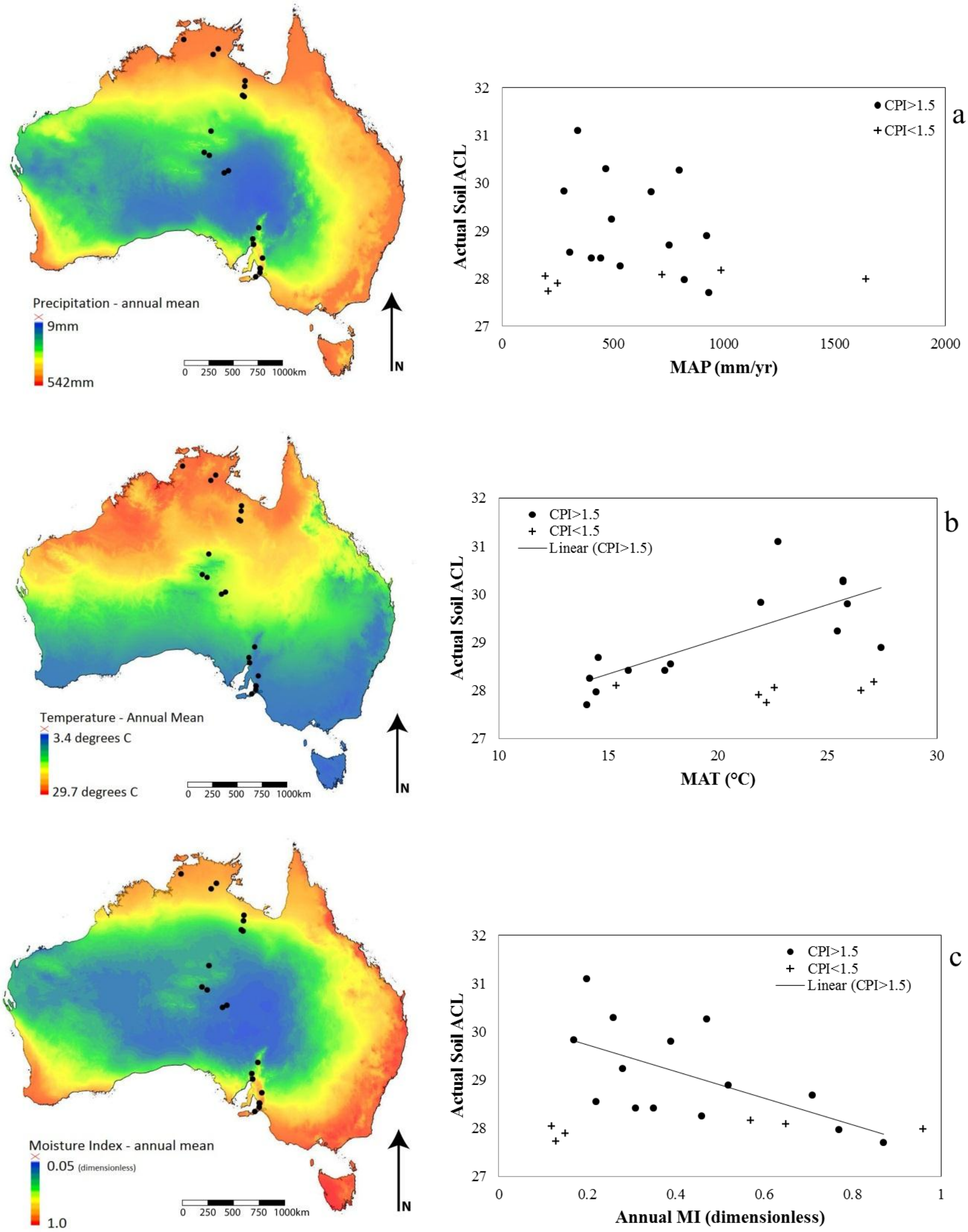
Climate Variable	r^2	P-value	Equation
MAP	0.03	0.43	
MAT	0.19	0.06	
Annual MI	0.12	0.14	
Lowest quarter mean MI	**0.22**	**0.04**	**y=-9.87x + 29.33**
Radiation – highest period	0.01	0.62	
Precipitation – driest month	0.18	0.06	
VPD – month max	0.18	0.06	

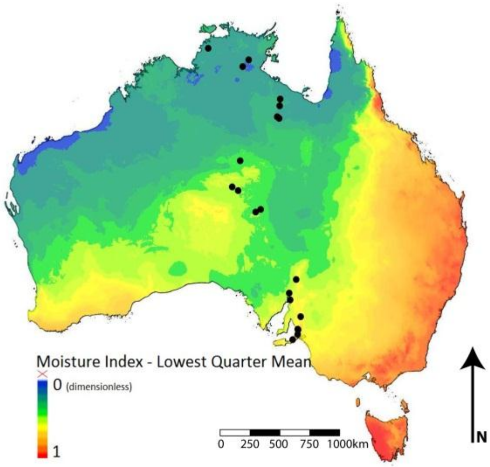
Table 14: Results of least squares regression analysis for the actual soil ACL for soils with a CPI>1.5. Rows in bold indicate variables with statistical significance (p<0.05).

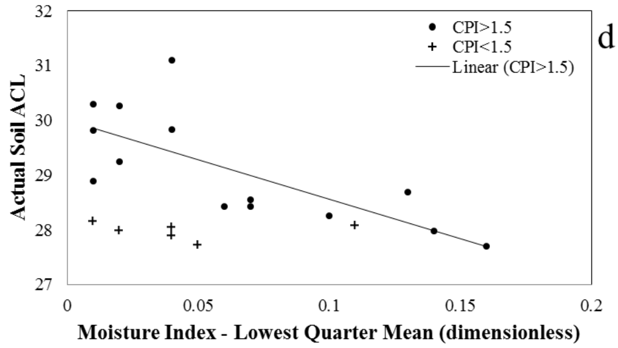
Climate Variable	r^2	P-value	Equation
MAP	0.12	0.23	
MAT	**0.56**	**0.002**	**y=0.14x + 26.17**
Annual MI	**0.37**	**0.021**	**y=-2.77 + 30.28**
Lowest quarter mean MI	**0.54**	**0.003**	**y=-14.42x + 30.01**
Radiation - highest period	0.08	0.33	
Precipitation - driest month	**0.60**	**0.001**	**y=-0.07x + 30.04**
VPD - month max	**0.63**	**0.001**	**y=1.19x + 27.22**

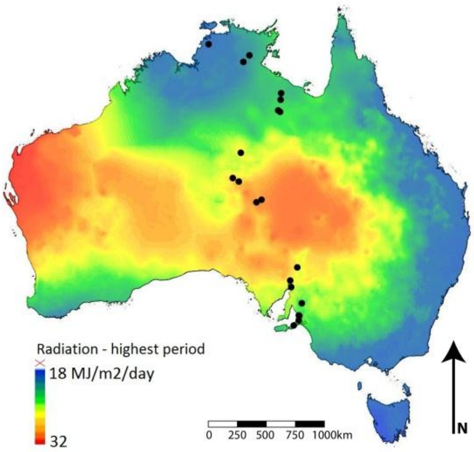
Figure 7 shows both the soils with a CPI>1.5 and the soils with a CPI<1.5. Maps obtained from the Atlas of Living Australia website show the locations of the sites with respect to the different climate variables. When looking at the samples with a CPI>1.5, the samples that have a significant p-value (p<0.05) have been plotted with their regression line. As MAT and monthly maximum VPD increase, so does ACL. In

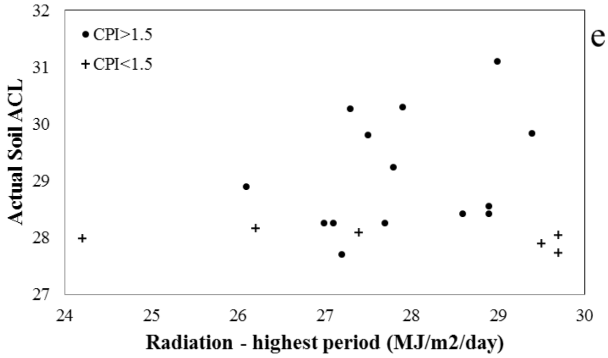
contrast, as annual mean MI, lowest quarter mean MI and driest month precipitation increase, ACL decreases.

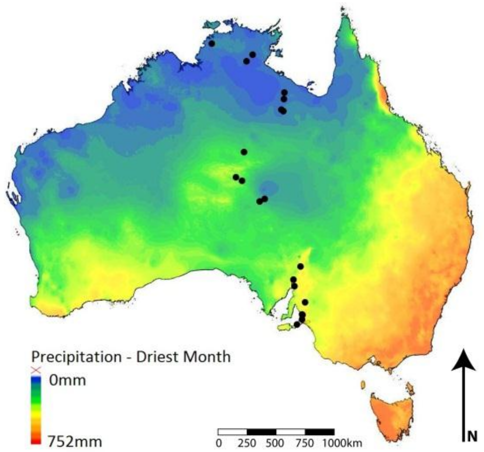


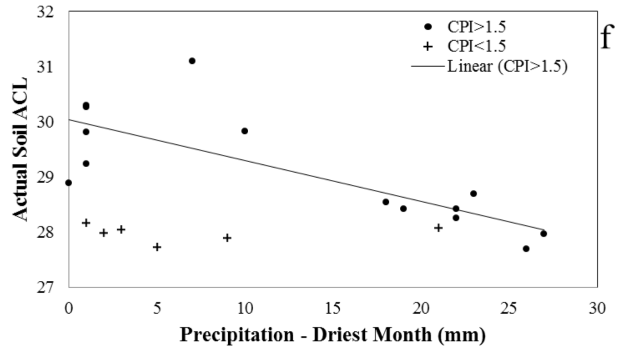

Moisture Index - Lowest Quarter Mean
0 (dimensionless)
1
0 250 500 750 1000km
N


d
CPI>1.5
CPI<1.5
Linear (CPI>1.5)
Actual Soil ACL
Moisture Index - Lowest Quarter Mean (dimensionless)
0
0.05
0.1
0.15
0.2
27
28
29
30
31
32


Radiation - highest period
18 MJ/m2/day
32
0 250 500 750 1000km
N


e
CPI>1.5
CPI<1.5
Actual Soil ACL
Radiation - highest period (MJ/m2/day)
24
25
26
27
28
29
30
27
28
29
30
31
32


Precipitation - Driest Month
0mm
752mm
0 250 500 750 1000km
N


f
CPI>1.5
CPI<1.5
Linear (CPI>1.5)
Actual Soil ACL
Precipitation - Driest Month (mm)
0
5
10
15
20
25
30
27
28
29
30
31
32

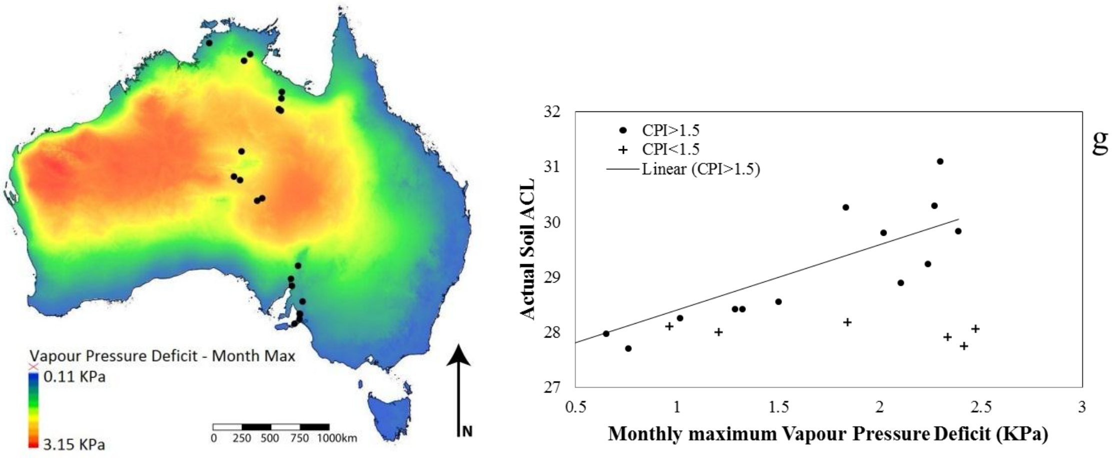


Figure 7: Plots demonstrating the relationship between actual soil ACL and MAT (a), MAP (b), annual MI (c), lowest quarter mean MI (d), highest period radiation (e), driest month precipitation (f) and vapour pressure deficit (g). Maps of the location of sites (black dots) with respect to the various climate variables reproduced with permission from CSIRO (Williams et al. 2012) and the Fenner School of Environment and Society at ANU. Regression lines are displayed for significant (p<0.05) relationships.

A plot of actual soil ACL and latitude (**Figure 8**) shows that ACL increases towards the equator. Least squares regression analysis shows that the r^2=0.55 and the p-value=0.003 for this relationship. A comparison of latitude with MAT has an r^2=0.959 and a p-value = 6.23×10^{-14} as shown in **Figure 9**.

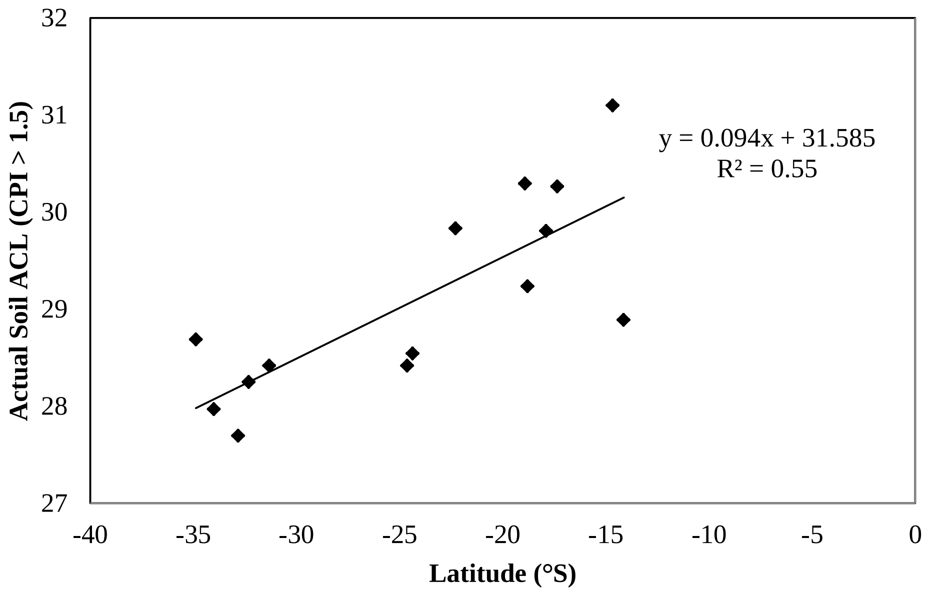


Figure 8: Plot of actual soil ACL (CPI>1.5) with respect to latitude.

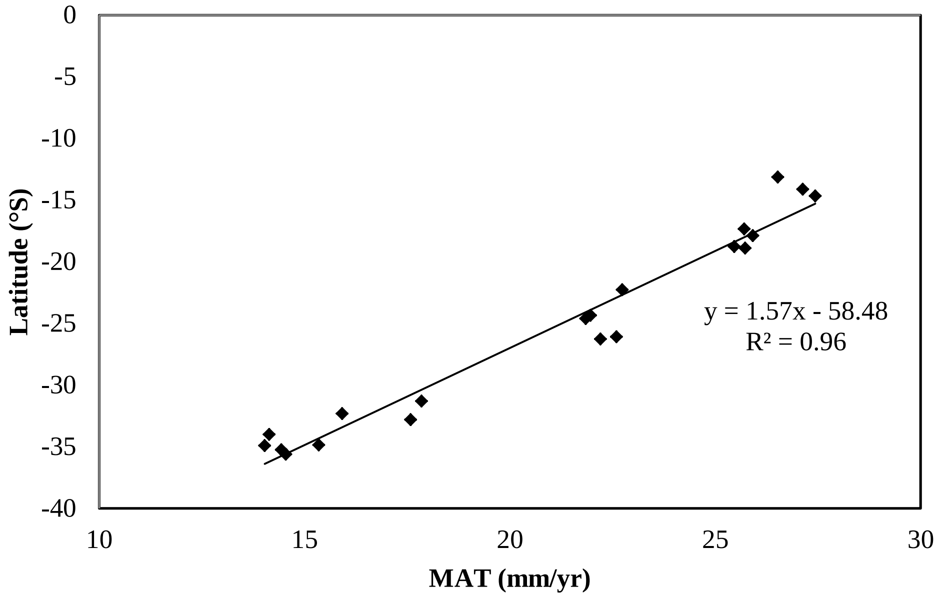
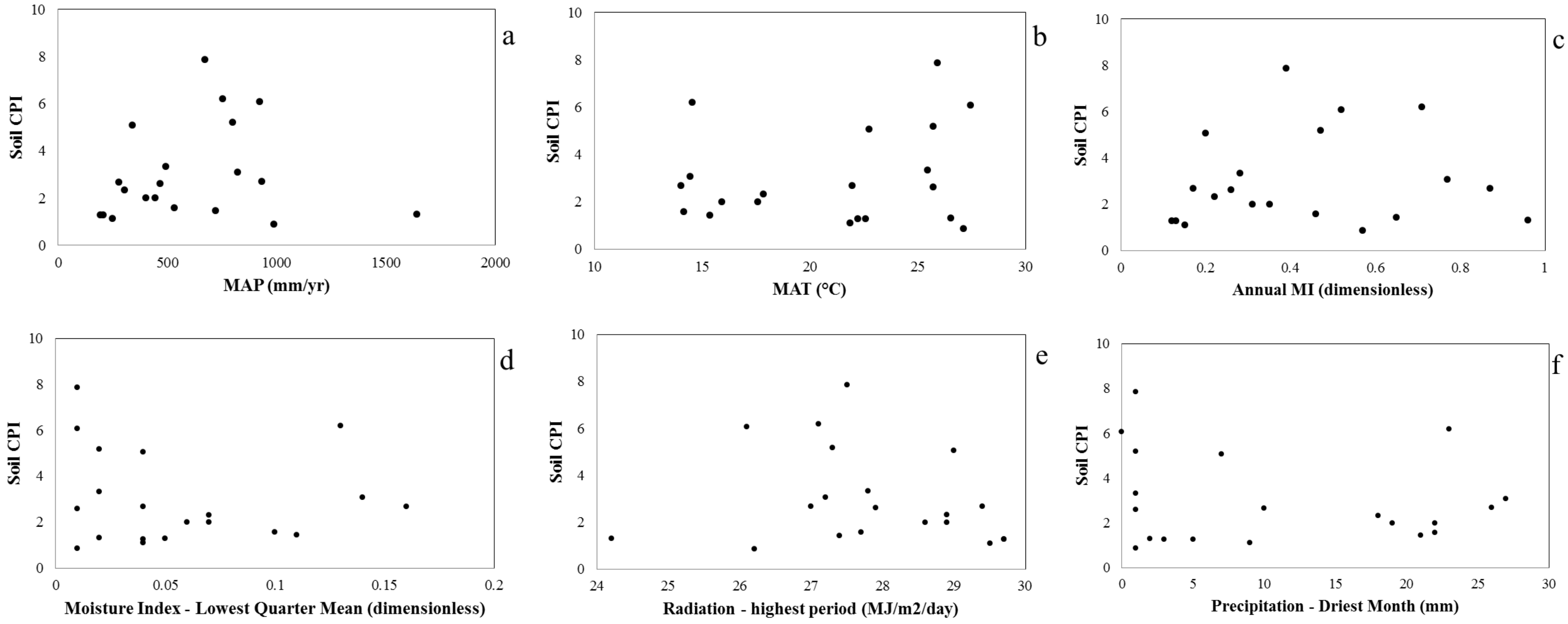


Figure 9: Plot showing the relationship between latitude and MAT.

Figure 10 shows all soil CPI data plotted against each of the climate variables. Soil CPI does not show a significant relationship to MAP, MAT, annual MI, Radiation, Driest Month Precipitation or Vapour Pressure Deficit ($p<0.05$). **Table 7** shows the p-values and r^2 for each climate variable versus CPI and shows that all of the relationships with the climate variables are not significant ($p>0.05$).



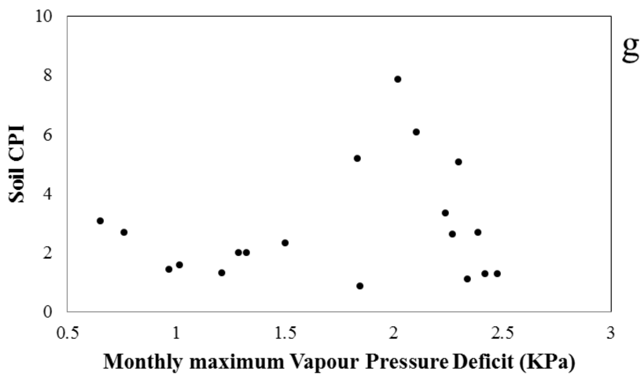


Figure 10: Plots of soil CPI against MAT (a), MAP (b), annual MI (c), lowest quarter mean MI (d), radiation (e), driest month precipitation (f) and maximum month vapour pressure deficit (g). From this data there appears to be no direct relationship between CPI and the above climate variables.

Table 15: Results of least squares regression analysis for the soil CPI for all soils

Climate Variable	r^2	P-value
MAP	0.02	0.60
MAT	0.04	0.39
Annual MI	0.01	0.69
Lowest quarter mean MI	0.01	0.64
Radiation - highest period	0.04	0.43
Precipitation - driest month	0.03	0.46
VPD - month max	0.00	0.99

DISCUSSION

Plant ACL response to climate

This study examines whether variation in *n*-alkane ACL distributions in different plants is dependent on different climate variables. It tests whether annual averages, as well as periods of extreme conditions drive the *n*-alkane distribution in plants. It is expected that plants are more likely to need to protect themselves from climatic extremes than moderate climate conditions. These relationships are expected because of the role that leaf epicuticular waxes play in protecting the plant against water loss and limiting damage against UV radiation. In particular, work by Shepherd and Griffiths (2006) shows that light intensity and temperature affect leaf epicuticular wax composition. Other work has also found evidence that ACL in plants is affected by temperature, humidity and VPD (Tipple and Pagani 2013). Results from this study show that plant ACL has no relationship with any of the climate variables tested.

There may be a number of reasons why the ACL of plants shows no relationship to the climate variables tested, for example, the timing of initial production of *n*-alkanes in plants. Recent work has identified that there is limited variation in *n*-alkane chain length distribution across a growing season in trees sampled near Chicago, US (Bush and McInerney 2013). Similarly, Gülz and Müller (1992) also showed that *n*-alkane concentrations remain fairly constant over a two year period for *Quercus robur* leaves growing at the University of

Cologne in Germany. Tipple et al. (2013) found that *n*-alkane ACL increased during the leaf-flush interval in *Populus angustifolia*, but once the leaf was fully expanded *n*-alkane distributions did not vary for the remainder of the growing season. This indicates that any climatic parameters that affect ACL in terrestrial plants must mainly do so during the leaf-flush interval. Timing of this event in plants may vary from species to species. Production of *n*-alkanes at different times of the year may result in variation in ACL between plants, because of the different timings of the leaf flush interval, as a response to the climate conditions at that moment in time. This may help to explain why the ACL of the plants does not covary with any of the climate variables tested. Plants represent a snapshot in time, which show both seasonal and year-to-year variation in growth. The different sites were each sampled on different days across 2011 and 2012, which means that any seasonal influences on the *n*-alkane production of the plants have not been controlled for.

Leaf life-span may also affect the *n*-alkane production in plants. Sachse et al. (2006) have suggested that deciduous trees that have a long vegetation period that are subject to high incoming radiation protect their leaves by producing longer chained *n*-alkanes. Diefendorf et al. (2011) further identify that evergreen angiosperm and gymnosperm species have a higher abundance of *n*-alkanes than their deciduous counterparts, indicating that a longer leaf life span is potentially exposed to greater extremes and needs to protect against that. As well as this, Sachse et al. (2009) observed variation in *n*-alkane concentrations in *Acer pseudoplatanus* as a result of wind and water ablation, resulting in the constant production of *n*-alkanes over the life of the leaf in this particular species in response to damaging conditions. Different types of plants have different leaf life times. This study examines many different species, with few species replicated and these results indicate that between species variation is high. This may explain why there is no relationship between the ACL of the different species and the climate variables.

In addition, different plant species or genera may respond differently to one another in response to different climate variables. Hoffmann et al. (2013) found that measuring Acacia and Eucalyptus genera along a hydrological gradient across the Northern Territory exhibited an opposite trend in ACL to one another. While they were not able to identify specifically why this occurred, they suggested that perhaps different plant species or genera exhibit different responses in ACL because of variation in leaf functional traits or because of evolutionary differences. However, results from this study do not show a relationship within Eucalyptus genus between ACL and the climate variables, indicating that within genera trends are not always consistent.

Recent work regarding a study of South African flora, however, found that there was no statistically significant relationship between *n*-alkane distribution as it related to mean or extreme climate conditions, specifically MAT and maximum temperature of the warmest month (Carr et al. 2014). Similarly, results from this study show that neither extreme nor average conditions have a greater influence on the ACL of the plants. It is possible that the relationships between plant ACL and climate in Australia are very similar to that observed in South Africa, due to the comparable arid and hot climate conditions experienced in both.

Predicted soil ACL versus actual soil ACL

This study also sets out to examine whether the ACL measured in soil represents a weighted average of the ACL of the dominant plants species. Results from this study show that the predicted soil ACL is not a reliable indicator for actual soil ACL. The calculation method used to predict the ACL for each site was based on the percentage of cover of the top three dominant plant species. The range of total percentage cover that the top three dominant plant species represented, however, was variable, from 43.9 to 99.1%. Furthermore, percentage cover does not necessarily equal biomass. In many ecosystems, percentage cover may not be representative of percentage biomass as a tree contains more biomass than a grass covering the same area. Moreover, it is possible that this selection method may not have captured the dominant *n*-alkane producers at each site. Different plant functional types, such as trees and graminoids, as well as different plant species each produce different concentrations of *n*-alkanes per kg of biomass. Research has identified that deciduous angiosperms produce 200 times more *n*-alkanes than deciduous gymnosperms (Diefendorf et al. 2011, Bush and McInerney 2013). Sachse et al. (2006) also identified that deciduous angiosperm trees are major contributors compared with conifers and mosses. Plant cover may be a poor predictor of the source of *n*-alkanes found in soils. Different species and different plant functional types are all represented in this study and results indicate that relying on the top plant cover alone is insufficient information for predicting the actual ACL of the soil.

The soils represent a temporal average of all of the different contributing organisms and so it is necessary to consider other contributors as well as plants. Different organisms all produce different concentrations of *n*-alkanes, as well as different chain lengths, which in turn affects the ACL of the soil. Generally, short-chained *n*-alkanes with even numbers are associated with bacteria and odd numbers are associated with algae or photosynthetic bacteria. *n*-Alkanes with medium, odd numbered chain lengths are associated with aquatic plants, whereas longer odd numbered chain lengths are representative of leaf waxes from land plants (Sachse et al. 2004). A particular group of organisms that has not been accounted for in this analysis are the cryptogams. Cryptogams form soil crusts, are common in arid regions, and consist of a number of different species including lichens, bryophytes, algae, cyanobacteria, fungi and bacteria. These organisms have been observed and recorded by TERN for each of the sites and recorded on the Soils to Satellites website. Most of the selected sites have observed cryptogam substrate cover which is expected in Australia where an arid climate predominates. It is possible that the presence of the cryptogams has an effect on the ACL of the soils. Little data exists for ACL of lichens, however Sachse et al. (2006) found that analysis of a small number of samples of the genus of moss-like lichens, *Cladonia spp*, in northern Finland and southern Italy yielded varying CPI between 0.9 – 5.0 and average chain lengths between 22.6 – 26.4. Huang et al. (2012) found that lichen species analysed in the Hubei province in China showed a CPI ranging between 3.5 – 8.2 and slightly longer average chain lengths ranging from 27.2 – 28.8. Results from this study show that it is important to consider all contributing species and not just those species which are dominant in terms of cover. High values of ACL in sediments may indicate a higher percentage of vascular plants contributing *n*-alkanes, as compared to non-vascular contributors such as lichens and, likewise, a low ACL may indicate an *n*-alkane source other than higher plants. The weighted average of the top three dominant plant species alone is not reliable for predicting ACL in soil.

Soil ACL response to climate

Although ACL in plants does not show a relationship with climate, the ACL signature in the soils does show a relationship with a number of the different climate variables. Soils with a CPI<1.5 were excluded from this analysis because a low CPI indicates a low odd-over-even carbon number and the source of the *n*-alkanes cannot be clearly identified. It is possible that this low CPI is due to petroleum contamination (Hughen et al. 2004, Douglas et al. 2012), which can conflate results. However, the soils with a CPI>1.5 are likely to indicate an *n*-

alkane source of lichens and higher plants that are locally derived and subject to the local climate conditions. There has been some research investigating the CPI of *n*-alkanes and its relationship to humidity, precipitation and temperature in sediments in south-eastern China to the northern margin of the Loess Plateau (Luo et al. 2012). Luo et al. (2012) found that high CPI values were associated with aridity and that a decrease in CPI was potentially caused by enhanced biodegradation in more humid climates. In this study, however, there was no statistically significant relationship between soil CPI and climate. This study has utilised CPI primarily as an indicator for determining the potential source of the contributing *n*-alkanes.

Soils with a CPI>1.5 show a statistically significant relationship exists between ACL and MAT, annual MI, lowest quarter mean MI, driest month precipitation and maximum month VPD, but do not show a strong relationship with radiation or MAP. Both maximum month VPD and driest month of precipitation show a strong relationship with ACL, with ACL increasing with greater aridity. Similarly a decrease in MI, both annually and the lowest quarter mean, correlate with an increase in ACL in soils. Andersson et al. (2011) also demonstrated that the *n*-alkane ACL of a peat bog in the north-east European Russian Arctic also demonstrated a positive correlation with drier conditions. Our results suggest that aridity is a significant driver of ACL in soils.

In addition, ACL in soils increases as VPD increases. Warmer air results in a higher VPD, which in turn results in increased transpiration in the leaf. This indicates that VPD is an indicator of temperature also and it may be that temperature is the main driver of increased ACL found in the soils with increasing VPD. Similarly, MAT shows a strong relationship to the ACL of soils with a CPI>1.5, with ACL increasing as MAT increases. A strong relationship between ACL in soils and temperature was also found by Bush et al. (In Review) from their measurements from soils across the mid-continental US which also showed an increase in ACL with MAT. Our results show that temperature is also a significant driver of ACL in soils.

The strong relationship between latitude and ACL appears to be strongly related to MAT. Similar to the findings here, Tipple and Pagani (2013) also found that ACL is inversely related to latitude, also with strong correlations between ACL and MAT. While it is also expected that radiation also varies along a latitudinal gradient, this study shows that radiation appears to show no relationship with latitude. However, this may be because the radiation measured in this instance accounts for cloud cover, as well as longitude and latitude.

The findings from this study are similar to the findings from other work (**Table 8**), with comparable r^2 values for latitude, temperature and VPD as they relate to ACL in soils and sediments. Although this study used different metrics for aridity than other studies, the climate variables annual MI, lowest quarter mean MI and driest month of precipitation each reflect available water, and each show an increase in ACL with drier conditions as Carr (2014) also showed.

Table 16: r^2 values for different climate variables and the ACL found in soils and sediments from other work compared with the findings of this study.

Climate variable	Other workers	This study
Latitude	r^2=0.69 Terrestrial and marine sediments from Italy (Leider et al. 2013)	r^2=0.55
MAT	r^2=0.65 Soils from the east coast of the US (Tipple and Pagani 2013)	r^2=0.56
Annual MI		r^2=0.37
Lowest quarter mean MI		r^2=0.54
Precipitation – driest month		r^2=0.54
VPD	r^2=0.45 Soils from the east coast of the US (Tipple and Pagani 2013)	r^2=0.63
Aridity	r^2=0.35 Soils from South Africa (Carr et al. 2014)	

Significant relationships exist between climate and ACL in the soils but not in the plants because the soil integrates the highly variable ACL of all contributing organisms over time. As well as accounting for different organism inputs, plant waxes can also be transported long distances by air or water so the ACL found in sediments integrates not only the local sources, but also regional inputs (Leider et al. 2013). Similar to our results, Sachse et al. (2006) found that *n*-alkane ACL distribution was less variable in sediments than in plant biomass, with their research investigating *n*-alkanes in lake sediments in Finland and Italy. Carr et al. (2014) also found that the soil represented an average of all of the plant variation in their study of leaf wax *n*-alkane distributions in sedimenta from South Africa. Bush and McInerney (In Review) also showed that the soils represent a pooled and averaged chain length distribution. This study demonstrates that *n*-alkane ACL in soils covaries with temperature and aridity and is thus suitable as a proxy for recording climate change in the sedimentary record.

CONCLUSIONS

This study demonstrates the strong correlation between both mean and extreme climate conditions relating to temperature and aridity and the ACL of soils across Australia. In particular, the mean conditions of interest are MAT and annual MI and the extreme conditions include lowest quarter mean MI, driest month of precipitation and the maximum month VPD. Interestingly, there is also a strong relationship between the ACL in the soils and latitude, and further investigation reveals that this relationship is driven by temperature rather than radiation. The soils show a much stronger relationship with the climate variables than the plants do and this is likely to be because the soils represent a temporal integration of all *n*-alkane contributing organisms. The plants, on the other hand, are subject to different rates and timing of growth and are more susceptible to climate variations on a much smaller timescale. This timescale does not necessarily represent the overall climate conditions, and the production of *n*-alkanes in the plants may instead be more closely related to seasonal variation. Overall, these results show that aridity and temperature are significant drivers of ACL found in soils. Coupled with their persistence in the sedimentary record, these results confirm that *n*-alkane ACL in soils is suitable as a proxy for recording climate variation in the sedimentary record.

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APPENDIX A: EXTENDED METHODOLOGY

AusPlots and TREND

Samples were taken from AusPlots and TREND plots provided by the services of the Terrestrial Ecosystem Research Network (TERN). The TERN plot selection process can be found in their AusPlots Rangelands Survey Protocols Manual (White et al. 2012). The process consists of four stages, with the first three stages being desktop exercises:

1. Bioregional stratification

   Hierarchical cluster analysis of Australia's different bioregions, to create groups of similar bioregions.

2. Selecting representative bioregions to sample

   The main goal is to sample at least one bioregion in each group.

3. Stratifying areas of sampling interest within bioregions

   Hierarchical analysis to a greater resolution to that of Stage 1, based on scientific and environmental information, historic information, logistic considerations and political considerations.

4. Choosing plot locations in the field based on areas of interest

Precise sites are chosen based on a consistent and constant mix of vegetation, slope, relief and soil, with plots being 1 hectare in size and having a N/S, E/W orientation.

Once plots had been selected, field work planned and the plot layout positioned, field workers then conducted and number of different methods at each plot. These include a plot description, photo panoramas, collection of vascular plant samples, collection of point intercept data, determination of basal area of trees and shrubs, determination of plant structural summary, leaf area index and soil descriptions and soil metagenomic sampling.

For the purposes of this project, the plant samples and soil metagenomics samples were those required for subsampling. Plant samples were collected by trimming off plant material with secateurs and placing in a labelled paper bag and then barcoded. At the end of each day, plants samples were then placed in a plant press to assist with preservation and identification. Once brought back from the trip all plant samples were sent to a local herbarium for identification. Once identification was complete, plant samples were then transferred to synthetic tea bags and stored with silica granules in an airtight plastic lunch box.

At each plot, 9 soil sampling locations were identified, with cores to 30cm deep being taken. As well as this, surface soil is also sampled for soil metagenomics. This involved scraping aside any loose plant material and animal waste and taking a soil sample with a small clean trowel to 3cm depth. This soil was then placed in a calico bag and barcoded. Each calico bag was then placed in a larger snaplock bag with silica granules for storage.

Site and Sample Selection

Sites for subsampling were initially selected based on the immediate availability of plant and soil samples. To further narrow down which sites were to be selected, Mean Annual Temperature (MAT) and Mean Annual Precipitation (MAP) for each site were plotted against one another in Excel to help select sites that provide a broad spread of these two variables. Information, including MAT and MAP, for each site was provided in spreadsheet format directly from TERN.

Once the sites had been narrowed down to 19 through the above process, the top three dominant plant species was selected from each site. This process was made simple by the Soils to Satellite website, found at http://soils2sat.ala.org.au:8080/ala-soils2sat/, provided by TERN. By selecting the Study Location>Point Intercept>Herbarium Determination, amongst

other things, a simple pie chart is presented that provides the percentage cover of all plant species present at that site, allowing selection of the top three dominant species.
Soil sample selection was a little more arbitrary than the plant sampling, with "Sample 5" being selected for each site. Initially it was assumed that Sample 5 represented the central sample of a total of 9 having been taken at each site; however this may or may not be the case for each site.

Metadata for Atlas of Living Australia Website (for both maps and data)

Precipitation - annual mean

Description:	Mean annual rainfall (mm)
Short Name:	rainm
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-07
Reference date:	
Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission required to re-distribute derivative works. Please contact Dr. Kristen Williams - kristen.williams@csiro.au
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Climate ⇒ Precipitation
Units:	mm
Data language:	eng
Scope:	
Notes:	
Keywords:	rain
More information:	http://spatial.ala.org.au/geonetwork/srv/en/metadata.show?uuid=64c0fb3f-b9c9-4ff1-bbaa-df7cba45e1b7
View in spatial portal :	Click to view this layer

Temperature - annual mean (Bio01)

Description:	Temperature - annual mean (Bio01)
Short Name:	bioclim_bio1
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-08

Reference date:	2008-02
Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission to re-distribute ANUCLIM outputs should be obtained from Prof. Michael Hutchinson - http://fennerschool.anu.edu.au/publications/software/
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Climate ⇒ Temperature
Units:	degrees C
Data language:	eng
Scope:	
Notes:	Data derived using ANUCLIM v6 (beta) with the new set of climate surfaces (centred on 1990), by Dr. Kristen Williams.
Keywords:	
More information:	http://fennerschool.anu.edu.au/publications/software/
View in spatial portal :	Click to view this layer

Moisture Index - annual mean (Bio28)

Description:	Moisture Index - annual mean (Bio28)
Short Name:	bioclim_bio28
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-08
Reference date:	2008-02
Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission to re-distribute ANUCLIM outputs should be obtained from Prof. Michael Hutchinson - http://fennerschool.anu.edu.au/publications/software/
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Substrate ⇒ Moisture
Units:	Dimensionless
Data language:	eng
Scope:	
Notes:	Data derived using ANUCLIM v6 (beta) with the new set of climate surfaces (centred on 1990), by Dr. Kristen Williams.
Keywords:	soil, water, saturation
More	http://fennerschool.anu.edu.au/publications/software/

information:	
View in spatial portal :	Click to view this layer

Moisture Index - lowest quarter mean (Bio33)

Description:	Moisture Index - lowest quarter mean (Bio33)
Short Name:	bioclim_bio33
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-08
Reference date:	2008-02
Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission to re-distribute ANUCLIM outputs should be obtained from Prof. Michael Hutchinson - http://fennerschool.anu.edu.au/publications/software/
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Substrate ⇒ Moisture
Units:	Dimensionless
Data language:	eng
Scope:	
Notes:	Data derived using ANUCLIM v6 (beta) with the new set of climate surfaces (centred on 1990), by Dr. Kristen Williams.
Keywords:	soil, water, saturation
More information:	http://fennerschool.anu.edu.au/publications/software/
View in spatial portal :	Click to view this layer

Aridity index - month max

Description:	Maximum month aridity index
Short Name:	arid_max
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-07
Reference date:	

Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission required to re-distribute derivative works. Please contact Dr. Kristen Williams - kristen.williams@csiro.au
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Climate ⇒ Precipitation
Units:	dimensionless
Data language:	eng
Scope:	
Notes:	The monthly ratio of precipitation to potential evaporation (pan, free-water surface). A numerical indicator of the degree of dryness of the climate at a given location. Adapted from the index proposed by UNEP (1992; cited in Middleton and Thomas (1997)).
Keywords:	evaporation, rain, precipitation, temperature
More information:	http://spatial.ala.org.au/geonetwork/srv/en/metadata.show?uuid=057e11df-fc1c-4d20-ad54-19dc0345e969
View in spatial portal :	Click to view this layer

Radiation - highest period (Bio21)

Description:	Radiation - highest period (Bio21)
Short Name:	bioclim_bio21
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-08
Reference date:	2008-02
Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission to re-distribute ANUCLIM outputs should be obtained from Prof. Michael Hutchinson - http://fennerschool.anu.edu.au/publications/software/
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Climate ⇒ Solar radiation
Units:	MJ/m2/day
Data language:	eng
Scope:	
Notes:	Data derived using ANUCLIM v6 (beta) with the new set of climate surfaces (centred on 1990), by Dr. Kristen Williams.
Keywords:	solar, sun

More information:	http://fennerschool.anu.edu.au/publications/software/
View in spatial portal :	Click to view this layer

WorldClim: Precipitation - driest month

Description:	Precipitation of Driest Month
Short Name:	worldclim_bio_14
Metadata contact organization:	WorldClim
Organisation role:	custodian
Metadata date:	2010-07
Reference date:	
Resource constraints:	• Licence level: 2 • Licence info: http://www.worldclim.org/current
Licence notes:	This dataset is freely available for academic and other non-commercial use. Redistribution, or commercial use, is not allowed without prior permission.
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Climate ⇒ Precipitation
Units:	mm
Data language:	eng
Scope:	
Notes:	(From http://www.worldclim.org/methods) - For a complete description, see: Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978. The data layers were generated through interpolation of average monthly climate data from weather stations on a 30 arc-second resolution grid (often referred to as 1 km2 resolution). Variables included are monthly total precipitation, and monthly mean, minimum and maximum temperature, and 19 derived bioclimatic variables. The WorldClim interpolated climate layers were made using: * Major climate databases compiled by the Global Historical Climatology Network (GHCN), the FAO, the WMO, the International Center for Tropical Agriculture (CIAT), R-HYdronet, and a number of additional minor databases for Australia, New Zealand, the Nordic European Countries, Ecuador, Peru, Bolivia, among others. * The SRTM elevation database (aggregeated to 30 arc-seconds, 1 km) * The ANUSPLIN software. ANUSPLIN is a program for interpolating noisy multi-variate data using thin plate smoothing splines. We used latitude, longitude, and elevation as independent variables.
Keywords:	rain, bio14
More information:	https://gist.github.com/tucotuco/1152668

View in spatial portal :	Click to view this layer

Vapour pressure deficit - month max

Description:	Maximum month vapour pressure deficit (KPa)
Short Name:	vpd2max
Metadata contact organization:	CSIRO Ecosystem Sciences
Organisation role:	
Metadata date:	2010-07
Reference date:	
Resource constraints:	• Licence level: 1 • Licence info:
Licence notes:	Permission required to re-distribute derivative works. Please contact Dr. Kristen Williams - kristen.williams@csiro.au
Type:	Environmental (gridded) 0.01 degree (~1km)
Classification:	Climate ⇒ Humidity
Units:	KPa
Data language:	eng
Scope:	
Notes:	
Keywords:	temperature, moisture
More information:	http://spatial.ala.org.au/geonetwork/srv/en/metadata.show?uuid=b0da1579-7cc6-4fff-8d56-d2bf1fae3d74
View in spatial portal :	Click to view this layer

Email from Dr Kristen William granting permission for use of climate data

From: Kristen.Williams@csiro.au [mailto:Kristen.Williams@csiro.au]
Sent: Saturday, 11 October 2014 8:06 PM
To: Sian Howard
Subject: RE: Use of maps made available on Atlas of Living Australia
Hi Sian,
Thank you for your enquiry.

I can help you with:

- Temperature: MINT and MAXT
- Precipitation: RAIN
- Radiation: RADN
- Aridity Index: ARID

- Vapour pressure deficit: VPD

For the moisture index, I can provide water deficit (P-E): ADEF.

postfix on naming: I = min, X – max; M = mean annual; A = annual total

1960 series includes VPD
1990 series includes RH (relative humidity)

All of above are custom derivatives of monthly variables generated using ANUCLIM software.

See XML metadata for details.

Will send data via cloudstor with license and acknowledgement/attribution requirements.

Use of this data in reports and publications requires citation of my paper describing the data collection: Williams et al. 2012 in the International Journal of GIS (attached).

This data is provided for your personal research use only.

You'll need help from someone with GIS skills to assist with mapping.

regards,
Kristen

Kristen J Williams, PhD, GISP-AP
Senior Research Scientist - Ecological Geographer
Group Leader Biodiversity Assessment and Conservation
Biodiversity, Ecosystem Knowledge and Services Research Program

CSIRO Land & Water National Research Flagship
http://www.csiro.au/Organisation-Structure/Flagships.aspx

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http://www.researcherid.com/rid/B-9941-2008 | http://orcid.org/0000-0002-7324-5880

Address: GPO Box 1700, Canberra, ACT 2601
Location: Black Mountain Laboratories, Clunies Ross Road, Acton

Email from BOM granting permission for use of climate data

From: climatedata@bom.gov.au [mailto:climatedata@bom.gov.au]
Sent: Friday, 1 August 2014 11:47 AM
To: Sian Howard
Subject: Bureau of Meteorology Climate Data: Ticket# E7WG664726 - Use of maps for Honours thesis [SEC=UNCLASSIFIED]

Australian Government
Bureau of Meteorology

In reply please quote: E7WG664726

Dear Sian,

Thank you for your enquiry. You can use the maps and data on our website as you wish - you just need to acknowledge the Bureau of Meteorology as the source.

Feedback
We are constantly working to improve our service and appreciate your feedback. If you would like to contribute, please complete our 2 minute survey at
http://www.bom.gov.au/climate/surveys/customer_feedback.shtml .

Regards,

Melanie Harris

Climate Data Services
Bureau of Meteorology

Contact details:
Monday to Friday: 10am – 12noon & 2pm – 4pm
Head office: 03 9669 4082

To avoid interstate call charges please use the appropriate number below:
NSW: 02 9296 1627
NT: 08 8920 3921
QLD: 07 3239 8727
SA: 08 8366 2746
TAS: 03 6221 2027
VIC: 03 9669 4082
WA: 08 9263 2228

http://www.bom.gov.au/climate/data-services/

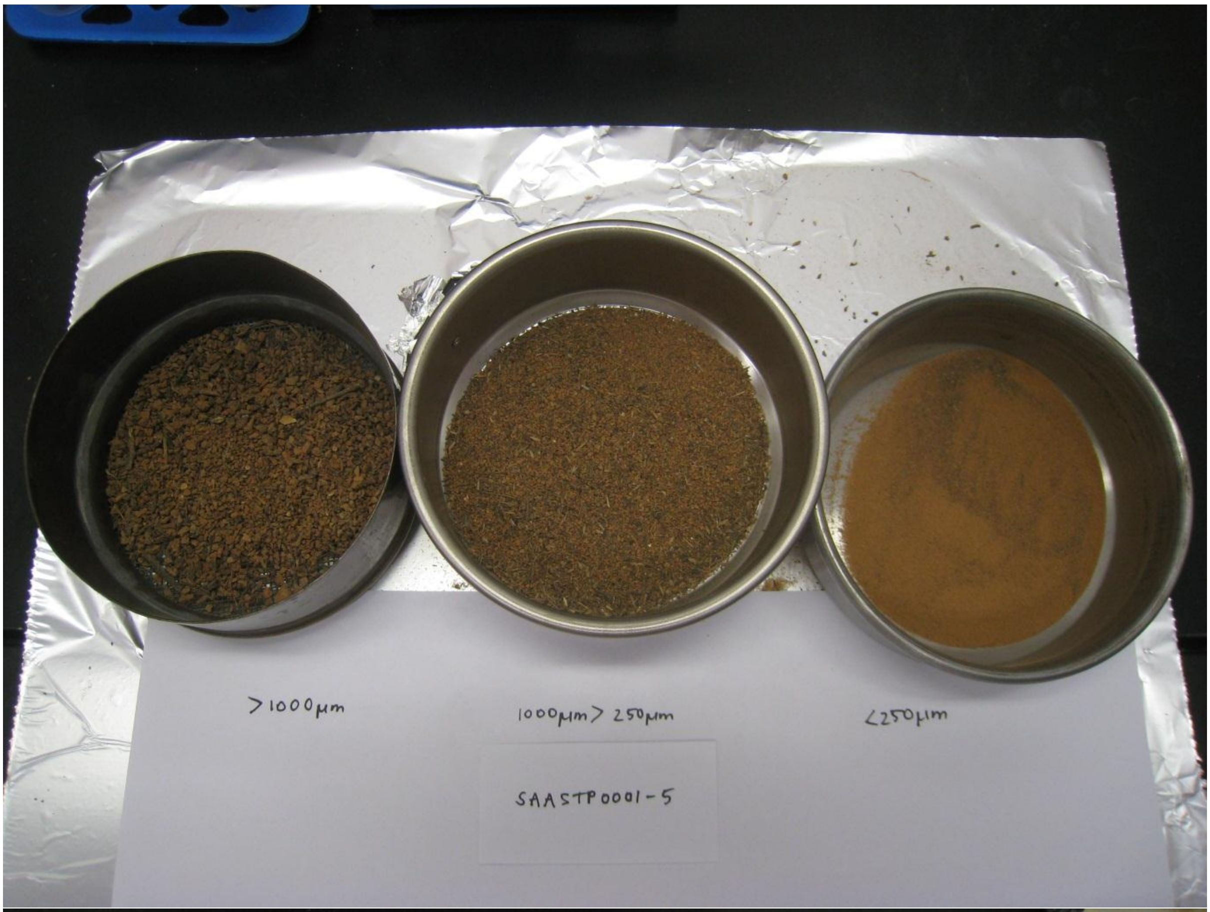
Sample Collection and Weighing

Plant samples were weighed using a Sartorius Analytical Microbalance. To clean tweezers, used to handle the plant samples, they are rinsed with solvents from Teflon squeeze bottles in the following order: three rinses with methanol, three rinses with dichloromethane, and three rinses of hexane, in order to remove any hydrocarbons present. All solvents are of Optima grade. Tweezers are cleaned before handling each sample. Nitrile gloves are also worn. A clean sheet of aluminium foil is placed on the bench, shiny surface facing down, and used as the surface for working from. This sheet of foil was replaced between handling of each sample, in the event that it came in to contact with any plant sample, to avoid cross contamination. A small clean beaker was placed on to the scales and a new, labelled and open plastic falcon tube rested inside it. These were tared on the scales. Using the tweezers, each "tea bag" containing the plant samples was opened and between 0.1-0.2g of plant sample grasped with the tweezers and weighed on the Sartorius Analytical Microbalance, making sure to avoid the sample came in to contact with anything except for the inside of the uncontaminated falcon tube. For larger samples, solvent rinsed scissors (see above process for solvent rinsing tweezers) were used to cut the plant sample into smaller pieces before being weighed. Once each sample had been weighed, the falcon tube was removed from the scales, capped, and the caps then labelled. The capped falcon tubes were then stored in a test tube rack until grinding occurred.

Soil samples were collected from storage at the TERN warehouse. The sample bag labelled "5" was subsampled from each site. Wearing nitrile gloves, a new clean and opened falcon tube was used to scoop out one tubeful of soil. A fresh pair of nitrile gloves was used for each soil sample taken. Once soil had been scooped out of the sample bag, the falcon tube was immediately capped, the outside wiped with Kimwipes to remove any residual material, labelled and then stored in a test tube rack until total lipid extraction occurred.

<u>Sample Grinding and Sieving</u>
Plant samples were ground into finer material in order to maximise the amount of lipids that could be extracted from them. These were ground using a ceramic mortar and pestle. Each sample was ground in a clean mortar and pestle, that had been washed with a 1:50 solution of decon90:water, followed by rinsing with tap water three times, and then rinsed with RO water three times, dried and then thoroughly solvent rinsed with Optima grade solvents from Teflon squeeze bottles in the following order: three rinses with methanol, three rinses with dichloromethane and then three rinses with hexane. Liquid Nitrogen was used to help grind the samples, and was collected in a thermal flask, following the regulation Safe Operating Procedures of wearing protective eyewear, labcoat and insulated gloves. Each plant sample was removed from its falcon tube, either by pouring directly in to the mortar, or by using clean, solvent rinsed tweezers, and then placed into the mortar. The mortar was then approximately 1/3 filled with liquid nitrogen, to speed up the crushing and grinding process by freezing the sample and making it more brittle. Using the pestle and attempting to avoid spillage, the plant was pulverised and ground until fine. Once all the liquid nitrogen had evaporated, the ground plant sample was then carefully scraped in to an ashed scintillation vial with a clean and solvent rinsed steel scoopula. The scintillation vials were then capped and labelled. In the event that the plant material was not entirely dry at this point, the scintillation vial was loosely covered with alfoil instead of being capped, and left in the fume cupboard so that the sample could dry out, in order to avoid and mould or fungal growth from occurring. Each sample was ground with a clean and solvent rinsed mortar and pestle and transferred with clean and solvent rinsed tweezers and scoopulas. Labelled scintillation vials were stored until sample was to undergo total lipid extraction.

Soil samples need to be sieved prior to total lipid extraction to remove any visible plant detritus including leaves, bark and root material, and to also remove any small pebbles. The soil sample was placed in an ashed aluminium sample boat and gently pressed with a solvent rinsed scoopula or tweezers to break up any clods. Two sieves, 530 micron and 1000 micron, were scrubbed with a 1:50 decon90:water mixture, rinsed three times with tap water, rinsed three times with RO water, sonicated in acetone for 15 minutes, followed by triple rinsing with Optima grade solvents from Teflon squeeze bottles in the following order: three times with Methanol, three times with dichloromethane and then three times with hexane. The sieves were stacked on top of a solvent rinsed catcher bowl, with the 1000 micron sieve on the top, and the soil sample poured onto the top sieve and gently shaken through. The sieved material collected in the catcher bowl was poured into a new, labelled falcon tube in readiness for total lipid extraction in an ASE, and the residual material placed into the original falcon tube and labelled with the site location and lab user initials.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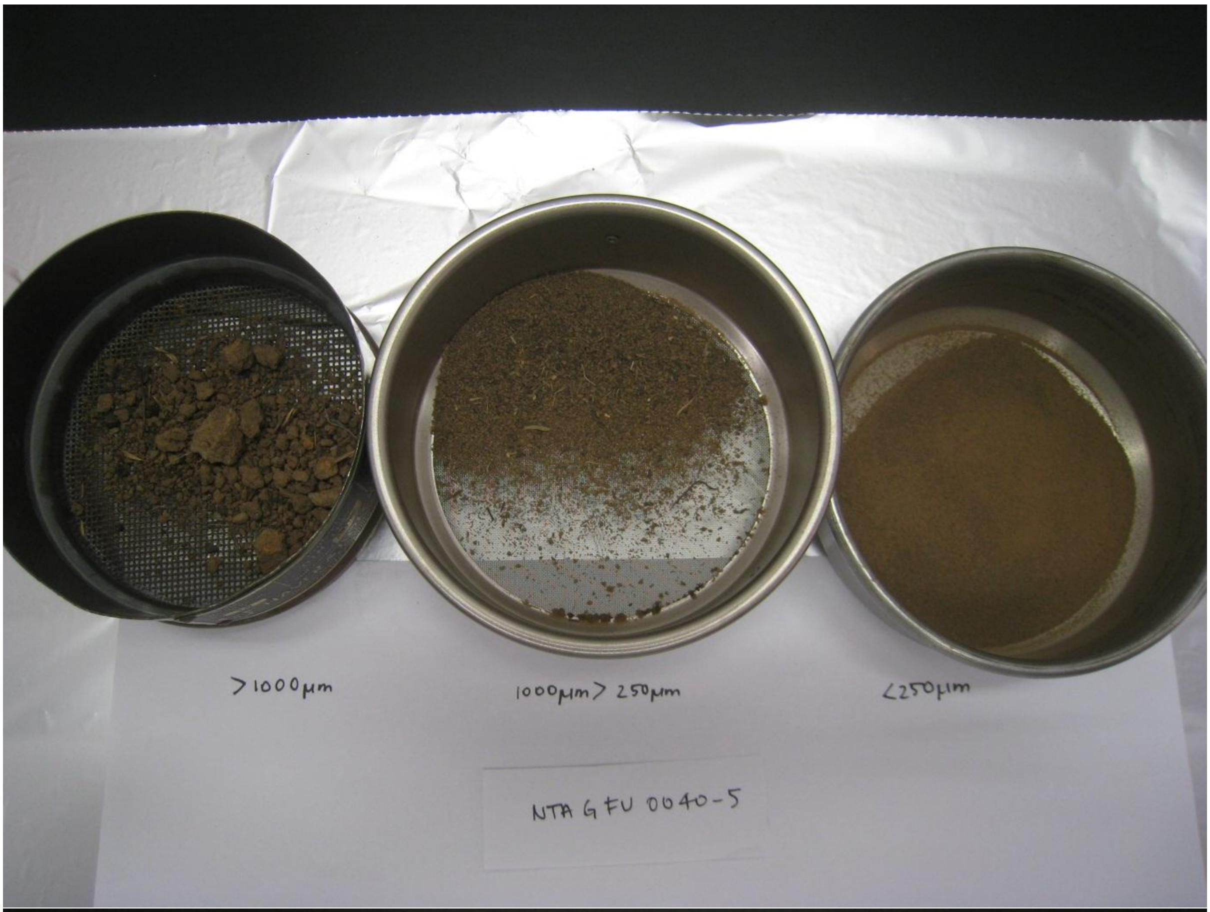
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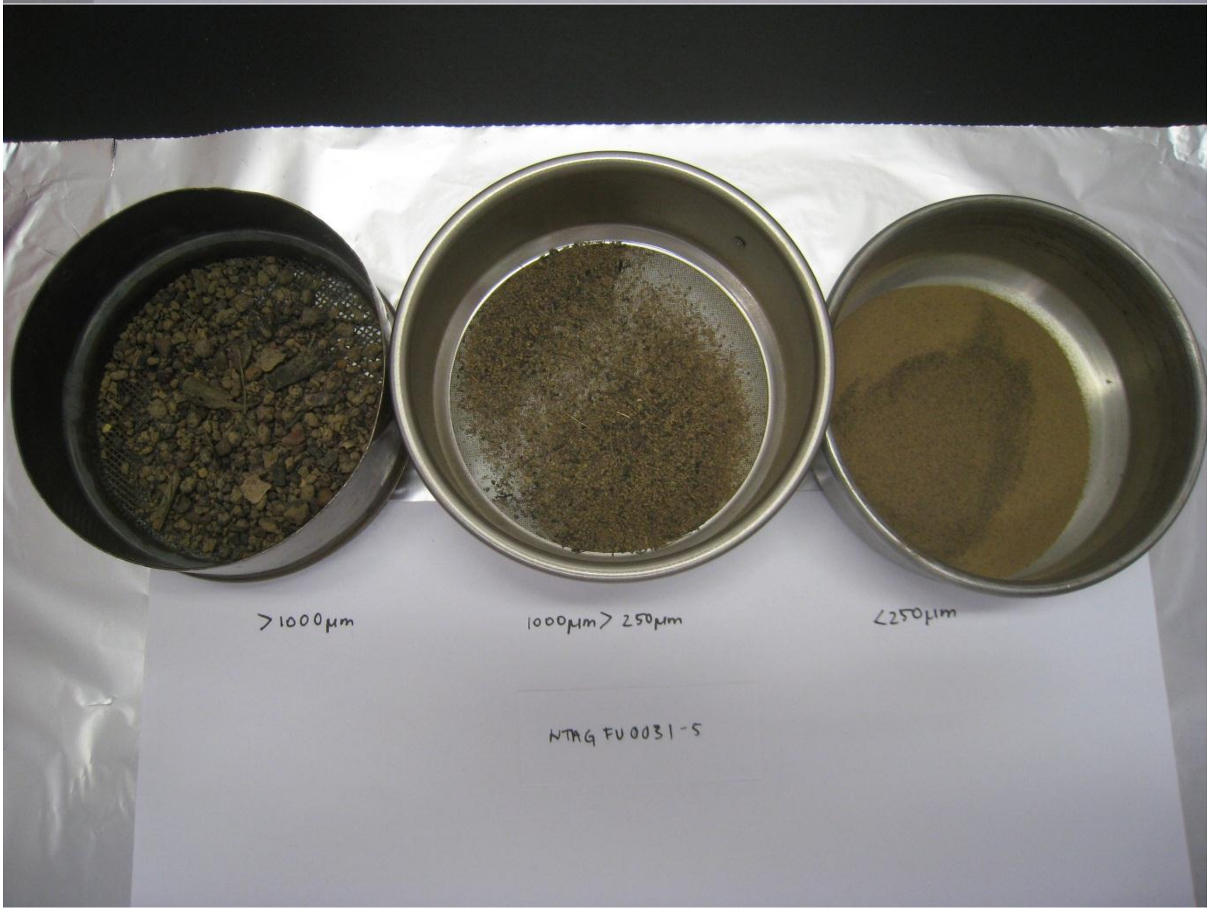
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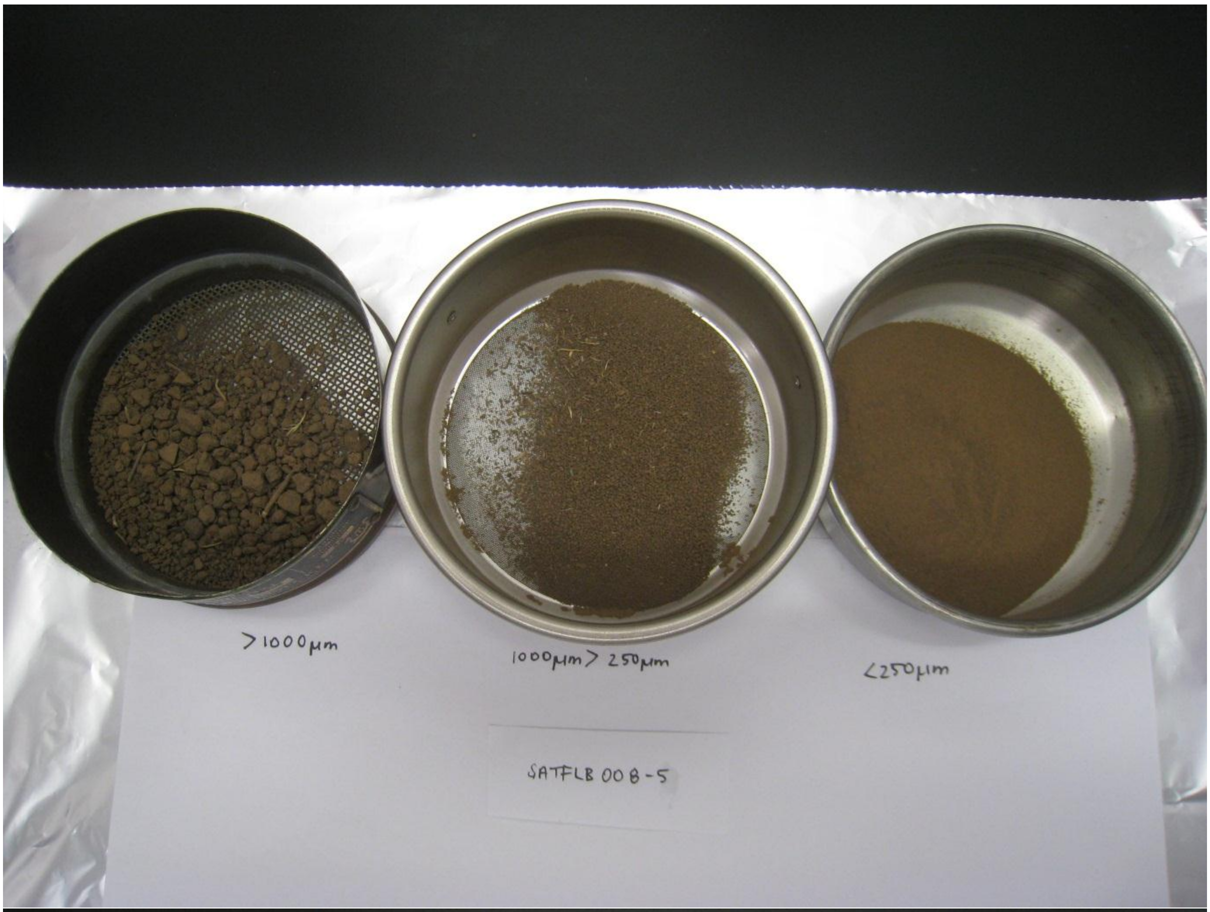
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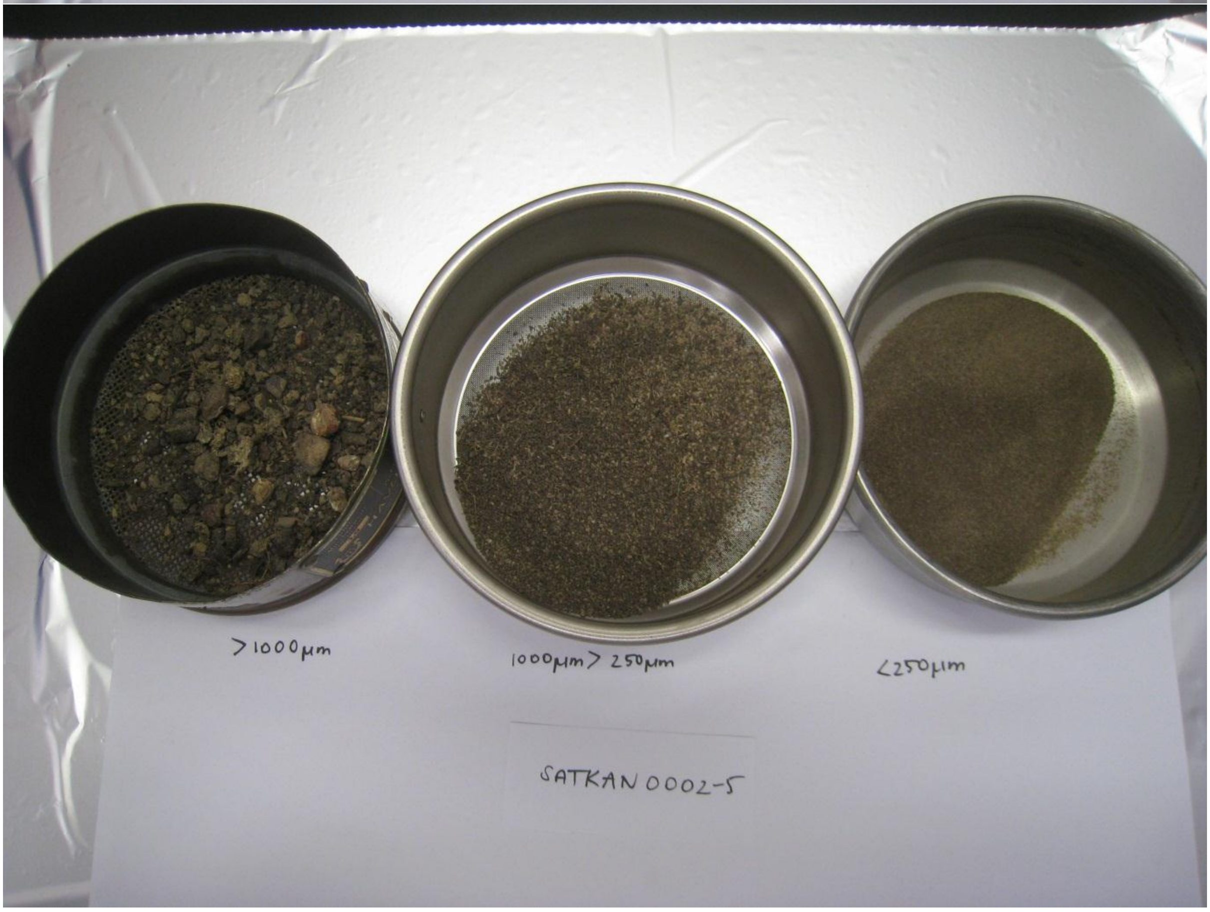
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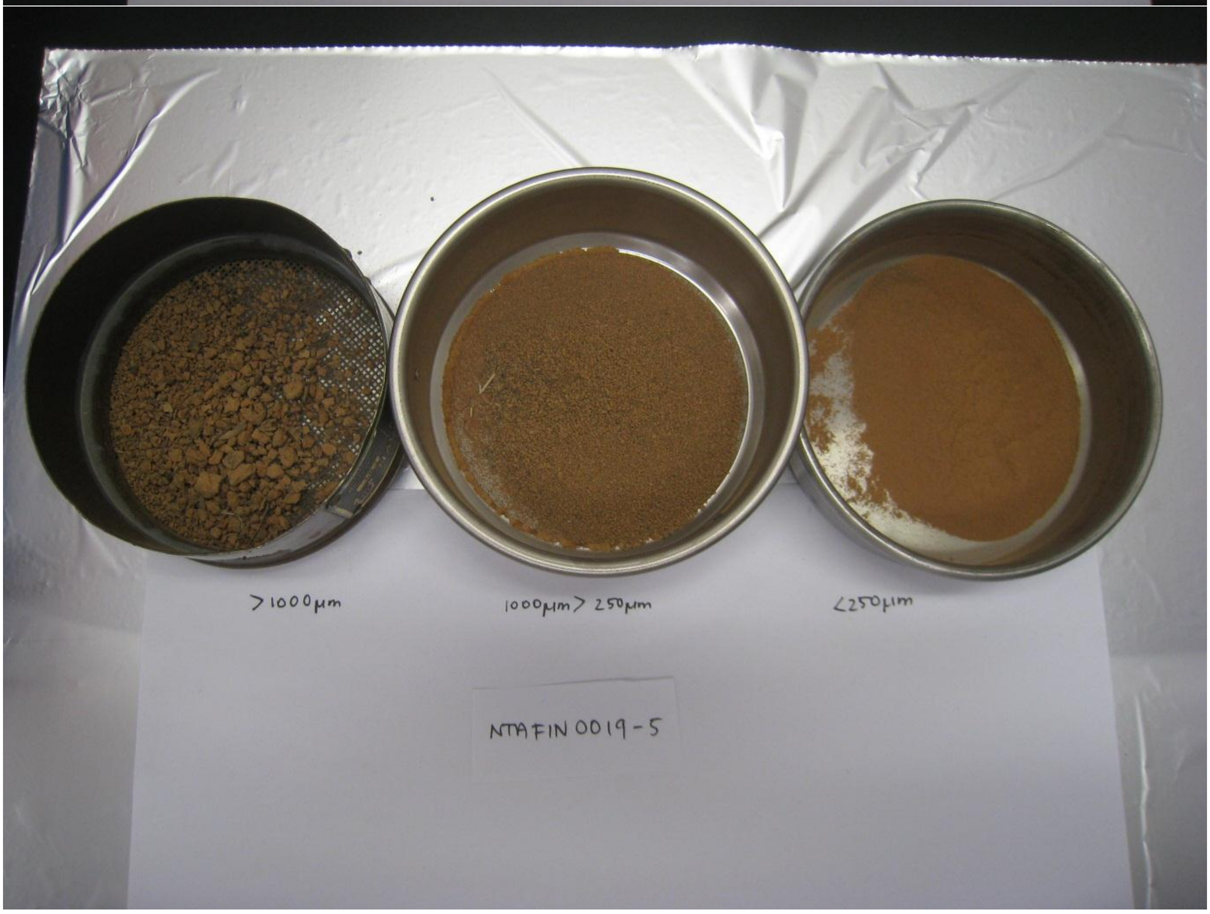
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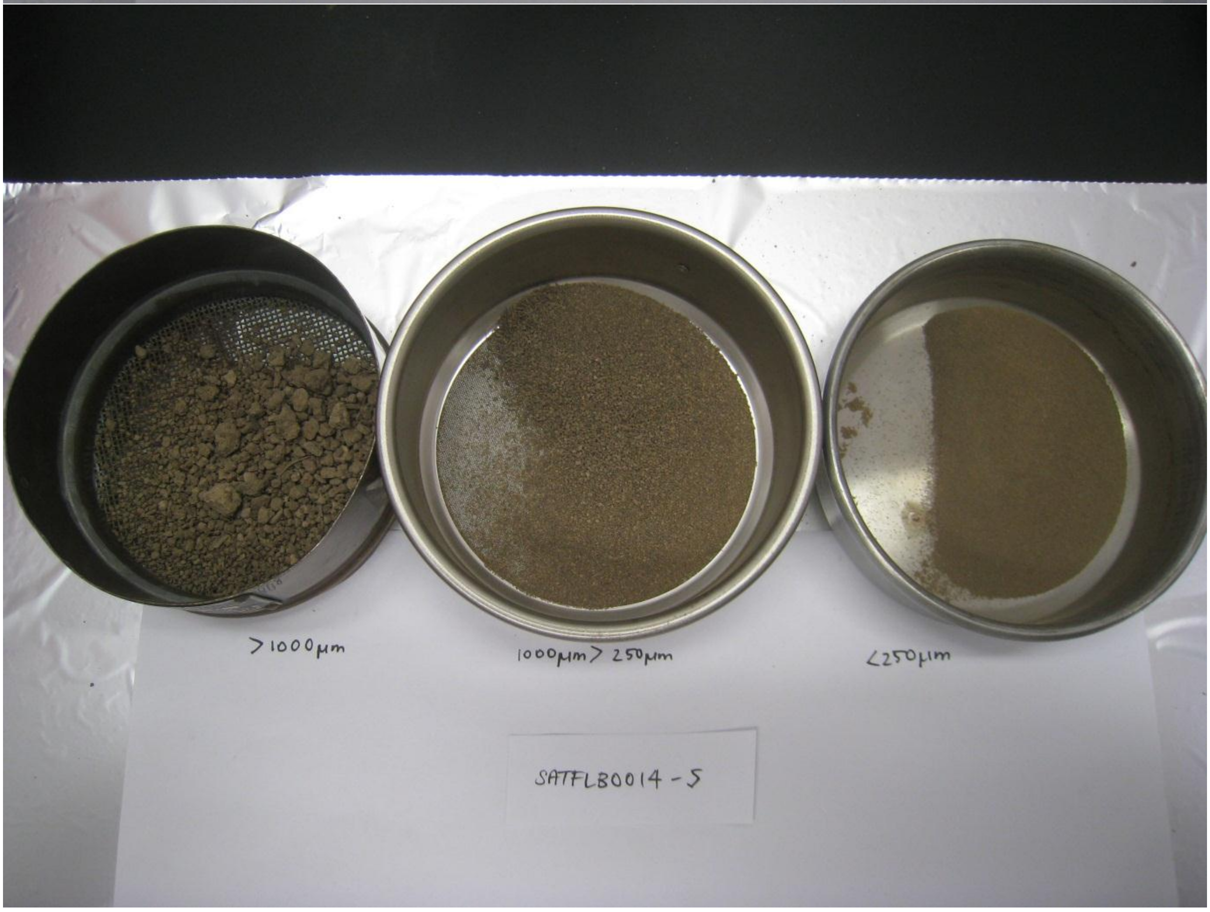
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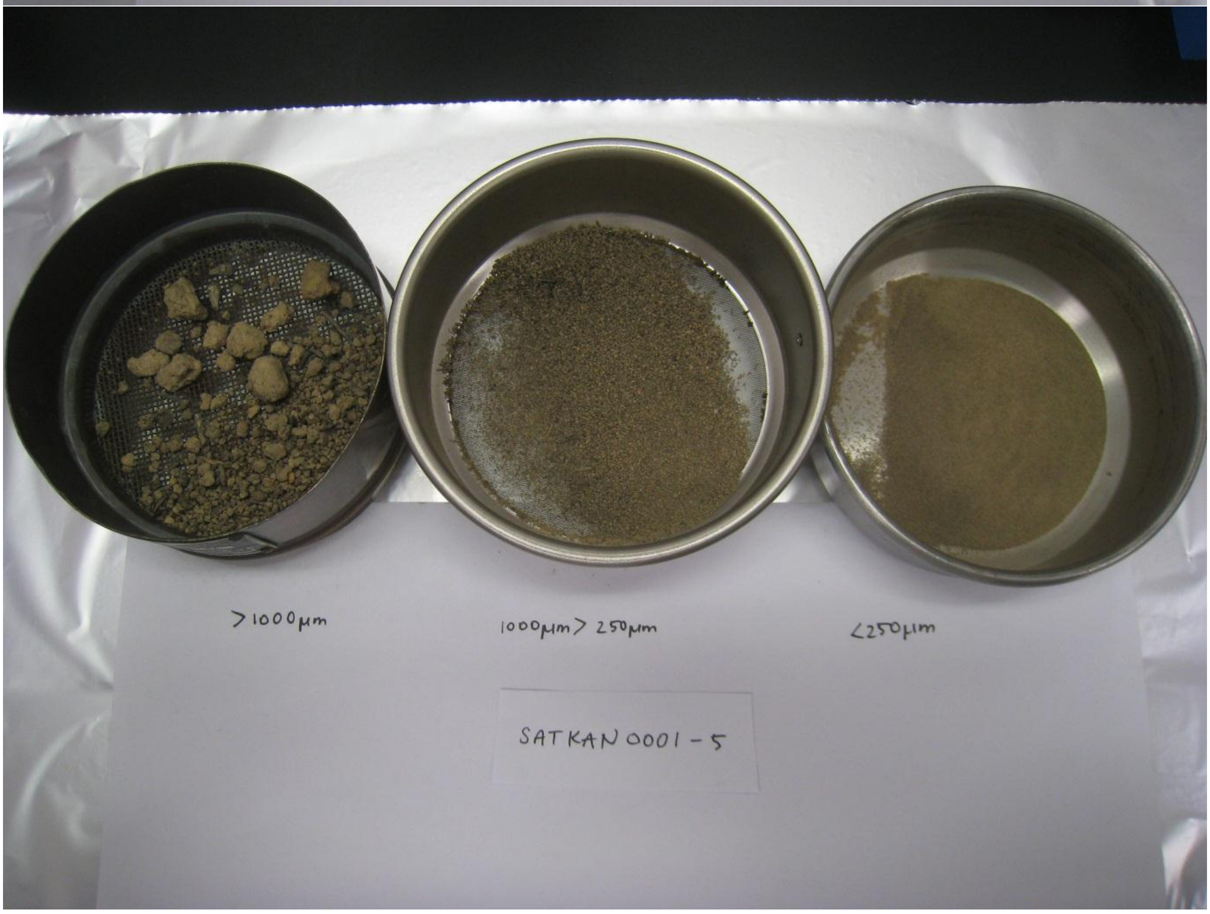
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Figure 1. Photos of sieved soil samples.

Total Lipid Extraction (TLE)

1. Sonication

Because it is relatively easy to extract lipids from plant samples, sonication in a Soniclean 250TD using solvents is sufficient for conducting a total lipid extraction. Using a sonication bath filled with RO water, dried and ground plant samples are added to an ashed test tube and covered with a 9:1 DCM:MeOH solution (approximately 5ml). Each test tube is covered with ashed alfoil and sonicated in the sonication bath for 15 minutes. During the sonication process, a clean set of ashed test tubes is arranged in a test tube rack, one per sample. An ashed glass funnel is placed in each one and using solvent rinsed tweezers, an ashed glass fibre filter is folded in half then half again, and opened up into a cone and placed in the funnel. Each funnel is covered with ashed alfoil until ready to use. Once sonication is complete, samples were left to stand to allow most sediment to settle. The sonicated sample is then decanted through the filter in the funnel. An ashed pipette can be used to assist with this. After transfer is complete, add a further amount of 9:1 solvent solution to cover the sample (approximately 5ml) and sonicate for 15 minutes. Decant this extract into the funnel. Repeat this process for a total of 3 extractions. The filtered extract is then dried down under N_2 in the FlexiVap until almost dry. The TLE is then quantitatively transferred using an ashed pipette and rinsing and transferring three times with DCM to ashed 4ml vials for refrigerated storage until ready for polar and non-polar fraction separation.

2. ASE

A Thermo Scientific Dionex Acceleration Solvent Extraction (ASE) 350 is used for total lipid extracts from soils. This process is suitable for soils because it uses heat and pressure in the extraction, and is therefore a quicker and more thorough means of extracting these compounds from soils than sonication.

The 22ml cell components, including PEEK seals and frits are cleaned with 1:50 decon90:water solution and then rinsed three times with tap water, followed by three rinses with RO water. Components are then placed in a 2L ashed beaker and covered with Histologic grade acetone. The beaker is the placed in to a sonicating bath and the components are sonicated for 15 minutes. This acetone is then replaced with Methanol, and the cells are again sonicated for 15 minutes. After the second sonication, the cell components are then left to soak in the methanol for a further 15 minutes. Each solvent can be reused a maximum of 6 times. Using clean, solvent rinsed tweezers, the components are removed from the beaker and placed on to ashed alfoil to dry. Using only solvent rinsed tweezers to handle them, two 27mm ashed glass fibre filters are inserted in the bottom end of the cell and the cell body was then screwed on to this.

Using the correct sized solvent rinsed funnel for the cells, between 4.5-26g of the <250μm soil sample was added to each 22ml cell and topped up to fill line with diatomaceous earth. Another 27mm ashed glass fibre filter paper was placed on top of the cell body, and the top cell end was screwed on. The cells were then labelled and placed in their respective slots on the ASE. Collection vials (60ml) that had been topped with alfoil and then ashed are capped with solvent rinsed caps and septa were labelled and placed in their respective slots on the ASE.

One of the ASE reservoirs contains Optima Grade DCM, and a second reservoir contains Optima Grade MeOH. A ratio of 9:1 DCM:MeOH is to be used for the extraction.
The ASE sequence is set to preheat for 12 minutes up to 100°C and held at that temperature for 5 minutes, with this heating process repeated three times. The cell is then

rinsed with 5ml of solvent solution a total of three times. The rinse volume was set to 60%, with a purge time of 120 seconds.
The total lipid extract is then dried down under N_2 in the FlexiVap until almost dry. The TLE is then quantitatively transferred using an ashed pipette and rinsing and transferring three times with DCM to ashed 4ml vials for refrigerated storage until ready for polar and non-polar fraction separation.

Polar and non-Polar Lipid Fraction Separation using short column chromatography

Separating the non-polar and polar fractions of the total lipid extract (TLE) is necessary for subsequent GC-MS analysis. The silica gel used in the chromatography columns is slightly polar, and the initial pass of a non-polar solvent allows the non-polar fraction to be removed and collected, while the polar fraction remains bonded to the silica gel. Following this with the addition of a solvent with greater polarity than that of the silica gel allows the polar fraction to then be removed and collected. Long-tipped pipettes were stuffed with a small amount of glass wool at their base, before their narrow tip, and then ashed. One of these glass wool pipettes was set up on a retort stand, and 4ml vial set up underneath it. A slurry of oven dried silica gel and hexane was combined in a small beaker and using a short-tipped, ashed pipette, the slurry was transferred to the glass wool pipette to produce a chromatography column. The silica gel was allowed to settle in the glass wool pipette until it reached the level of the indent near the top. Hexane was continually added to ensure that the top level of the silica gel was not exposed to air. Underneath the chromatography column, and new ashed 4ml vial labelled as Fraction 1 (F1) was set up underneath. The total lipid extract (TLE), which had been completely dried down, was diluted with a couple of drops of hexane, and transferred to the top of the chromatography column using a new ashed pipette. 4ml of hexane was used to continue rinsing the vial that originally held the TLE, and this 4ml was continually added to the top of the chromatography column and captured in the 4ml vial beneath. After the last of the 4ml of hexane was used, a new 4ml collection vial, labelled Fraction 2 (F2) was set up underneath and 4ml of 1:1 DCM:MeOH solution was then used to rinse the original TLE vial and was then transferred to the top of the chromatography column. Once the chromatography column ceased dripping the polar fraction in to the 4ml collection vial, the two collection vials (F1 and F2) were then capped and stored in the fridge.

Prior to GC-MS being conducted, the F1 samples were dried down under nitrogen using a Flexivap. These samples then had a small amount of Optima grade hexane (7-8 drops), the hexane was rinsed down the sides of the vial using an ashed pipette and was transferred to a bottom spring insert in a 2ml vial. This quantitative transfer was repeated another two times, for a total of three rinses and transfers. Once the samples were transferred to the insert in the 2ml vial, they were dried down under nitrogen using a Flexivap. Once the samples were dried down fully, 50µl of Optima grade hexane was added using a 50µl syringe that had been fully cleaned and rinsed with hexane prior to use. Samples were then labelled with their sample number and F1, and stored in the fridge in preparation for GC-MS analysis.

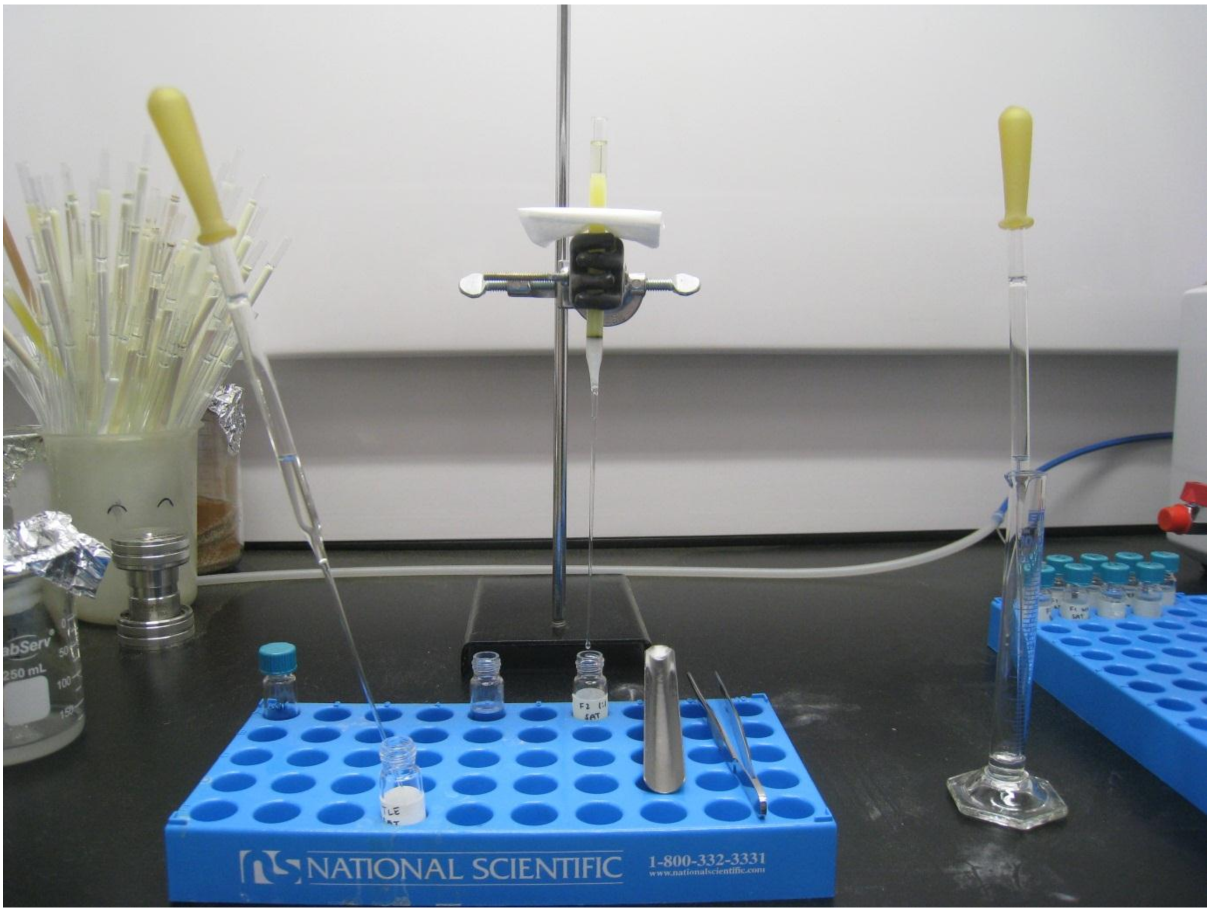


Figure 2: Silica gel chromatography column.

<u>GC-MS</u>

Instrument: HP5973 MS coupled to a HP6890 GC (MS operated in scanning mode from 45 to 500Da)
Capillary: SGE CPSil-5MS, 60m (length) x 0.25mm (internal diameter) x 0.25udf (phase thickness)
Carrier Gas: Helium at 1ml/min constant flow
Temperature program: 50°C held for 1 min ramped at 8°C/min to 340°C held for 7.75mins
Injection: 1µl in either split mode with a 50:1 split or pulsed splitless depending on sample concentration.
Injection temperature: 300°C
Software: Chemstation

Using Chemstation software:
A quant package was set up that enabled automatic quantitation of peak areas in each samples' chromatogram. For each run of samples, they were opened and the quant package set to run by hitting Method>Load Method>[name of quant package method]. Then select Quantitate>Calculate. Mass 57 was selected. QUANT files were saved for each sample and opened up in Excel in order to copy the "NAME", "TIME" and "PEAK AREA" columns into a new spreadsheet, in order to calculate ACL for each soil sample.

Instrument: Perkin Elmer Clarus 500 GCMS
Capillary: SGE CPSil-5MS, 60m (length) x 0.25mm (internal diameter) x 0.25udf (phase thickness)
Carrier Gas: Helium at 1ml/min constant flow

Temperature program: 50°C held for 1 min ramped at 8°C/min to 340°C held for 7.75mins
Injection: 1µl in either split mode with a 50:1 split or splitless depending on sample concentration.
Injection temperature: 300°C
Software: Turbomass

Using Turbomass software:
Open up chromatogram for the standard in order to determine which peak is associated with which *n*-alkane chain length for the sample, and then pick out Mass 57. Add chromatogram for sample and pick out Mass 57. Hit Edit>Integrated Peaks. Then Edit>Peak List Write. Create a file, name as the sample name>Open>Append All>Exit. The .pdb files created were opened in Excel and the "NAME", "FOUND RT" and "AREA" columns were copied and pasted into a new Excel spreadsheet, in order to calculate ACL for each soil sample.

Standard: an in-house hydrocarbon standard with even *n*-alkanes from C_{14} to C_{32} without C_{28}.

<u>Statistical Analysis</u>
Regression analysis of the soil samples GC data was conducted using the Data Analysis Add-on in Excel. The ACL of the soil samples was given as the Input Y Range, with MAP, MAT and MI separately given as the Input X Range.

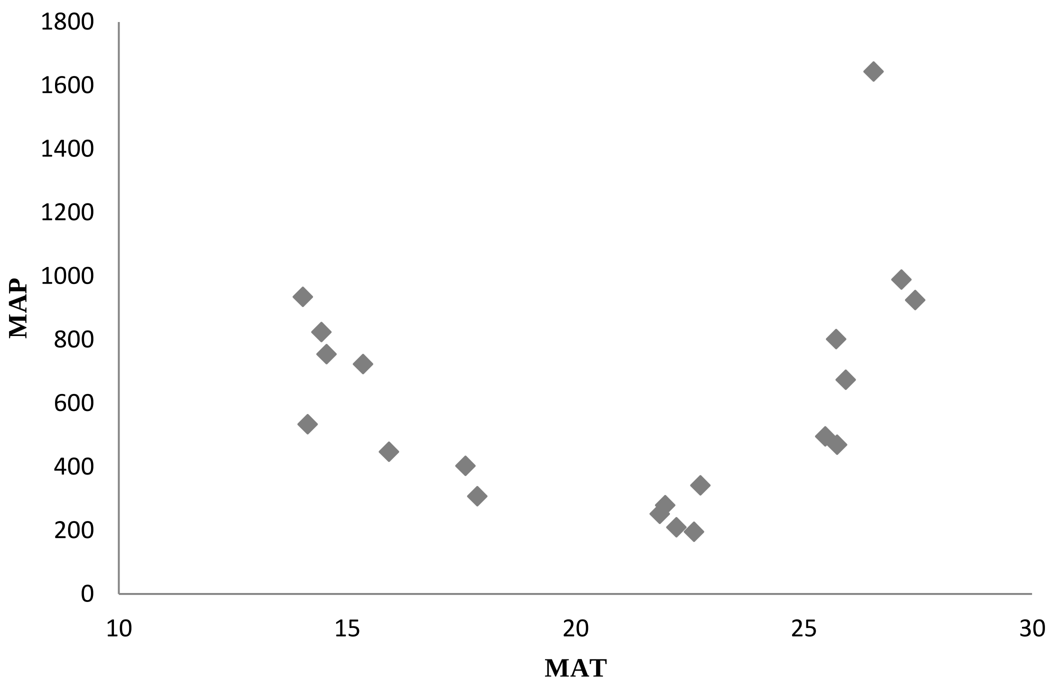


Figure 3. Mean annual precipitation (MAP) versus mean annual temperature (MAT) of selected sites. This allows for comparison of similar MAP with differing MAT as well as comparison of differing MAP with similar MAT.

Table 1: Data regarding the growth form, genetic voucher, percentage cover and amounts weighed out for analysis for each plant sample (cont'd on next two pages).

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No	Amount Subsampled from teabag (g)	Amount subsampled for sonication (mg)	% cover
NTAGFU0001	Gulf fall and uplands	Aristida pruinosa	Tree Mallee	NTA 001524	0.101	46.8	17.4
NTAGFU0008	Gulf fall and uplands	Triodia pungens	Hummock grass	NTA 002012	0.187	50.8	45.4
NTAGFU0010	Gulf fall and uplands	Triodia pungens	Hummock grass	NTA 002136	0.147	52	62.7
NTAGFU0017	Gulf fall and uplands	Melaleuca viridiflora	Shrub	NTA 002634	0.172	50.4	34.5
NTAGFU0031	Gulf fall and uplands	Melaleuca viridiflora	Shrub	NTA 003622	0.182	50.5	30.5
NTAGFU0040	Gulf fall and uplands	Acacia dimidiata	Shrub	NTA 004200	0.117	50.4	26.8
NTABRT0004	Burt plain	Acacia aptaneura	Shrub	NTA 001301	0.19	50.5	56.8
NTAFIN0019	Finke	Cenchrus ciliaris	Tussock Grass	NTA 000754	0.066	34.8	68.6
NTAFIN0022	Finke	Eremophila freelingii	Shrub	NTA 000964	0.125	51.3	50.5
SATFLB0005	Flinders lofty block	Dodonaea viscosa subsp. angustissima	Shrub	SAT 000316	0.113	50.5	21.9
SATFLB0008	Flinders lofty block	Triodia scariosa	Hummock grass	SAT 000424	0.149	50.4	47.6
SATFLB0010	Flinders lofty block	Eucalyptus odorata	Tree/Palm	SAT 000535	0.152	51.1	67
SATFLB0012	Flinders lofty block	Allocasuarina muelleriana subsp. Muelleriana	Shrub	SAT 000649	0.178	52	42.1
SATFLB0014	Flinders lofty block	Eucalyptus odorata	Tree Mallee	SAT 000746	0.172	51	33
SATFLB0015	Flinders lofty block	Eucalyptus obliqua	Tree/Palm	SAT 000816	0.12	51.4	61.2
SATKAN0001	Kanmantoo	Eucalyptus baxteri	Tree/Palm	SAT 000122	0.136	50.4	42.9
SATKAN0002	Kanmantoo	Eucalyptus obliqua	Tree/Palm	SAT 000191	0.139	50.3	55.2
SAASTP0001	Stony plains	Maireana aphylla	Chenopod	SAA 000250	0.189	50.4	34.6
SAASTP0004	Stony plains	Malvastrum americanum var. americanum	Forb	SAA 000019	0.062	36.2	25.6
NTADAC0001	Darwin Coastal	Eucalyptus tetrodonta		NTA 006020	0.169	52.3	

Site	Bioregion	Dominant Spp 2	Growth form	Genetic Voucher No	Amount Subsampled from teabag (g)	Amount subsampled for sonication (mg)	% Cover
NTAGFU0001	Gulf fall and uplands	Enneapogon polyphyllus	Tussock Grass	NTA 001525	0.124	50	13.3
NTAGFU0008	Gulf fall and uplands	Aristida contorta	Tussock Grass	NTA 002011	0.135	50	19.5
NTAGFU0010	Gulf fall and uplands	Eucalyptus leucophloia	Tree Mallee	NTA 002140	0.188	50.6	36.4
NTAGFU0017	Gulf fall and uplands	Chrysopogon fallax	Tussock Grass	NTA 002610	0.166	50.6	10.4
NTAGFU0031	Gulf fall and uplands	Schizachyrium pachyarthron	Tussock Grass	NTA 003588	0.063	23.5	28.3
NTAGFU0040	Gulf fall and uplands	Heteropogon contorus	Tussock Grass	NTA 003995	0.091	22.8	15.9
NTABRT0004	Burt plain	Aristida holathera	Tussock Grass	NTA 001318	0.17	51	24.4
NTAFIN0019	Finke	Acacia estrophiolata	Tree/Palm	NTA 000784	0.123	50	19.2
NTAFIN0022	Finke	Enneapogon polyphyllus	Tussock Grass	NTA 000962	0.118	51.6	15
SATFLB0005	Flinders lofty block	Eucalyptus flindersii	Tree Mallee	SAT 000286	0.196	52	18.8
SATFLB0008	Flinders lofty block	Cassinia laevis	Shrub	SAT 000419	0.105	50.2	23.7
SATFLB0010	Flinders lofty block	Rhagodia paradoxa	Chenopod	SAT 000552	0.13	51.3	10.1
SATFLB0012	Flinders lofty block	Hibbertia crinita	Shrub	SAT 000657	0.112	51.2	15.5
SATFLB0014	Flinders lofty block	Xanthorrhoea quadrangulata	Shrub	SAT 000791	0.208	51.6	18.5
SATFLB0015	Flinders lofty block	Lepidosperma semiteres	Sedge	SAT 000860	0.123	51.4	8.5
SATKAN0001	Kanmantoo	Lepidosperma semiteres	Sedge	SAT 000167	0.218	50.5	11.3
SATKAN0002	Kanmantoo	Lepidosperma semiteres	Sedge	SAT 000218	0.16	50.1	9.2
SAASTP0001	Stony plains	Eragrostis setifolia	Tussock Grass	SAA 000294	0.136	50.6	12.8
SAASTP0004	Stony plains	Rutidosis helichrysoides subsp. Helichrysoides	Forb	SAA 000016	0.017	5.8	18.5
NTADAC0001	Darwin Coastal	Eucalyptus miniata		NTA 006042	0.144	51.1	

Site	Bioregion	Dominant Spp 3	Growth form	Genetic Voucher No	Amount Subsampled from teabag (g)	Amount subsampled for sonication (mg)	% Cover
NTAGFU0001	Gulf fall and uplands	Eucalyptus pruinosa	Tree Mallee	NTA 001531	0.139	50.2	13.2
NTAGFU0008	Gulf fall and uplands	Fimbristylis dochotoma	Sedge	NTA 002018	0.118	51	14.4
NTAGFU0010	Gulf fall and uplands	N/A	N/A	N/A	N/A	N/A	N/A
NTAGFU0017	Gulf fall and uplands	Schizachyrium fragile	Tussock Grass	NTA 002681	0.124	50.3	7.7
NTAGFU0031	Gulf fall and uplands	Petalostigma banksii	Shrub	NTA 003613	0.147	50.2	9.2
NTAGFU0040	Gulf fall and uplands	Eucalyptus tectifica	Tree/Palm	NTA 003965	0.137	49.9	9.7
NTABRT0004	Burt plain	Triodia schinzii	Hummock Grass	NTA 001317	0.17	52.6	7.4
NTAFIN0019	Finke	Enchylaena tomentosa	Tussock Grass	NTA 000761	0.014	8	2.4
NTAFIN0022	Finke	Aristida contorta	Tussock Grass	NTA 000960	0.106	50.6	7.7
SATFLB0005	Flinders lofty block	Chrysocephalum semipapposum	Forb	SAT 000287	0.09	50.1	13.2
SATFLB0008	Flinders lofty block	Casuarina pauper	Shrub	SAT 000401	0.165	50.4	12.6
SATFLB0010	Flinders lofty block	Enchylaena tomentosa var. tomentosa	Chenopod	SAT 000550	0.11	50.8	6.1
SATFLB0012	Flinders lofty block	Eucalyptus fasciculosa	Tree Mallee	SAT 000630	0.15	50.6	12.6
SATFLB0014	Flinders lofty block	Allocasuarina verticillata	Shrub	SAT 000775	0.123	50.5	14
SATFLB0015	Flinders lofty block	Hibbertia crinita	Shrub	SAT 000866	0.112	51.5	6.6
SATKAN0001	Kanmantoo	Pultenaea involucrata	Shrub	SAT 000124	0.181	50.9	10.3
SATKAN0002	Kanmantoo	Hakea rostrata	Shrub	SAT 000207	0.187	51	8.2
SAASTP0001	Stony plains	Acacia aneura var. tenuis	Shrub	SAA 000338	0.186	51.4	8.5
SAASTP0004	Stony plains	Sida fubulifera	Forb	SAA 000022	0.049	29.8	11.7
NTADAC0001	Darwin Coastal	Sorghum plumosum		NTA 005954	0.118	49.9	

(green)	Sample displays some fungal growth in scintillation vial after grinding
(peach)	Data not on S2S - no information available about % cover or growth form available

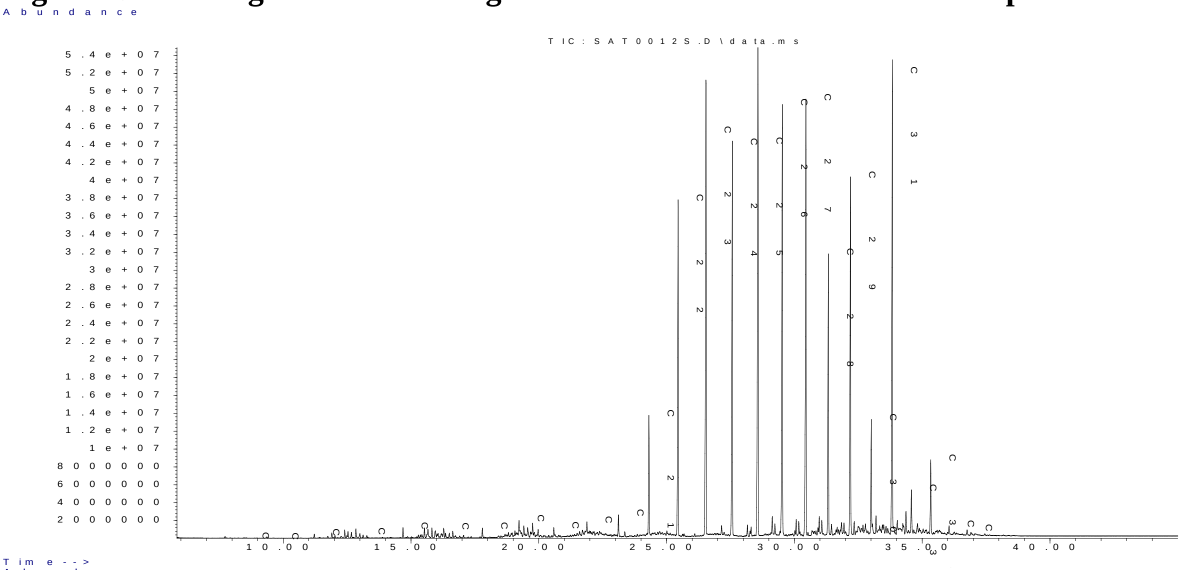
Table 2: Amount of soil weighed out for extraction of lipids in the ASE 350

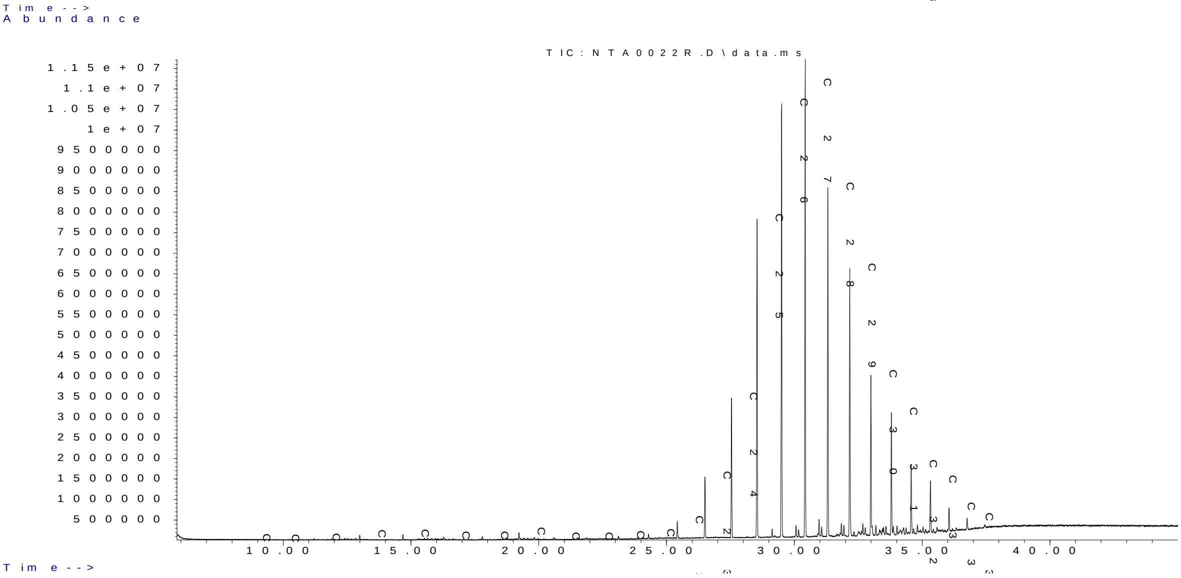
Site	Bioregion	Amount subsampled for ASE (g)
NTAGFU0001	Gulf fall and uplands	13.222
NTAGFU0008	Gulf fall and uplands	18.709
NTAGFU0010	Gulf fall and uplands	8.257
NTAGFU0017	Gulf fall and uplands	16.513
NTAGFU0031	Gulf fall and uplands	14.521
NTAGFU0040	Gulf fall and uplands	8.625
NTABRT0004	Burt plain	19.371
NTAFIN0019	Finke	16.781
NTAFIN0022	Finke	26.635
SATFLB0005	Flinders lofty block	15.934
SATFLB0008	Flinders lofty block	18.487
SATFLB0010	Flinders lofty block	12.185
SATFLB0012	Flinders lofty block	15.854
SATFLB0014	Flinders lofty block	12.559
SATFLB0015	Flinders lofty block	4.475
SATKAN0001	Kanmantoo	5.891
SATKAN0002	Kanmantoo	6.818
SAASTP0001	Stony plains	11.365
SAASTP0004	Stony plains	21.287
NTADAC0001	Darwin Coastal	9.976

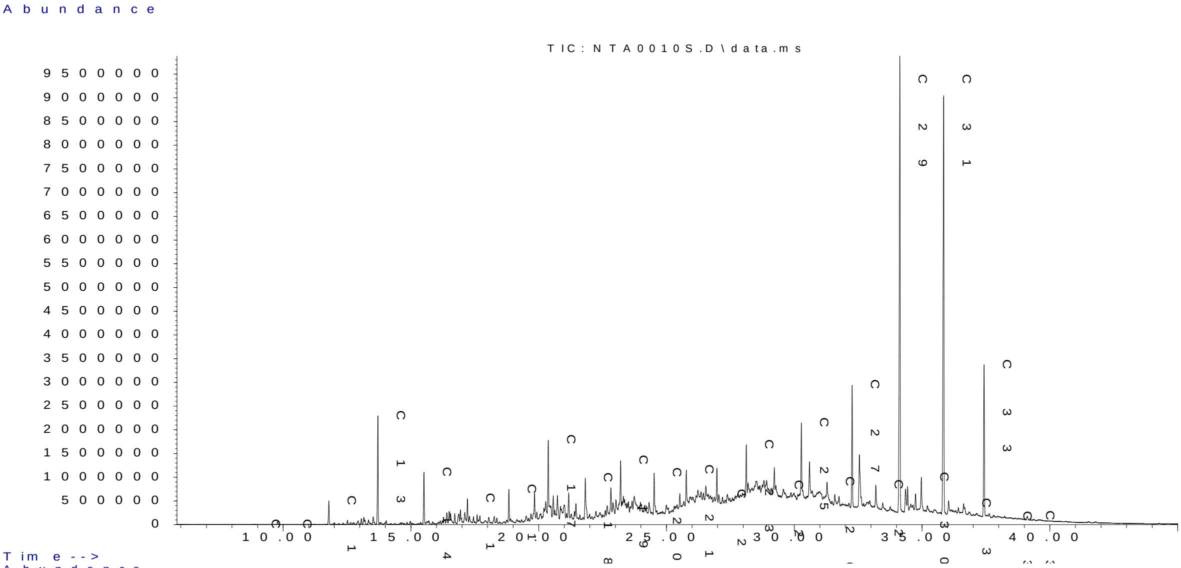
APPENDIX B: ADDITIONAL DATA

Appendix B – Additional Data

Figure 1: Below figures – chromatograms for GCMS results for soils and plants



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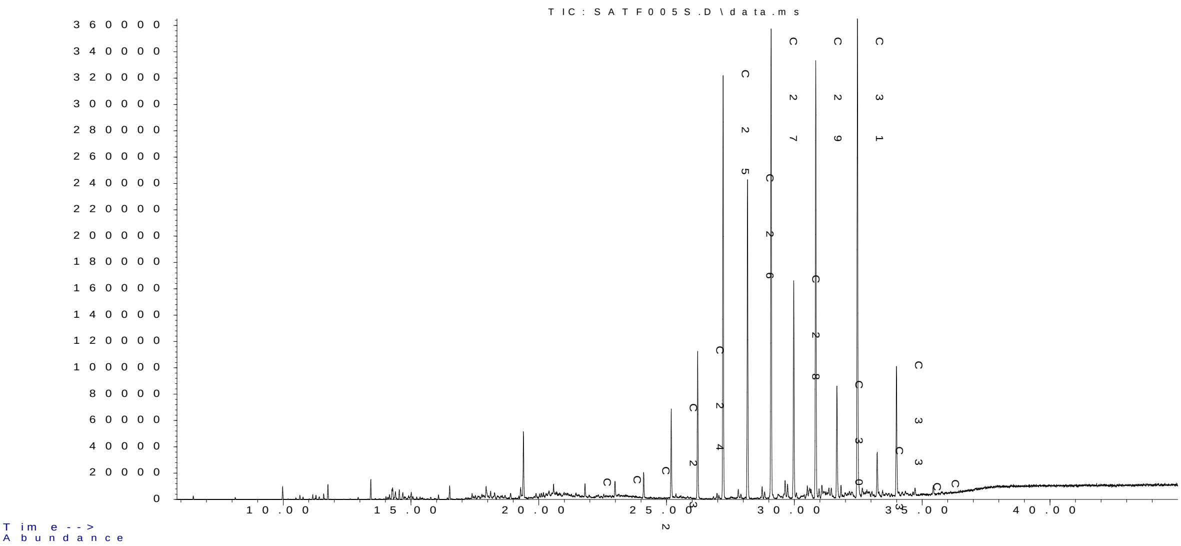
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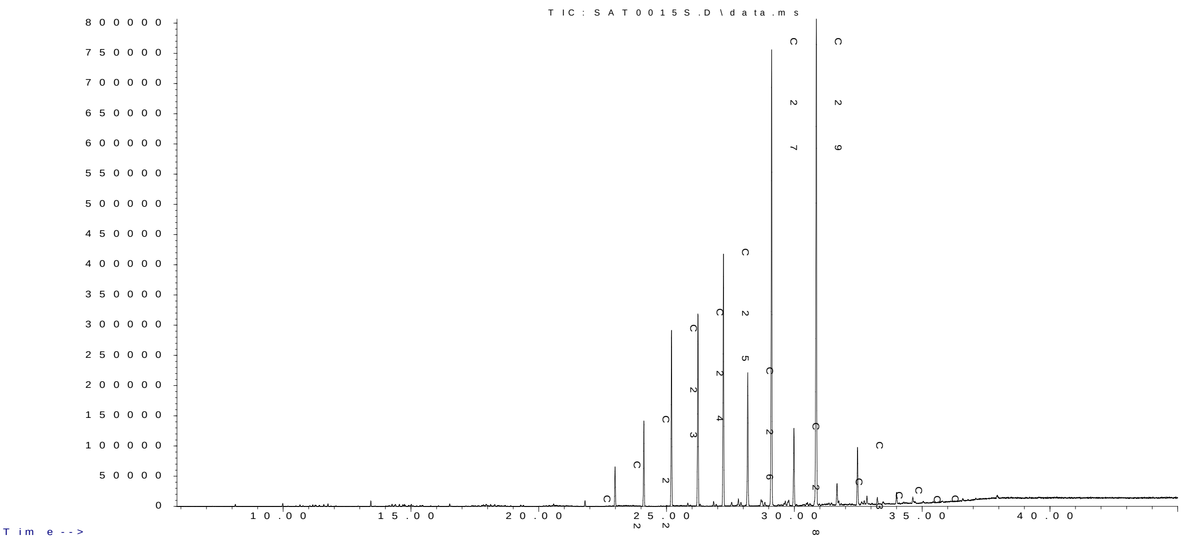
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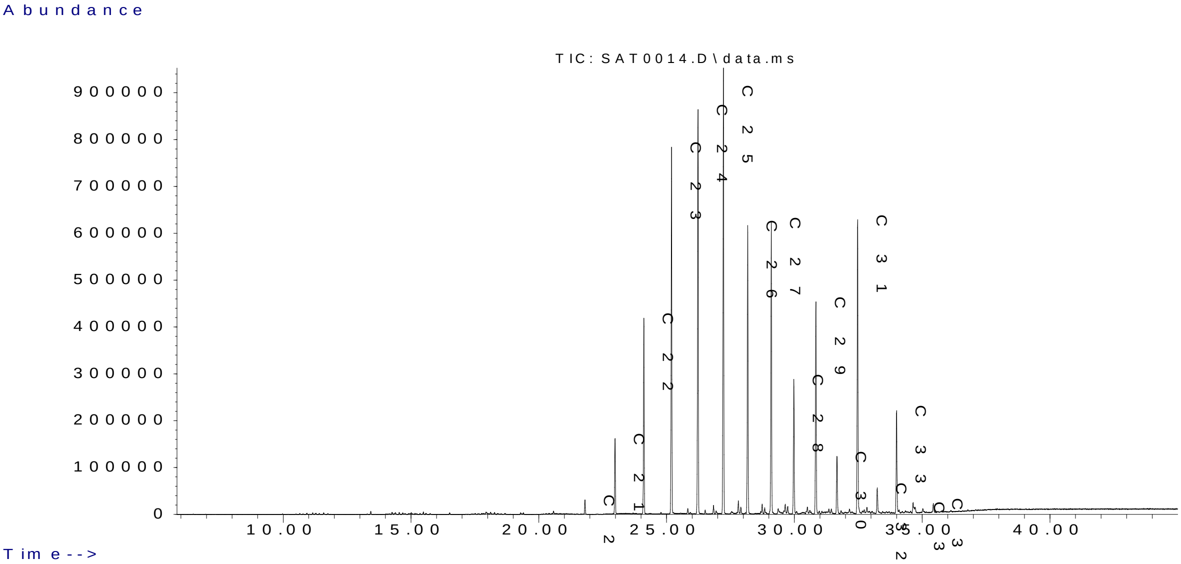
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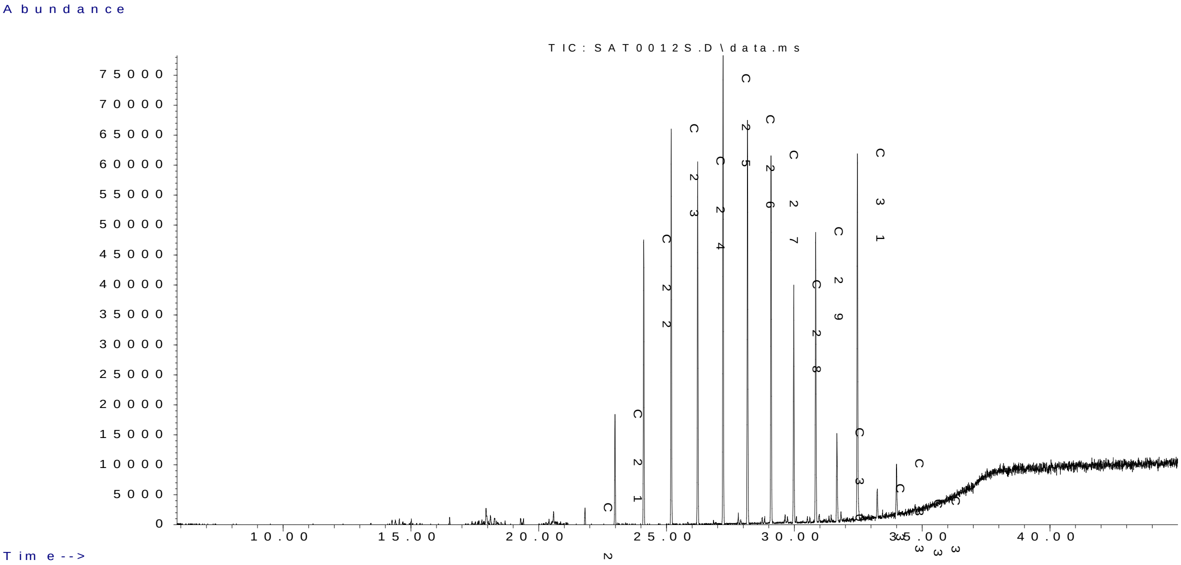
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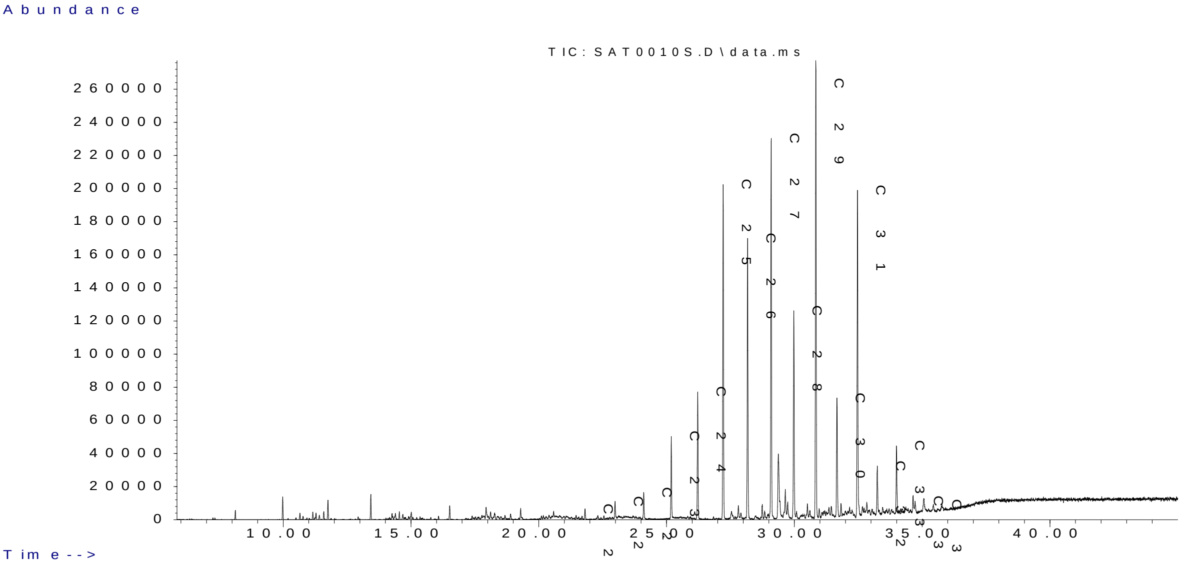
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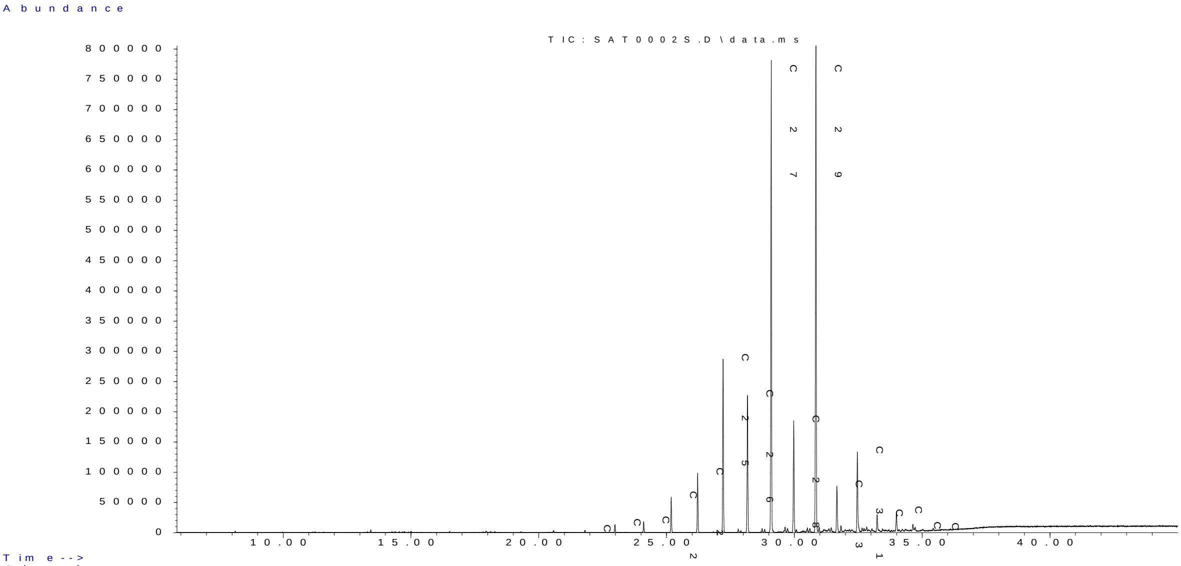
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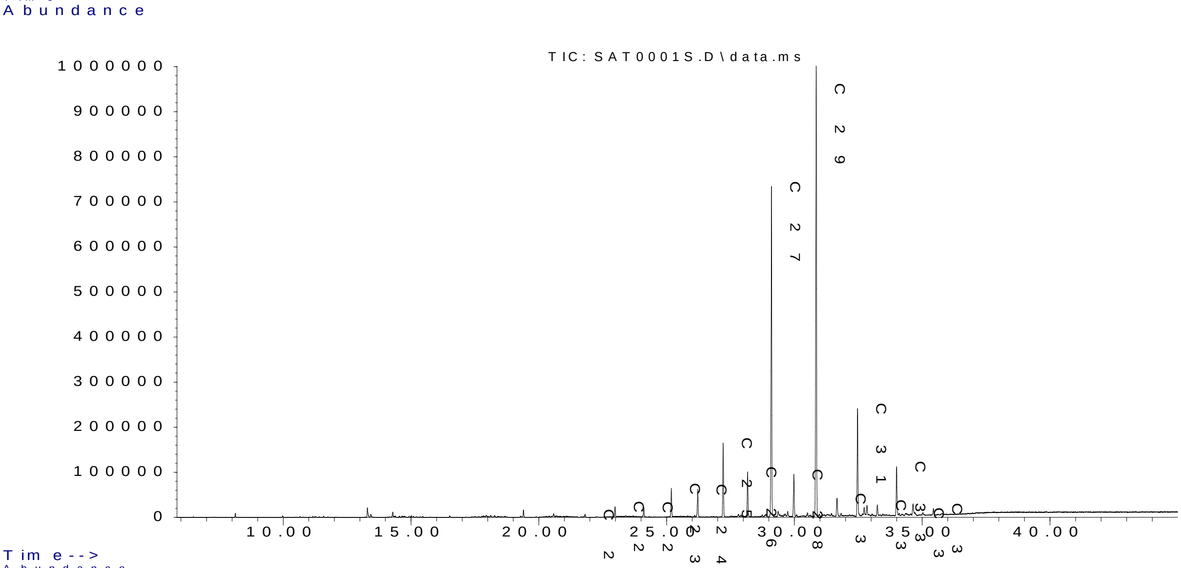
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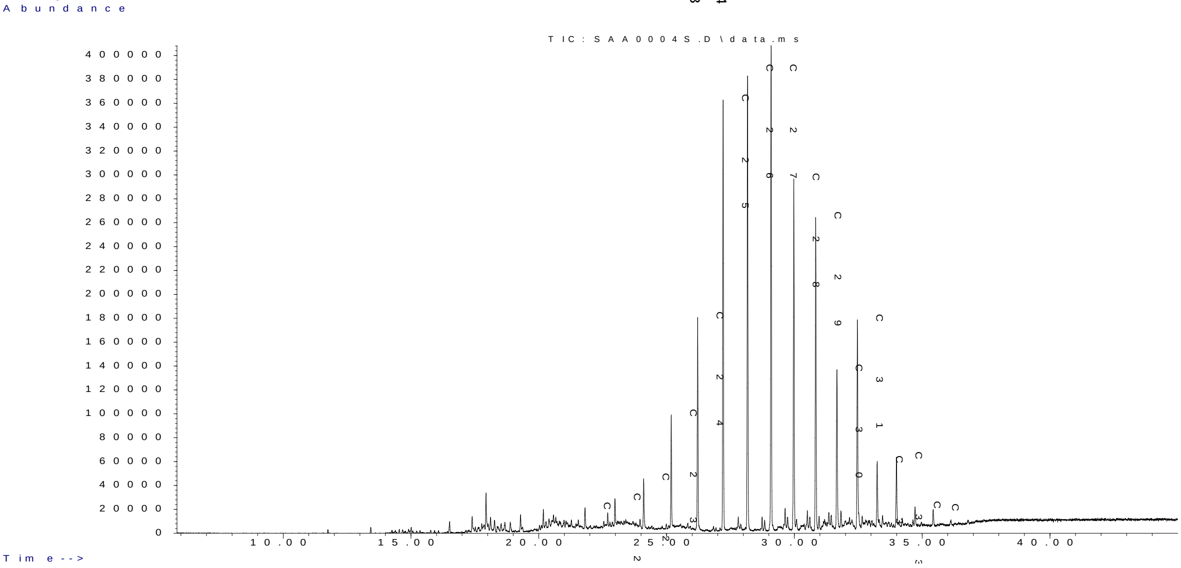
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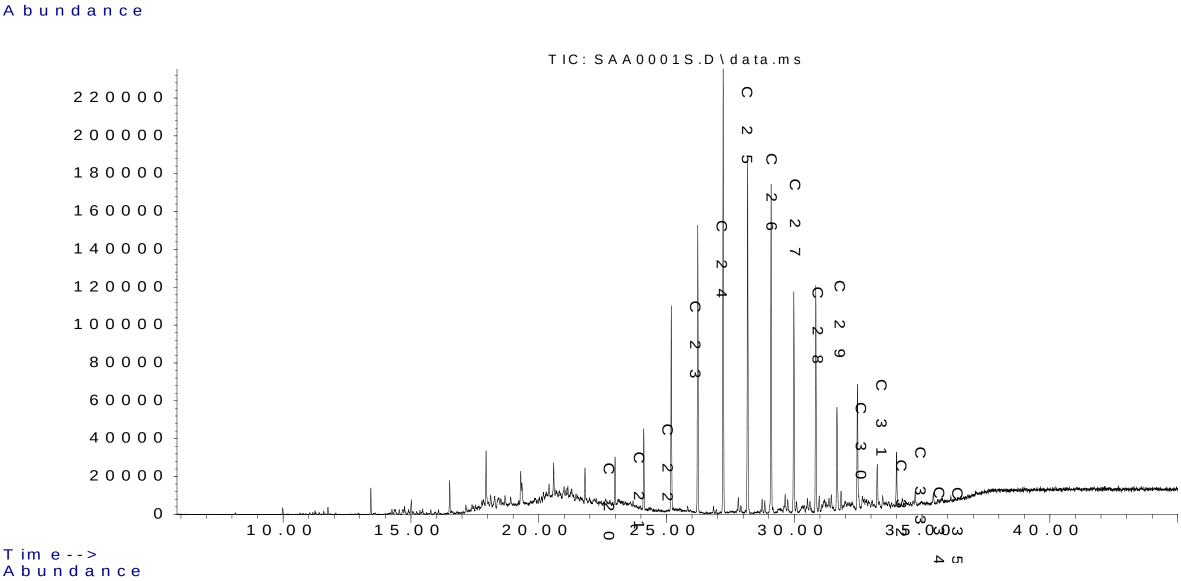
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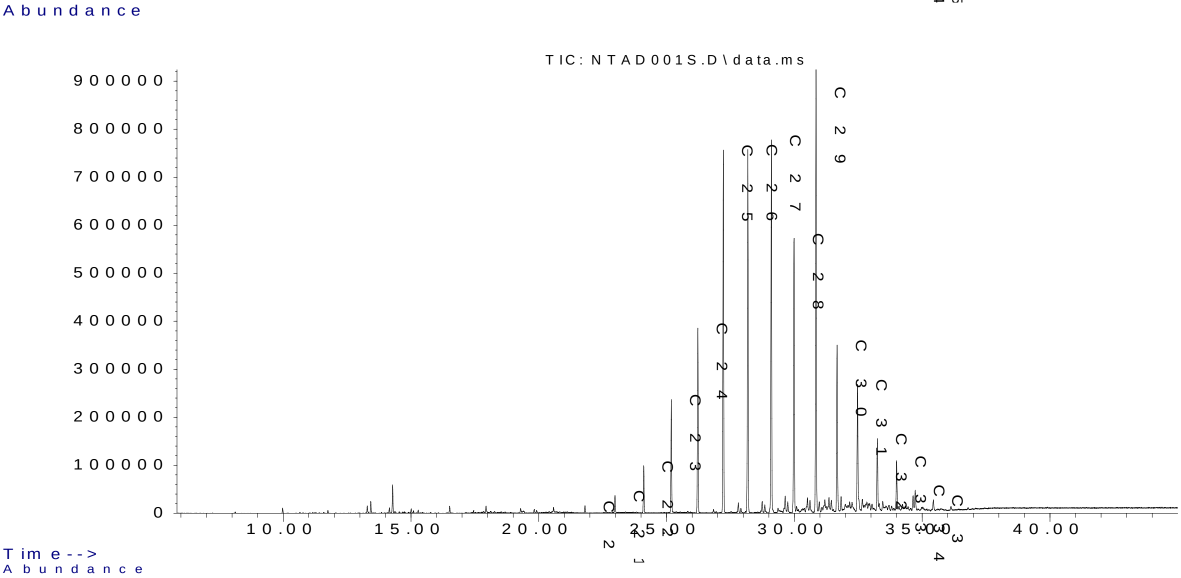
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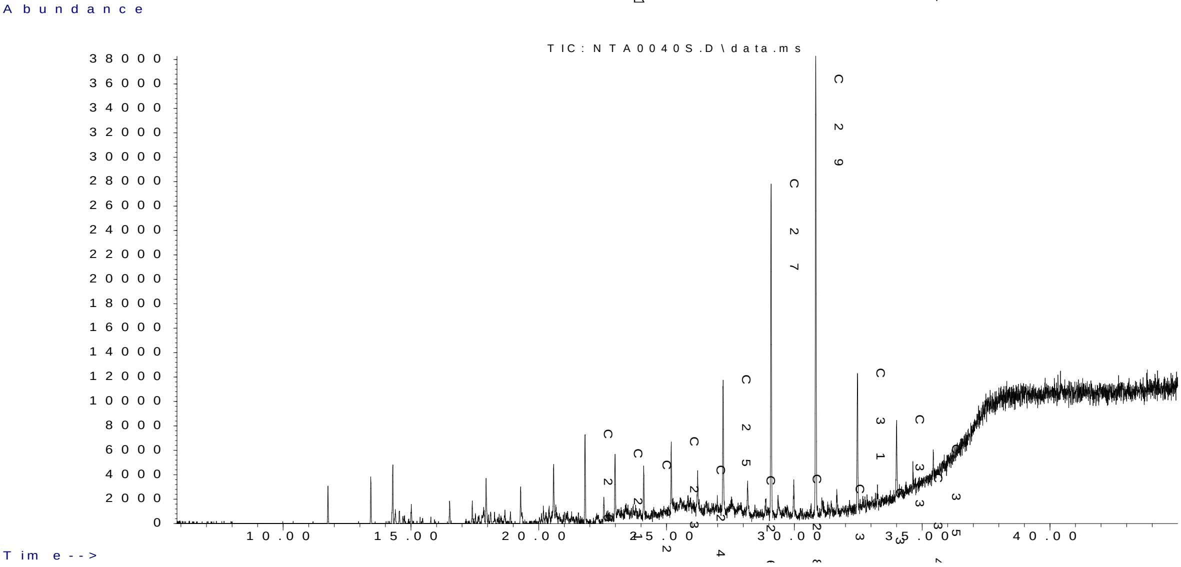
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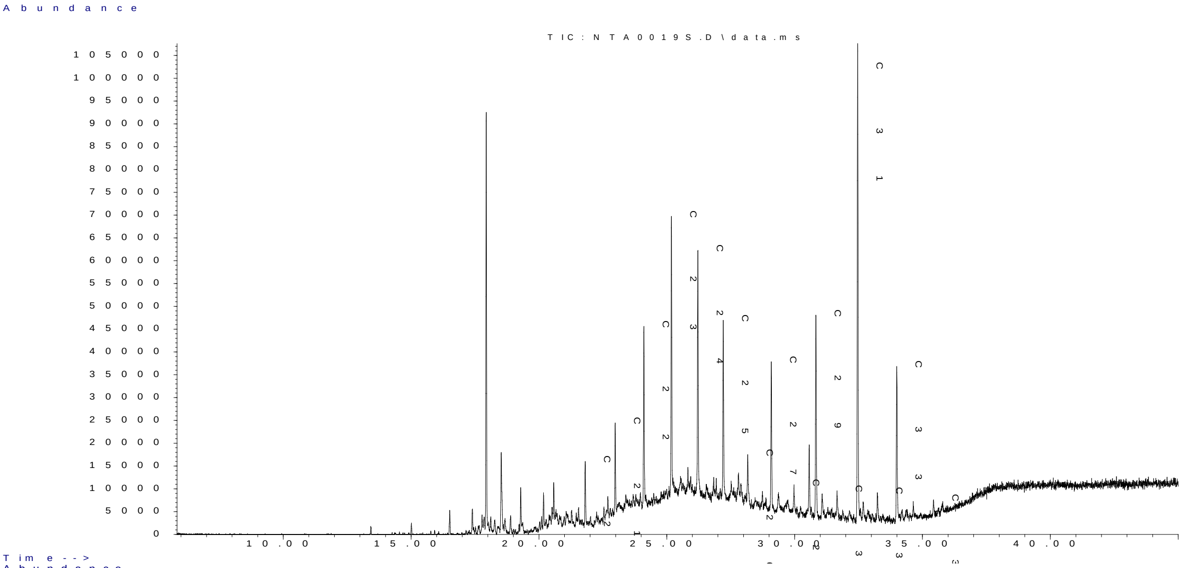
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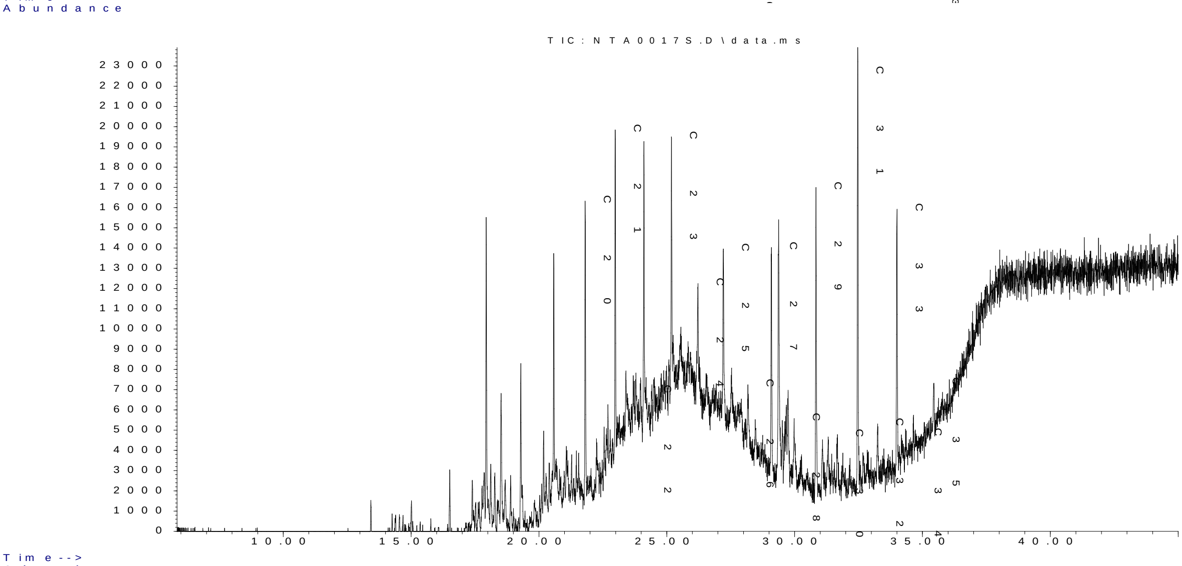
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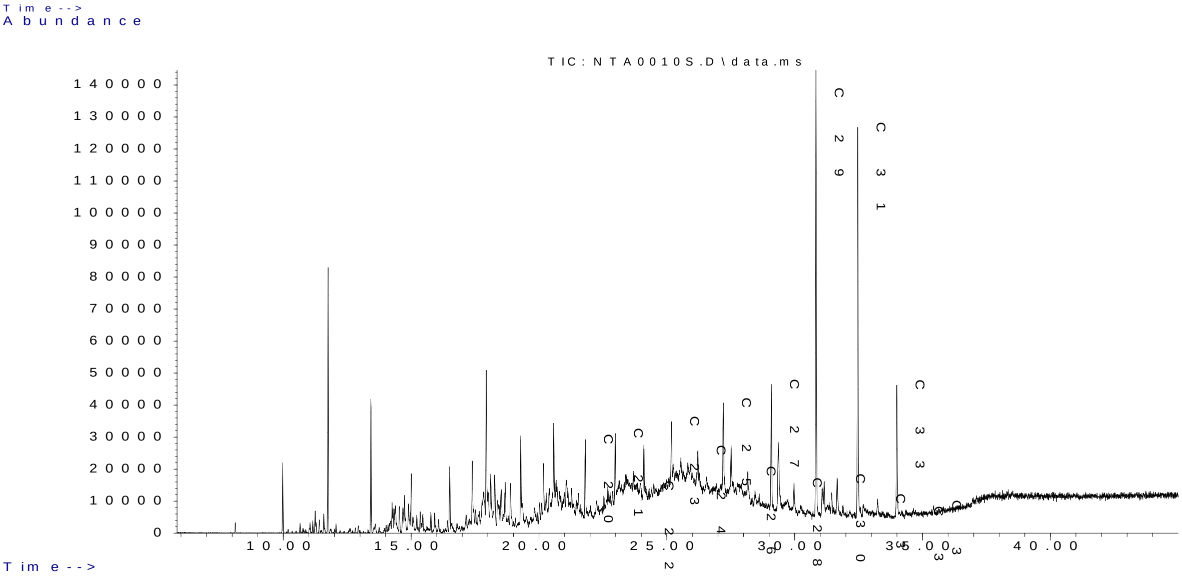
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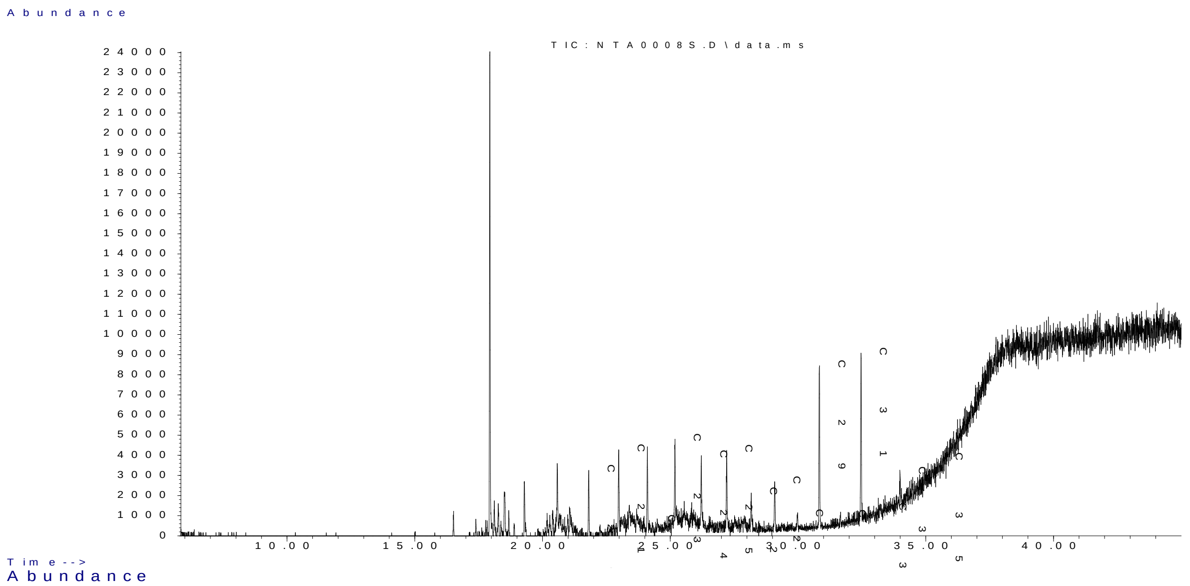
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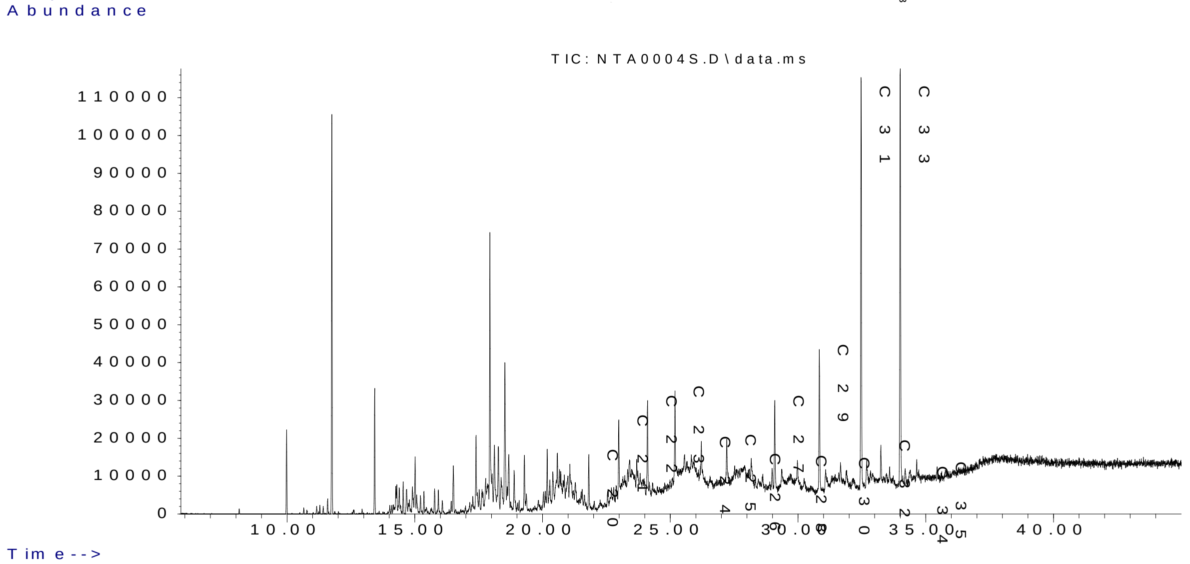
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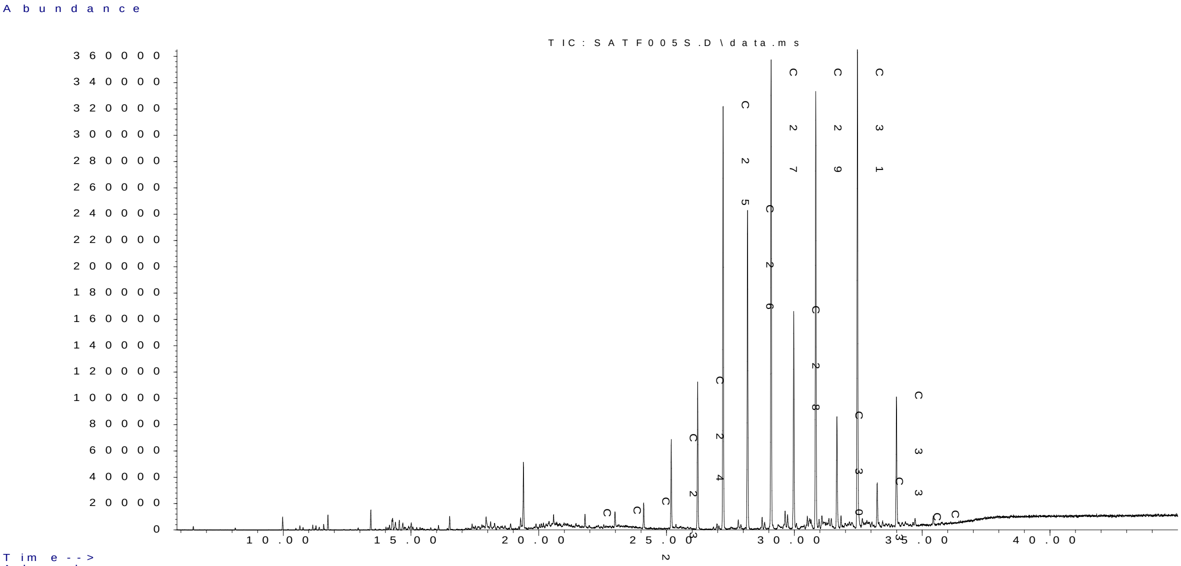
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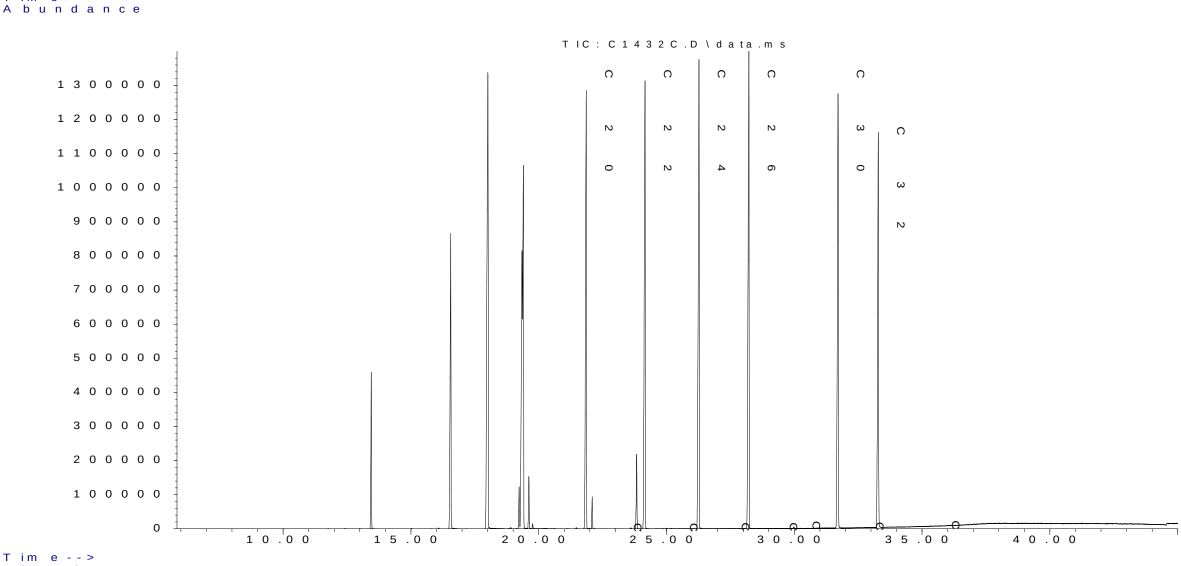
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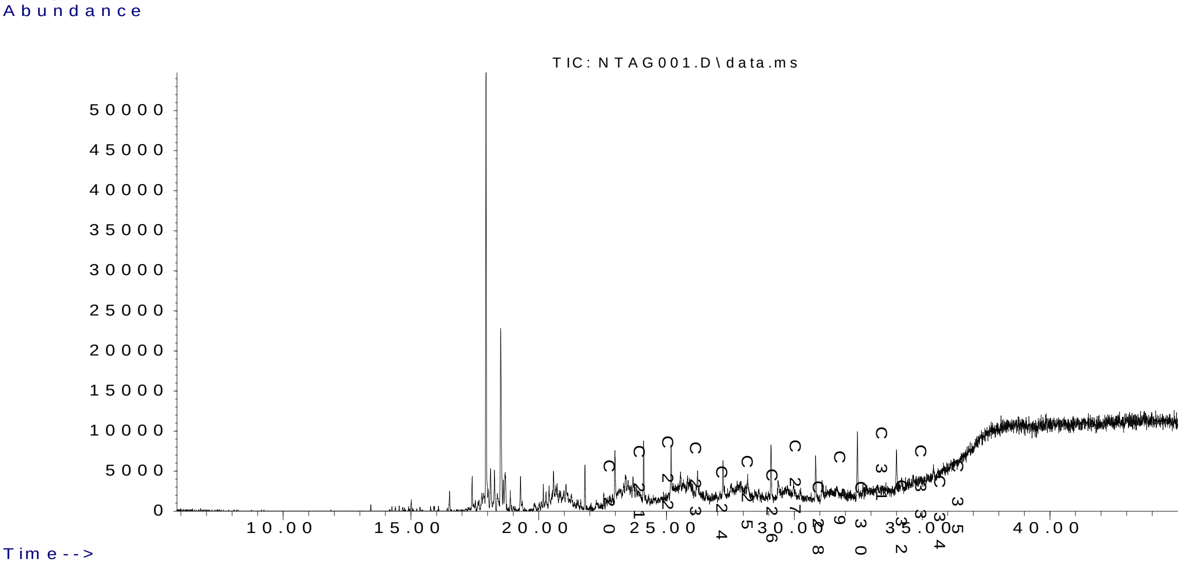
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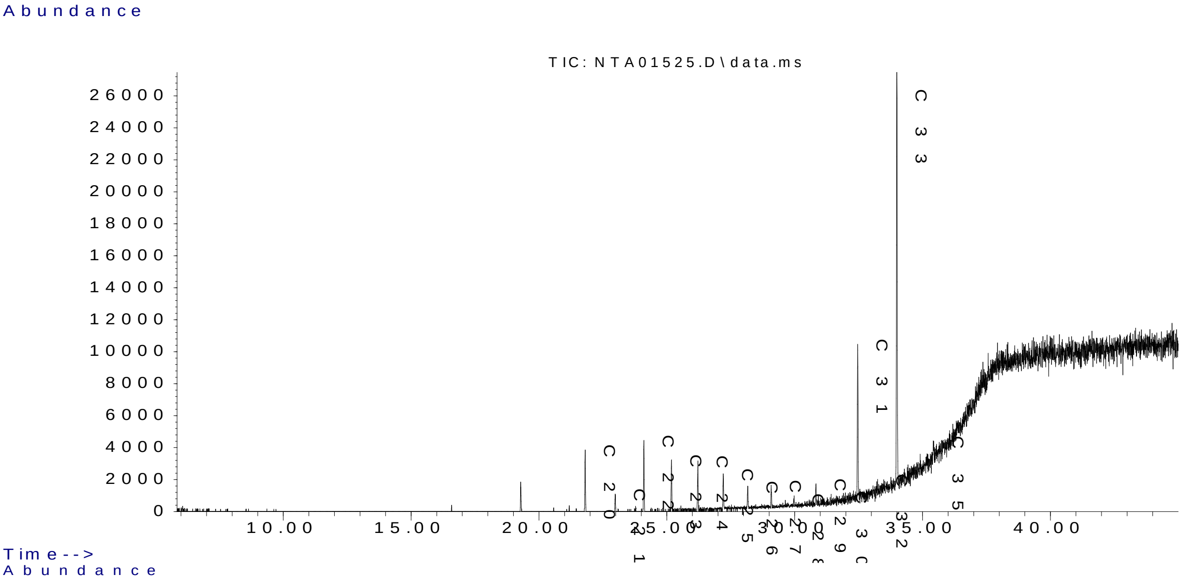
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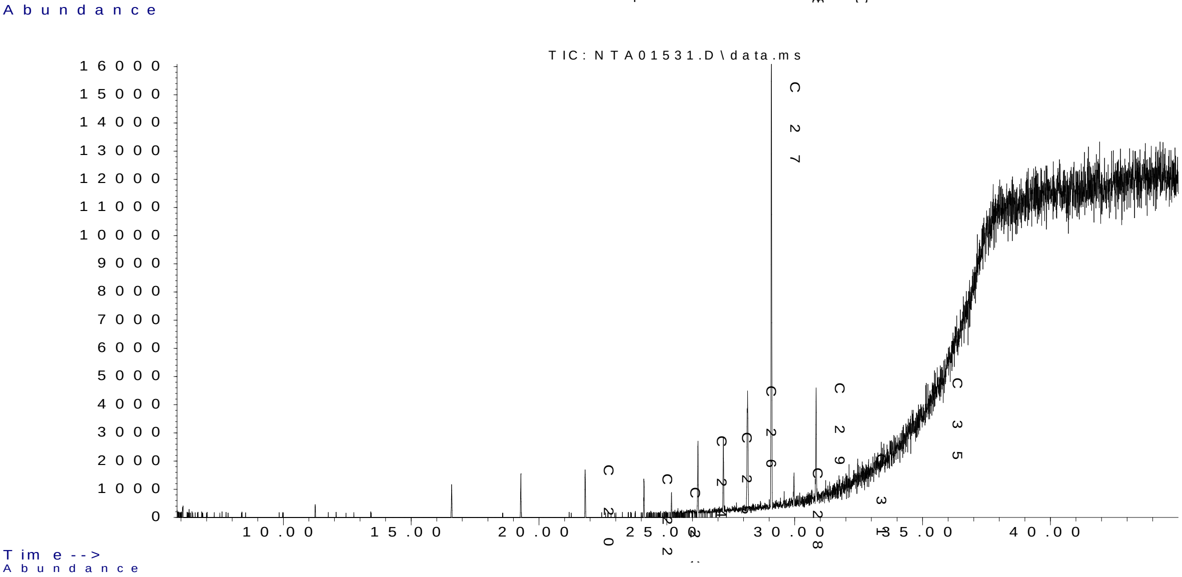
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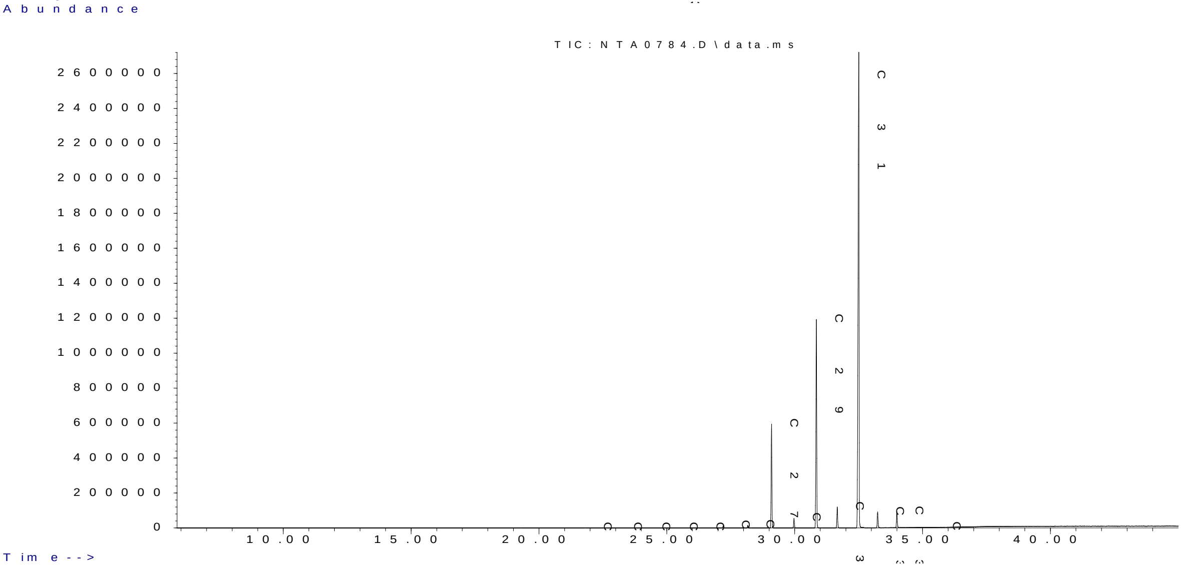
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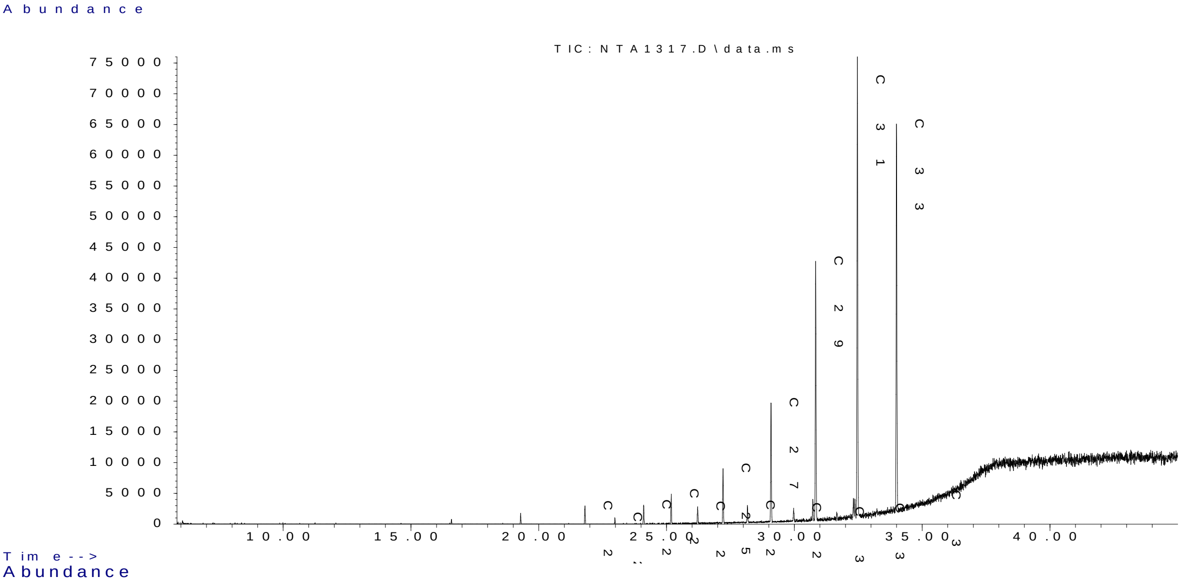
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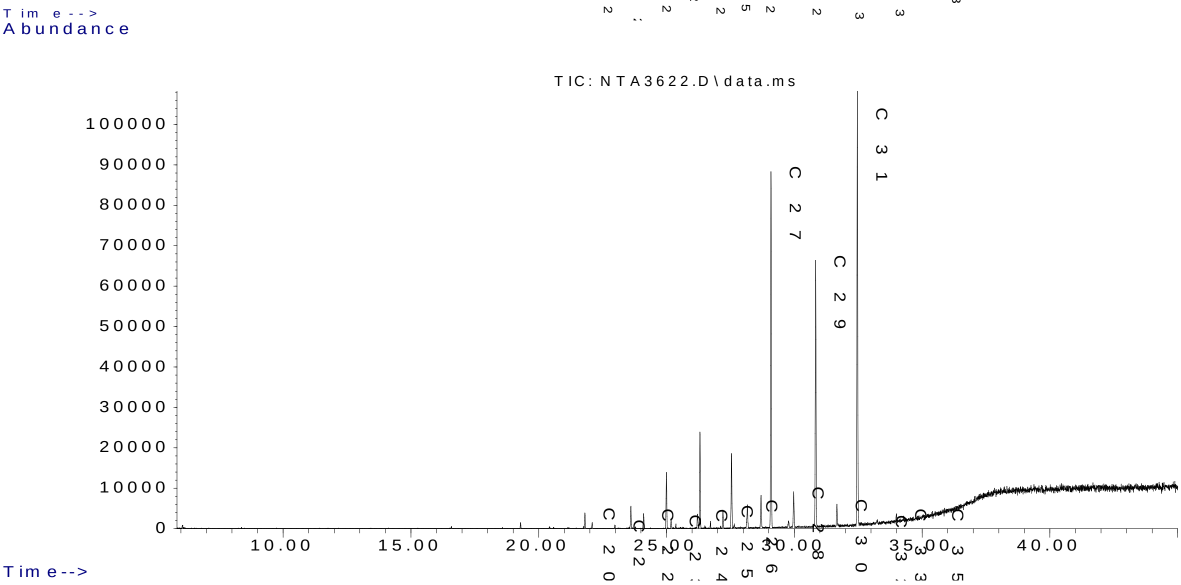
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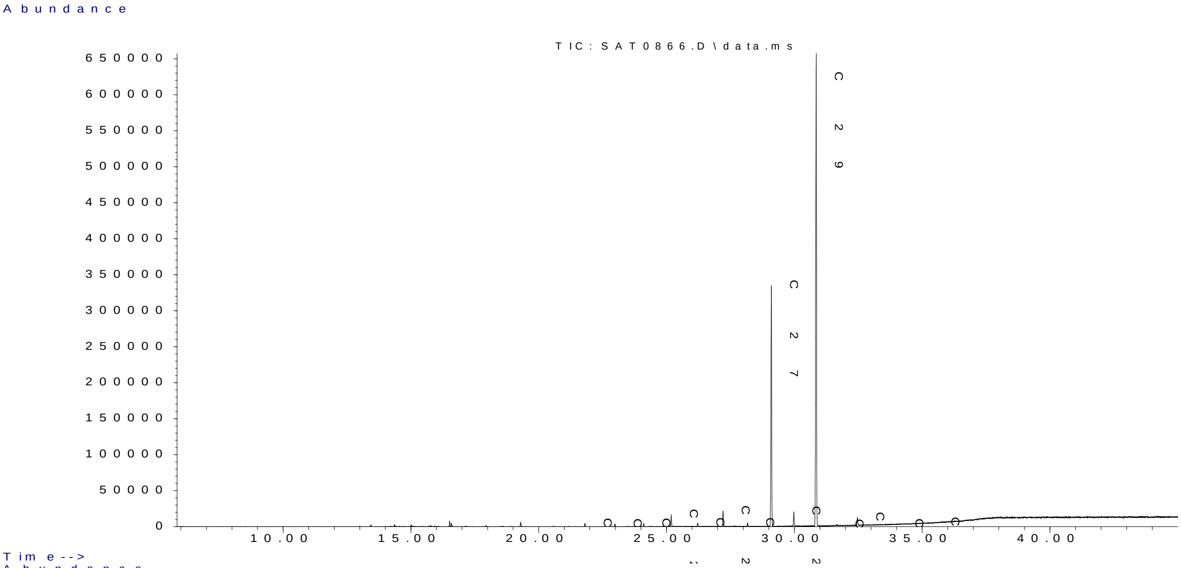
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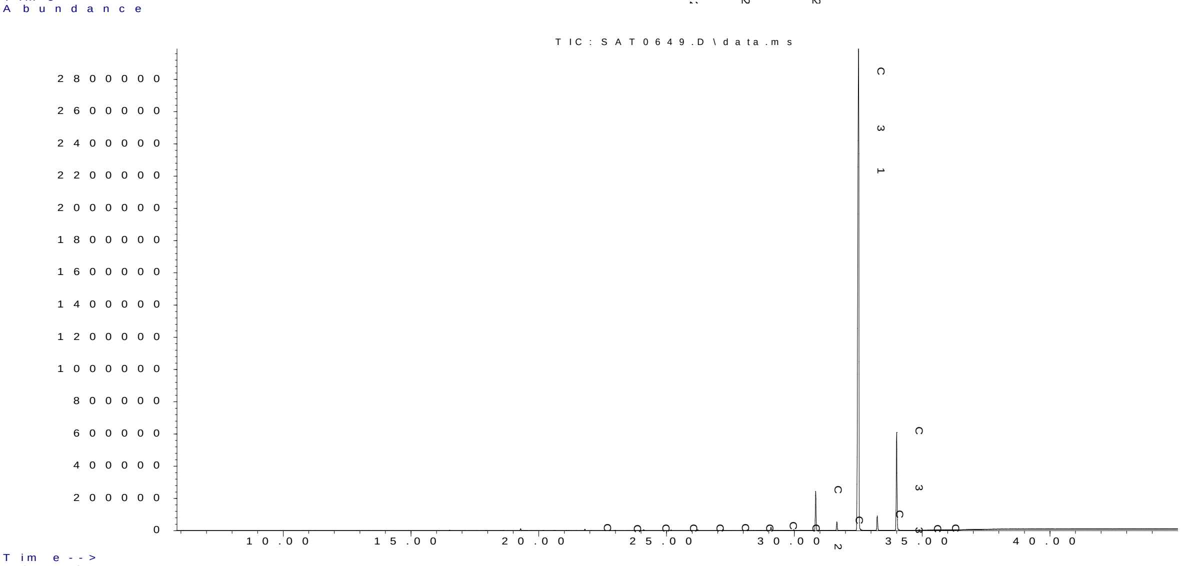
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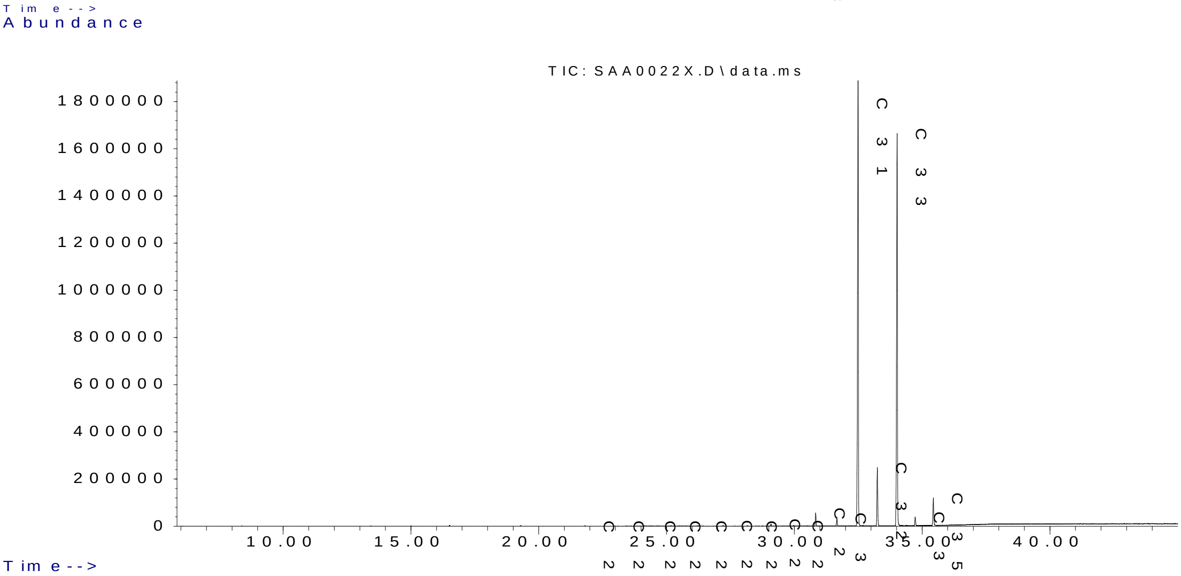
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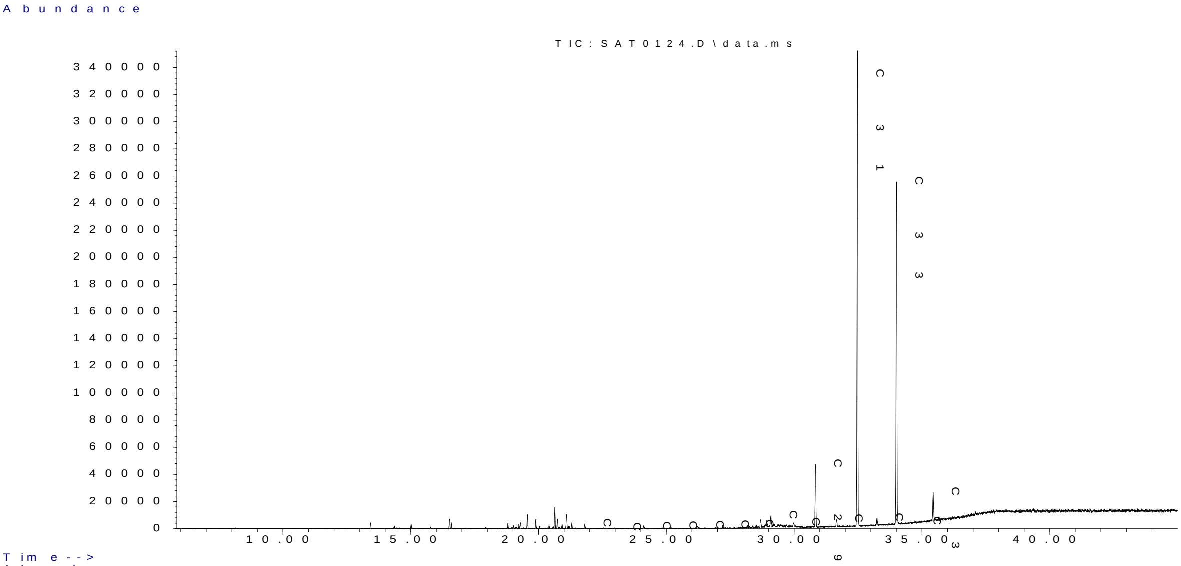
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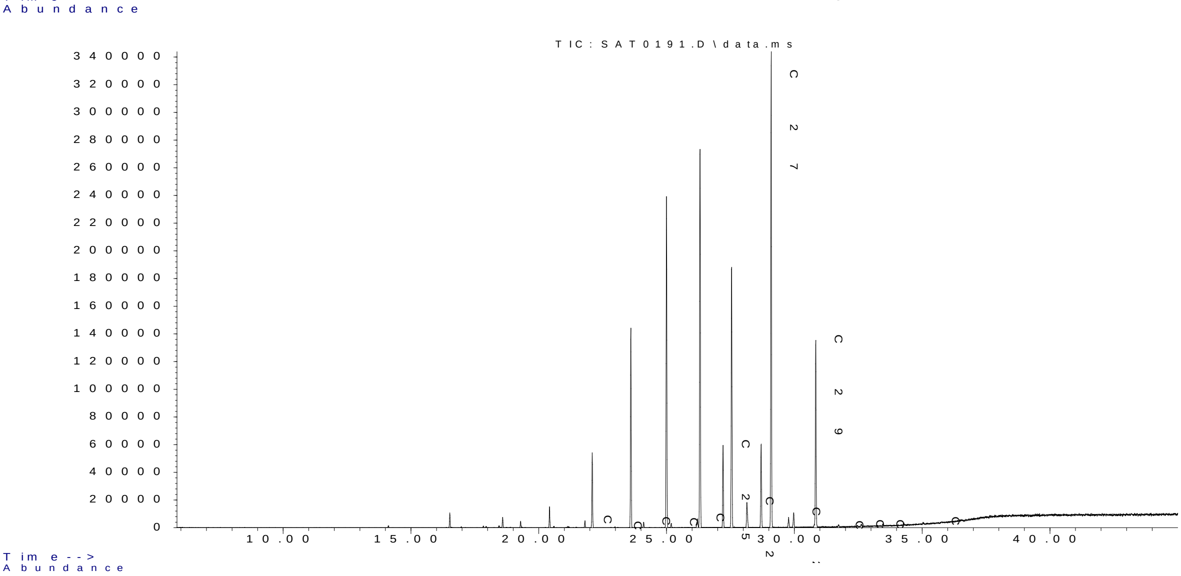
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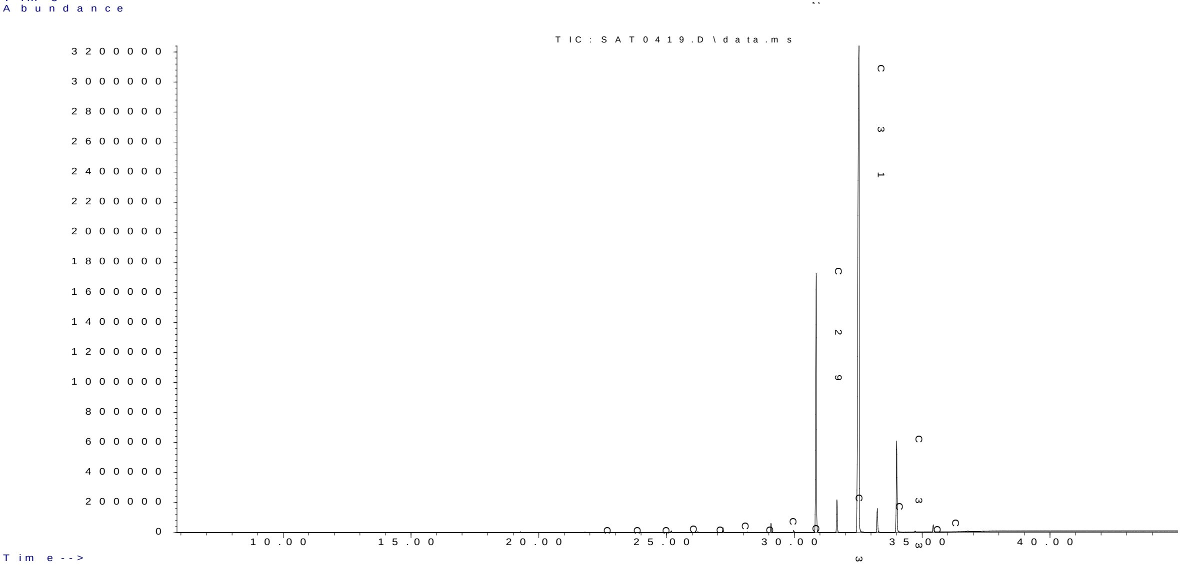
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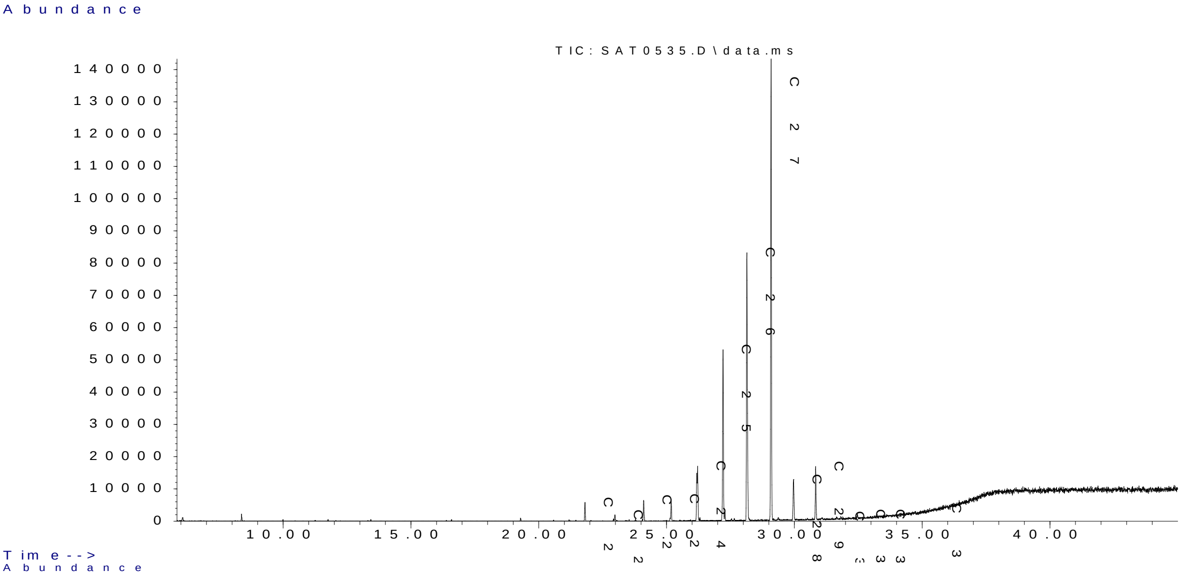
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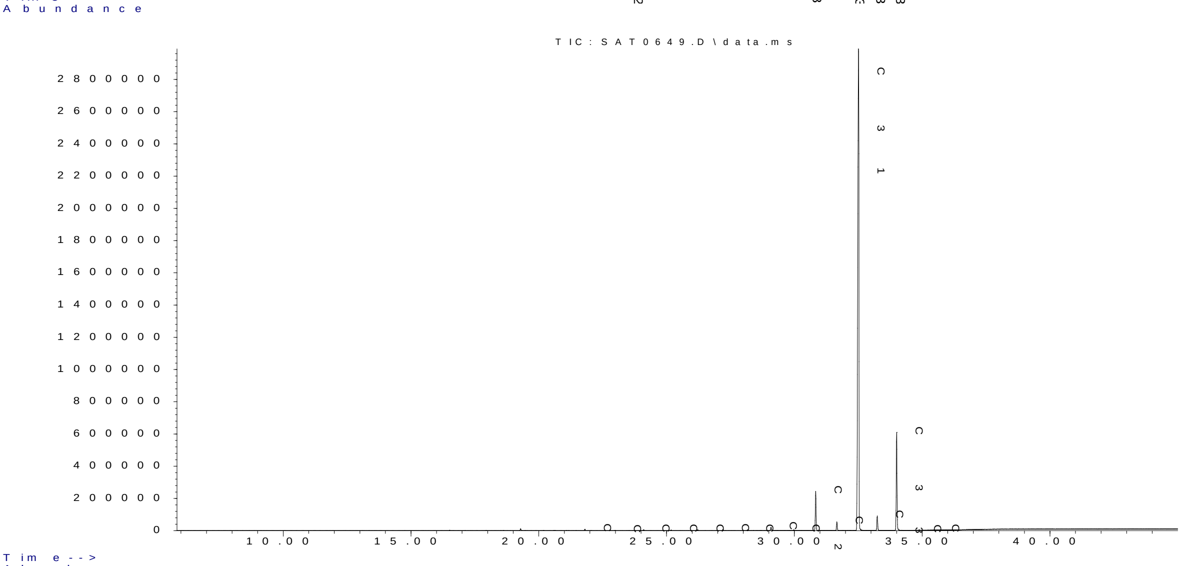
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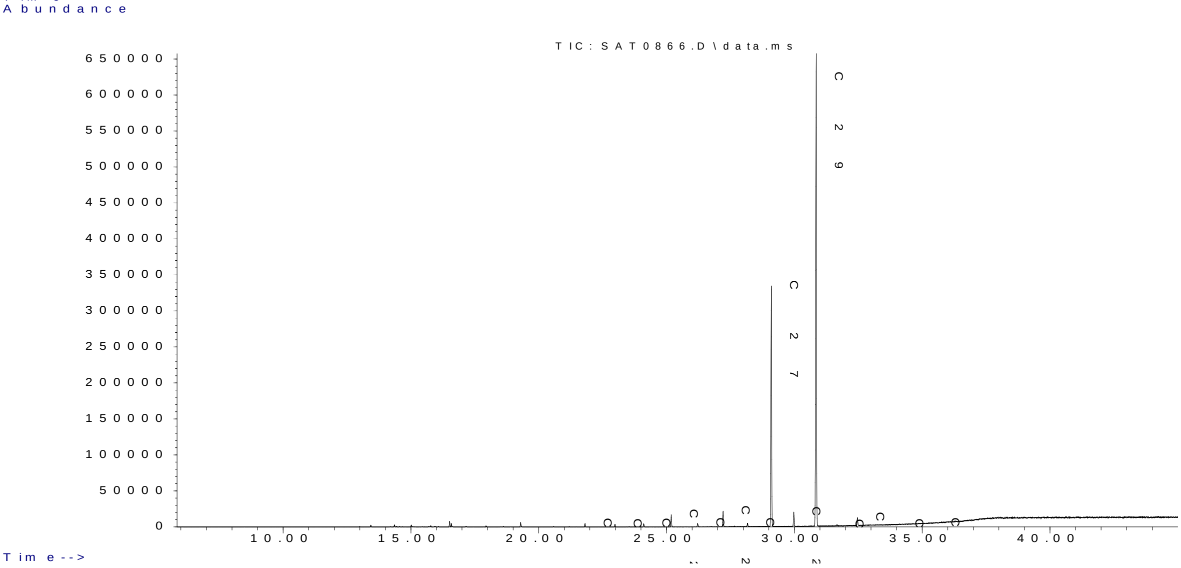
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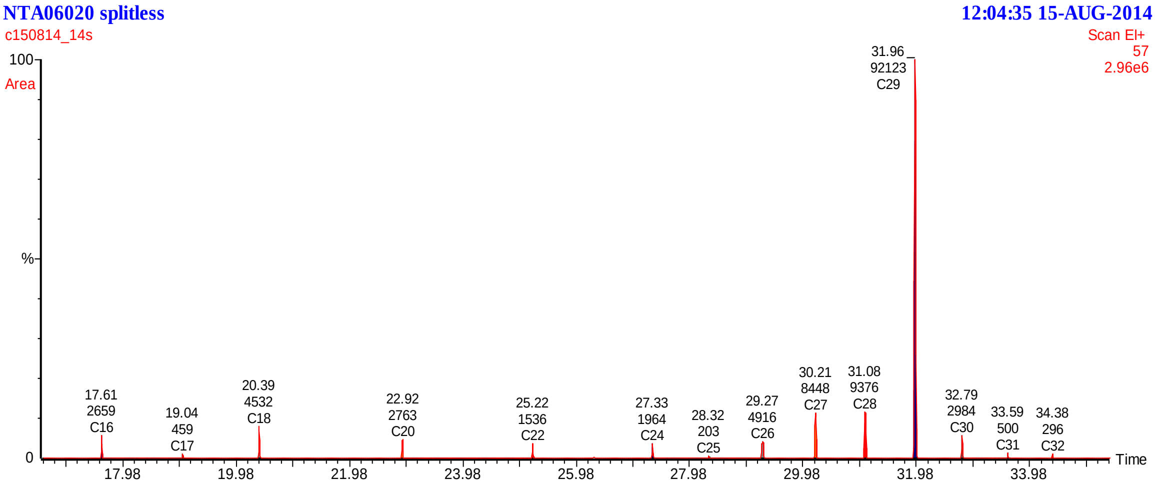
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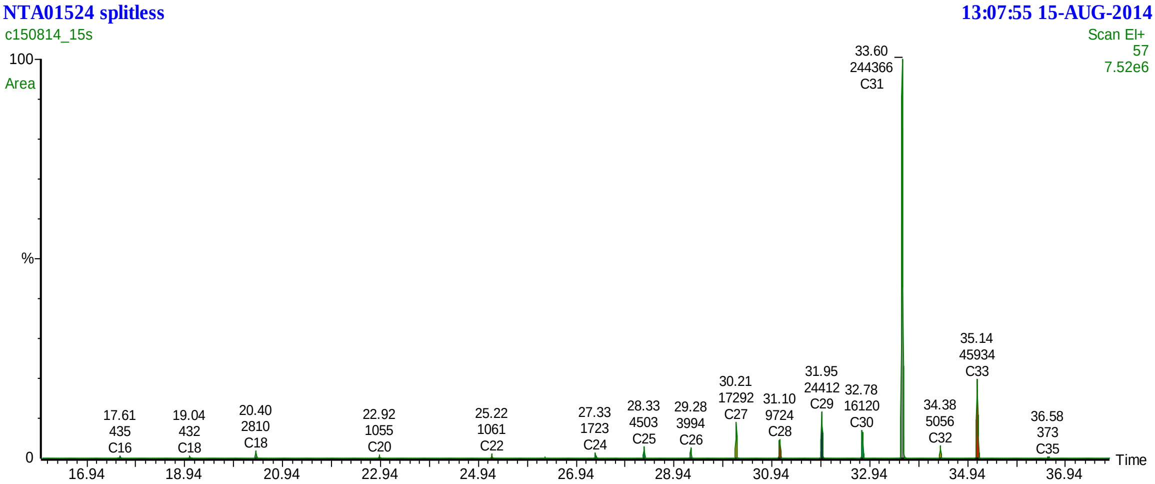
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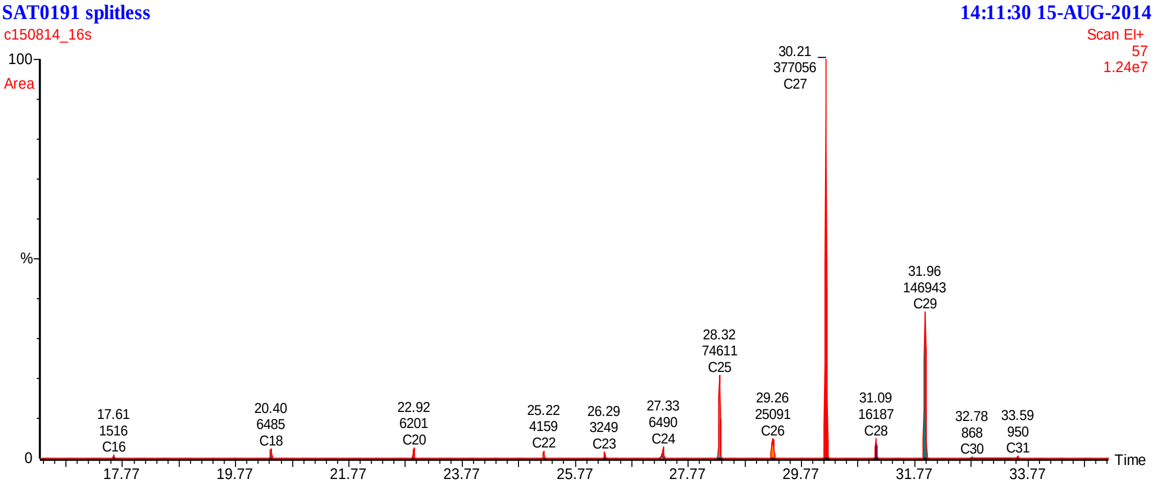
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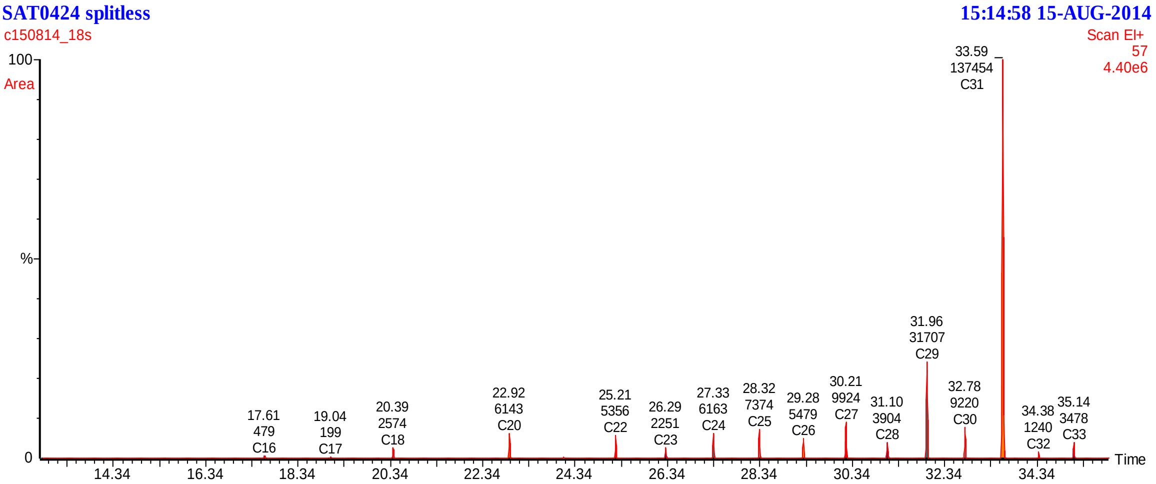
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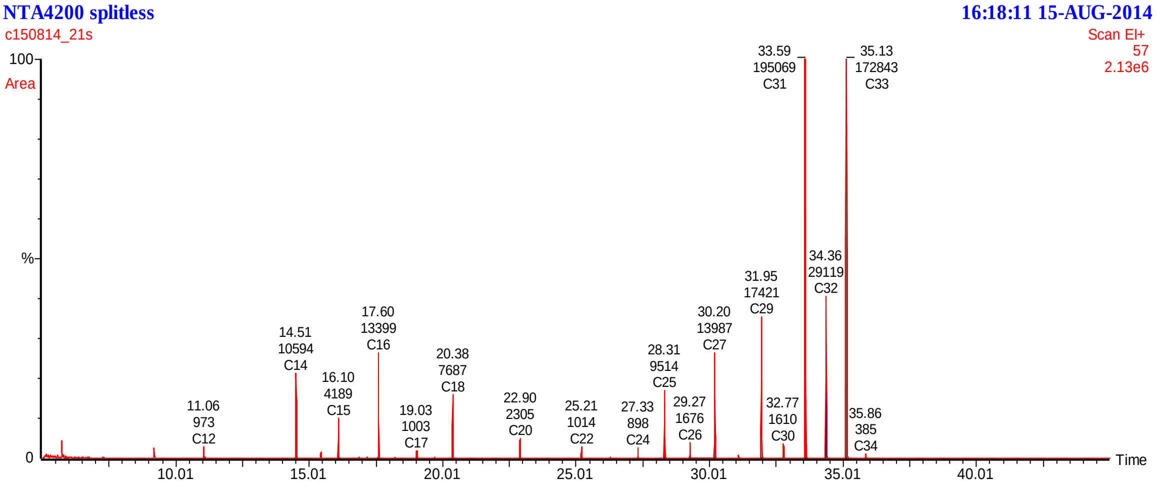
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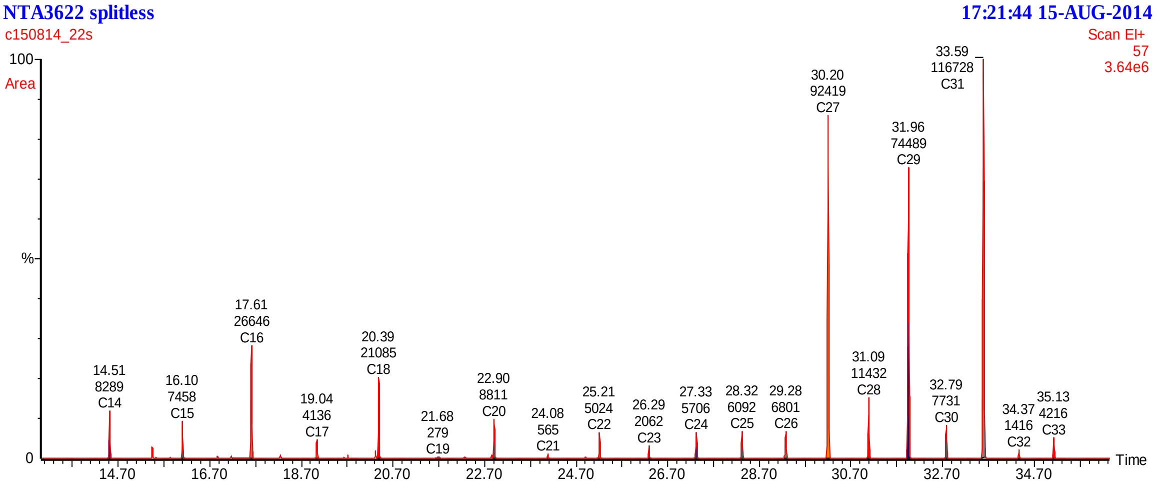
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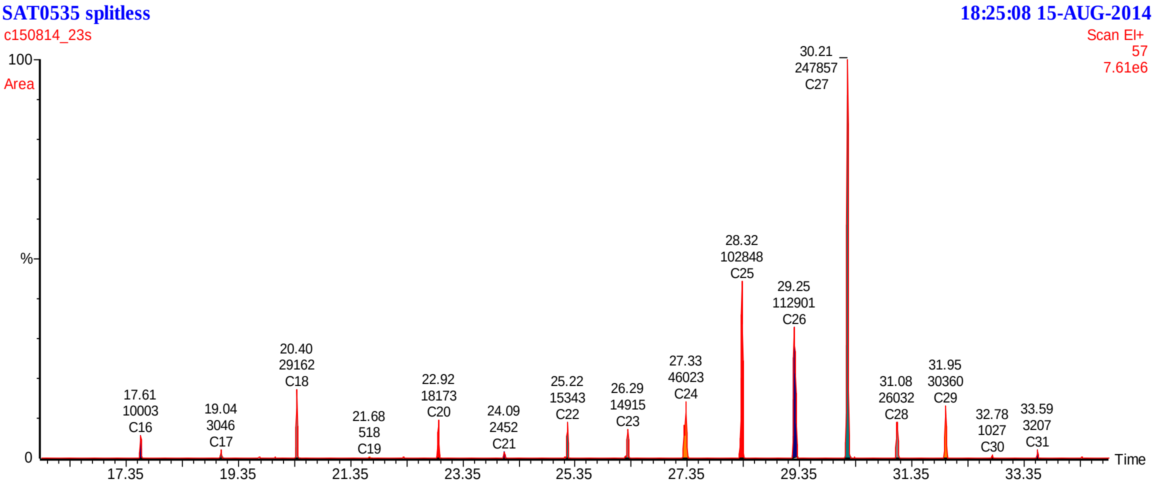
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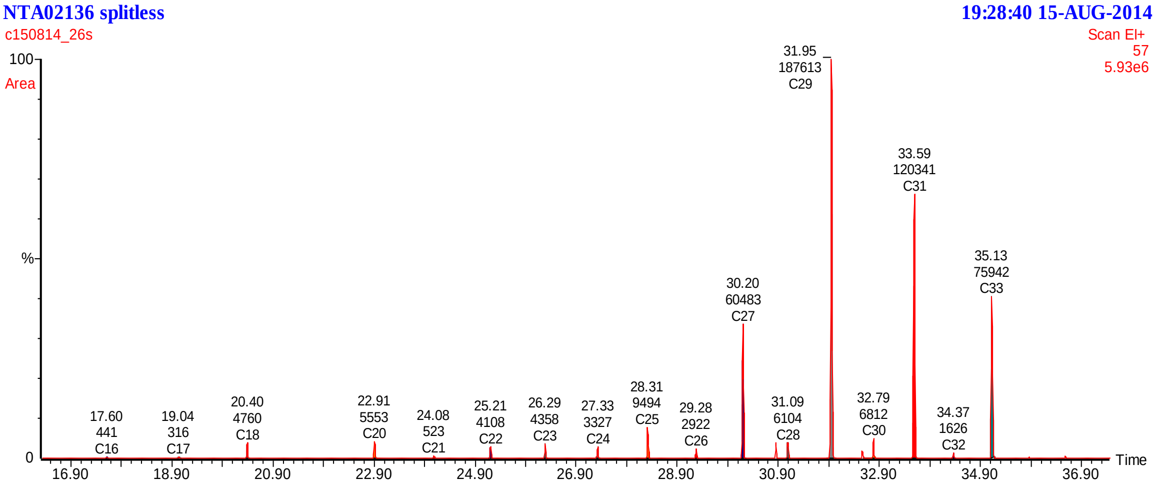
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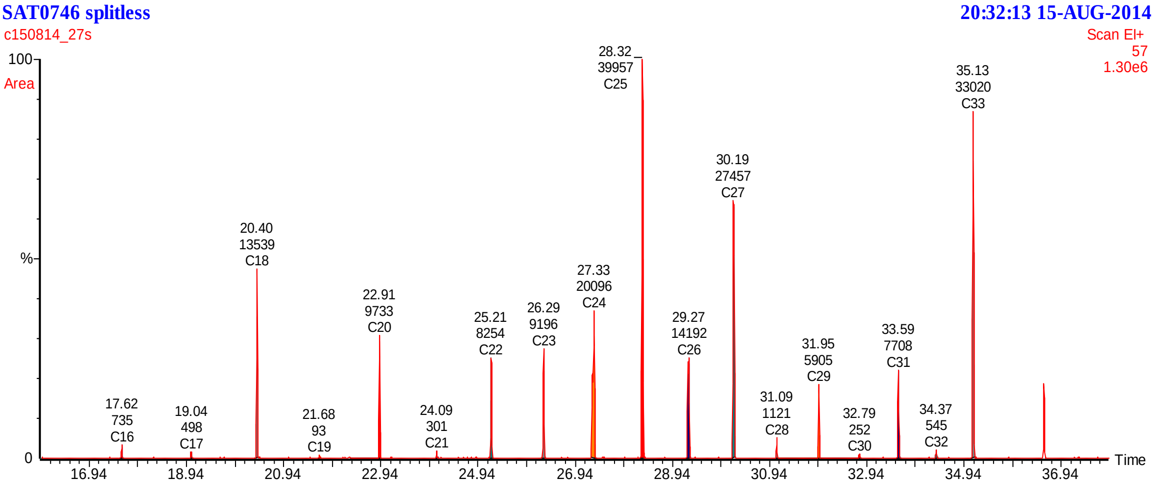
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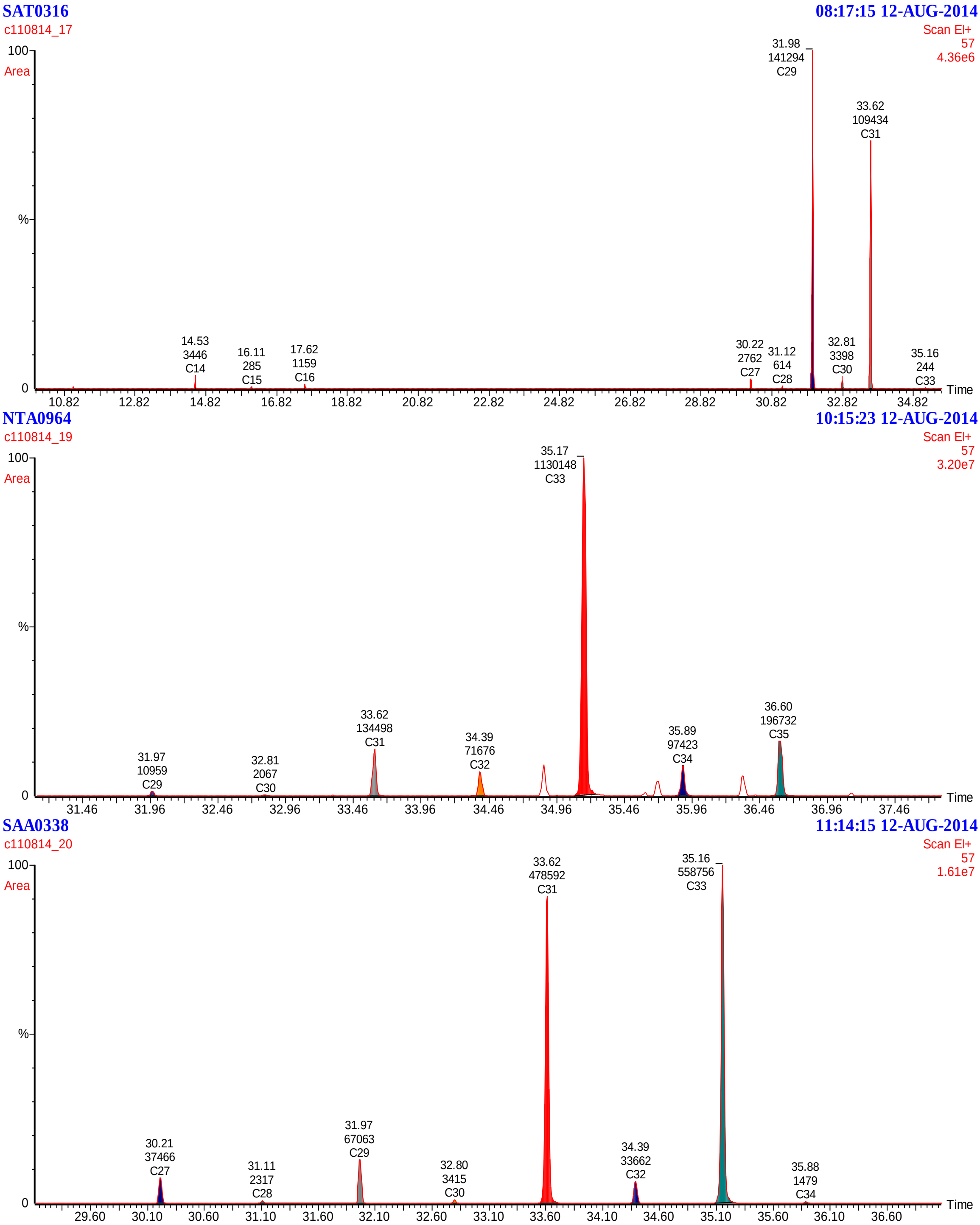
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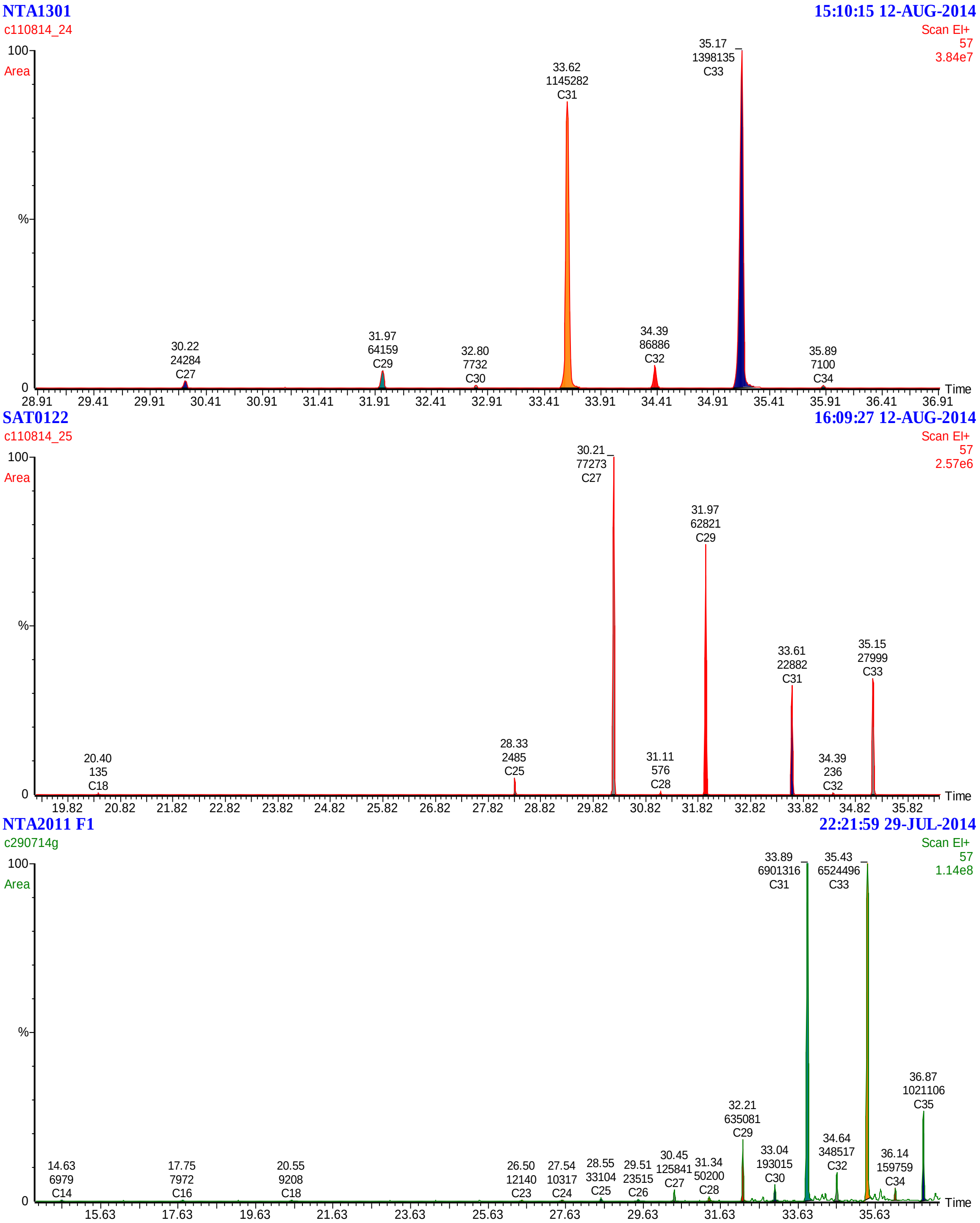
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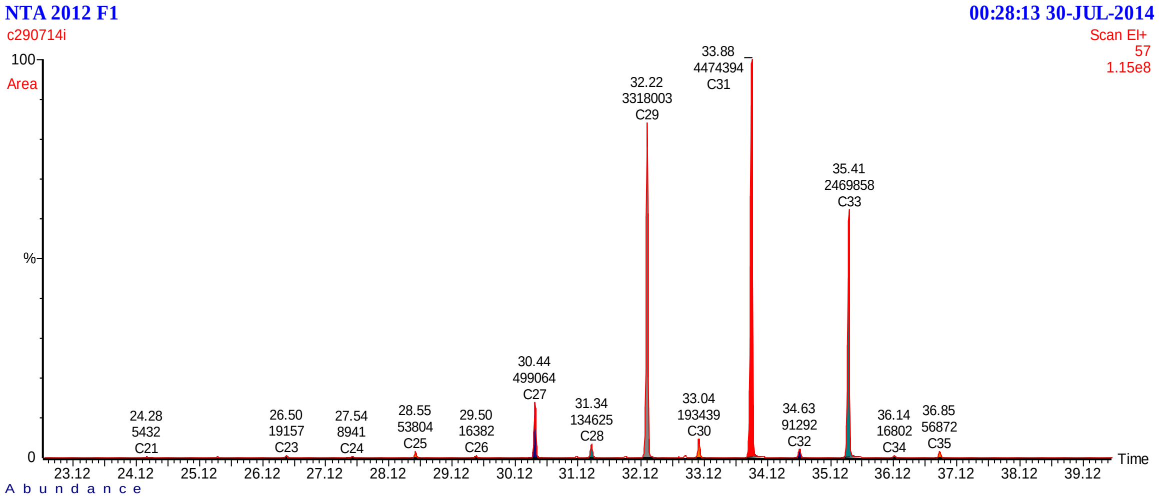
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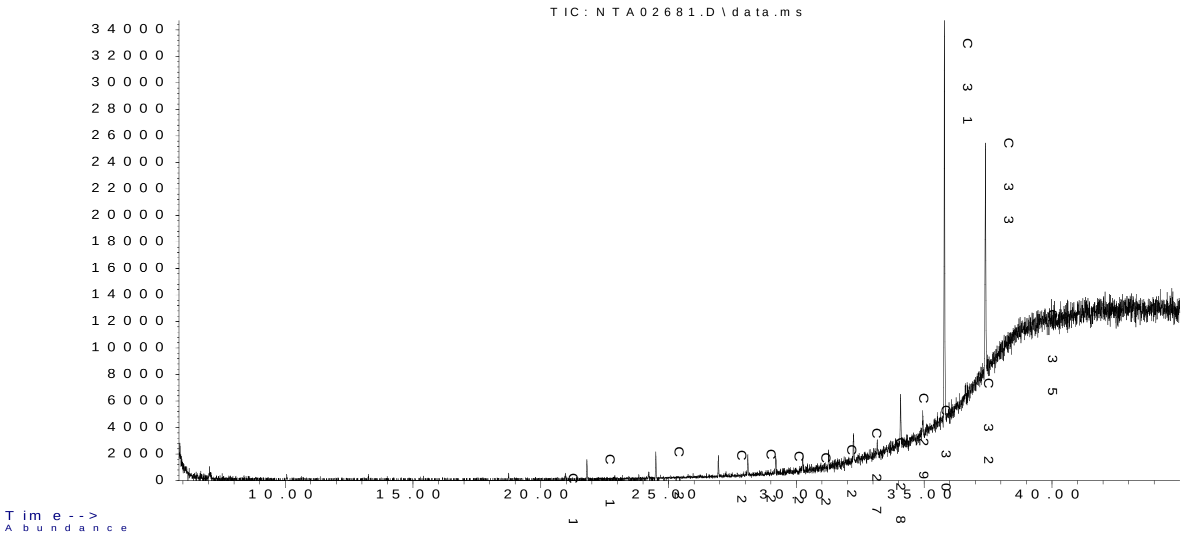
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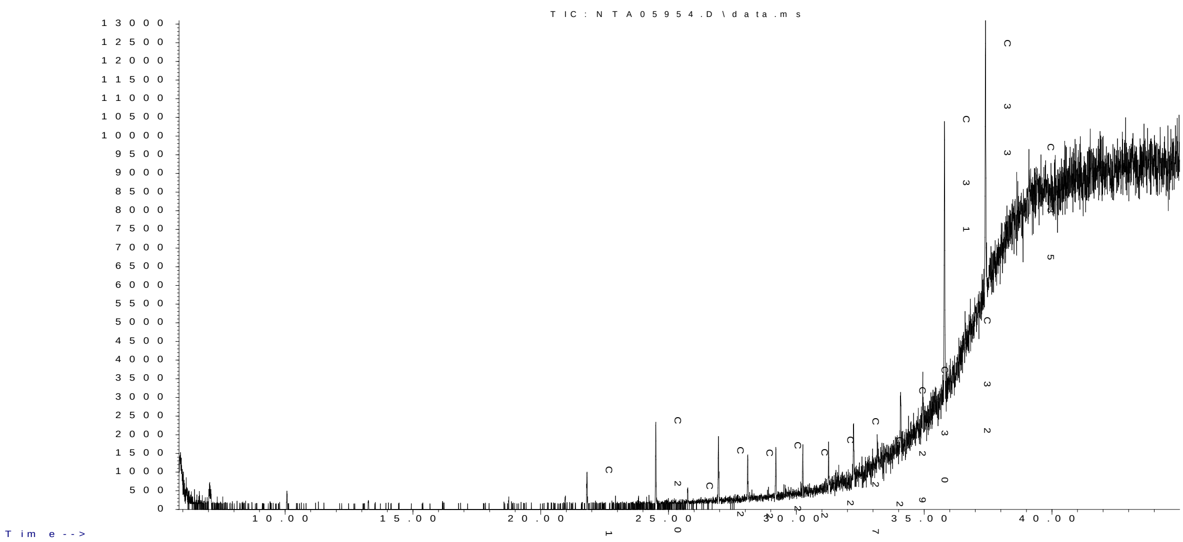
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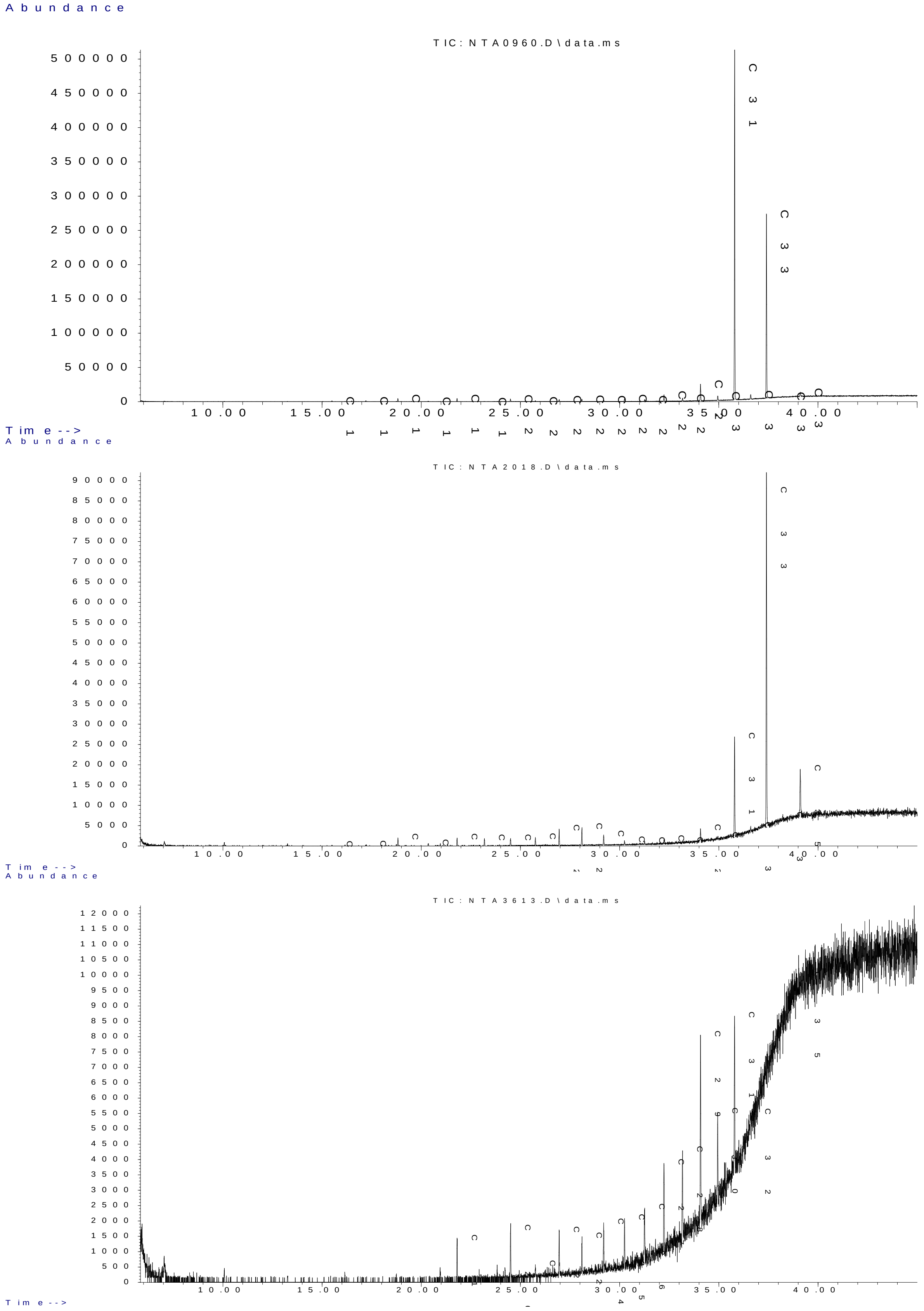
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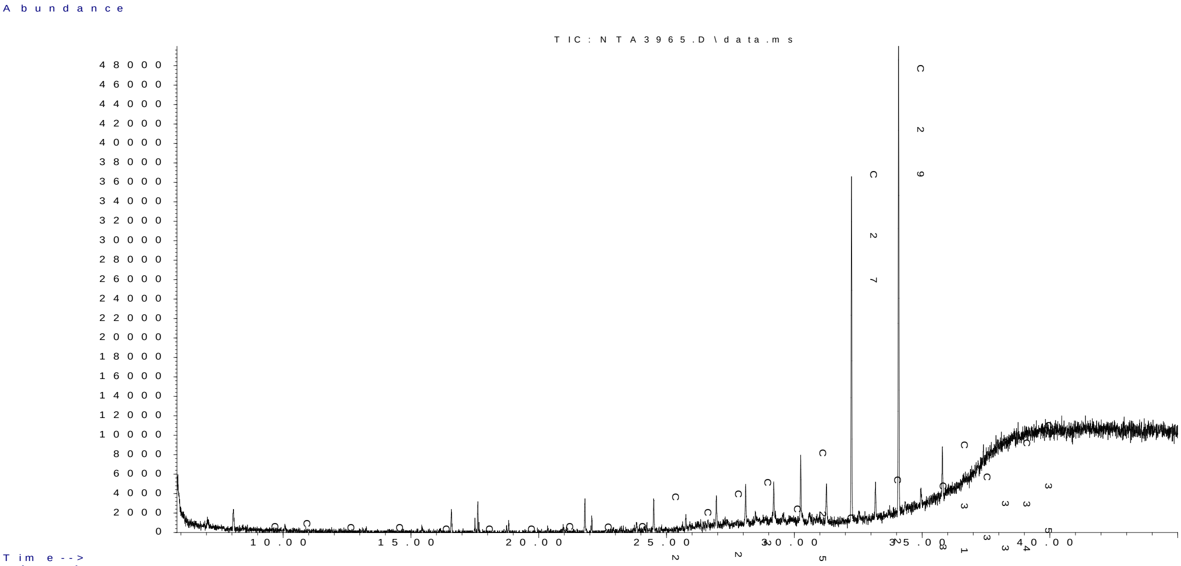
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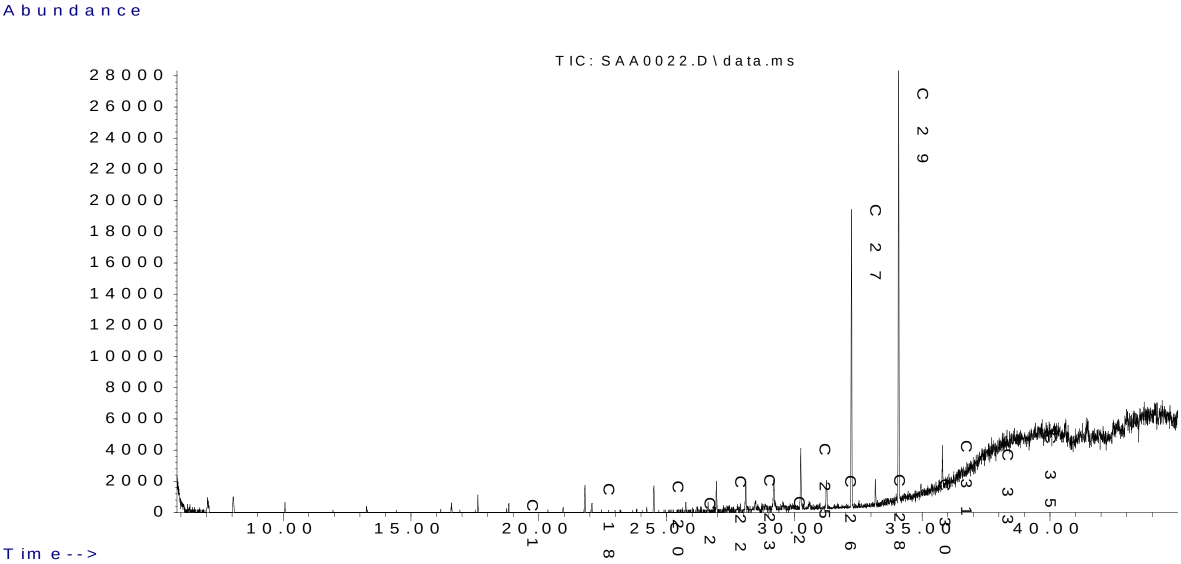
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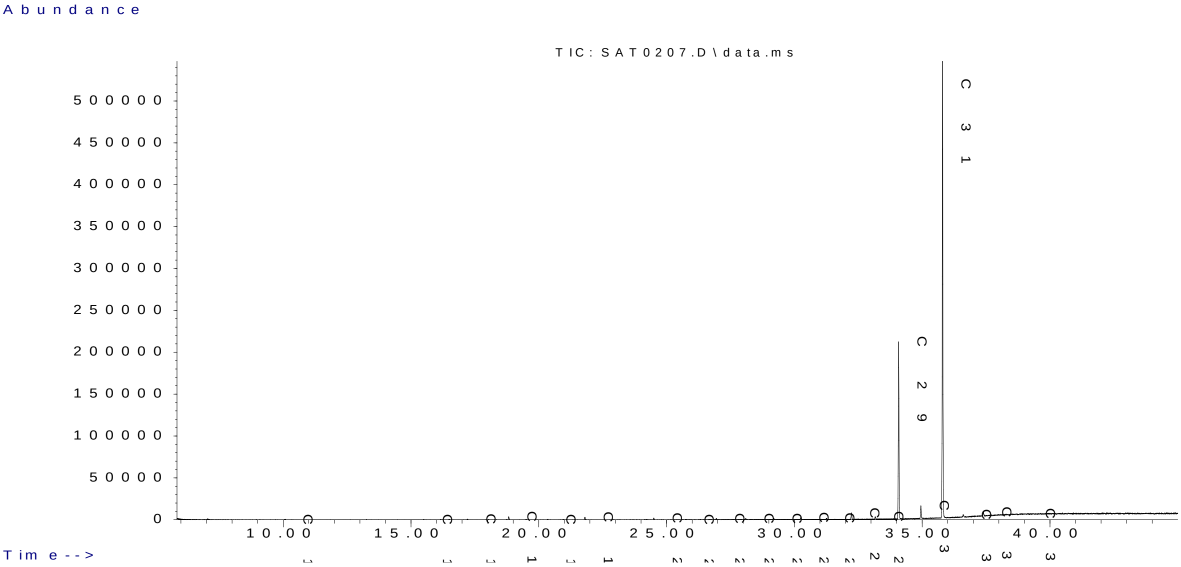
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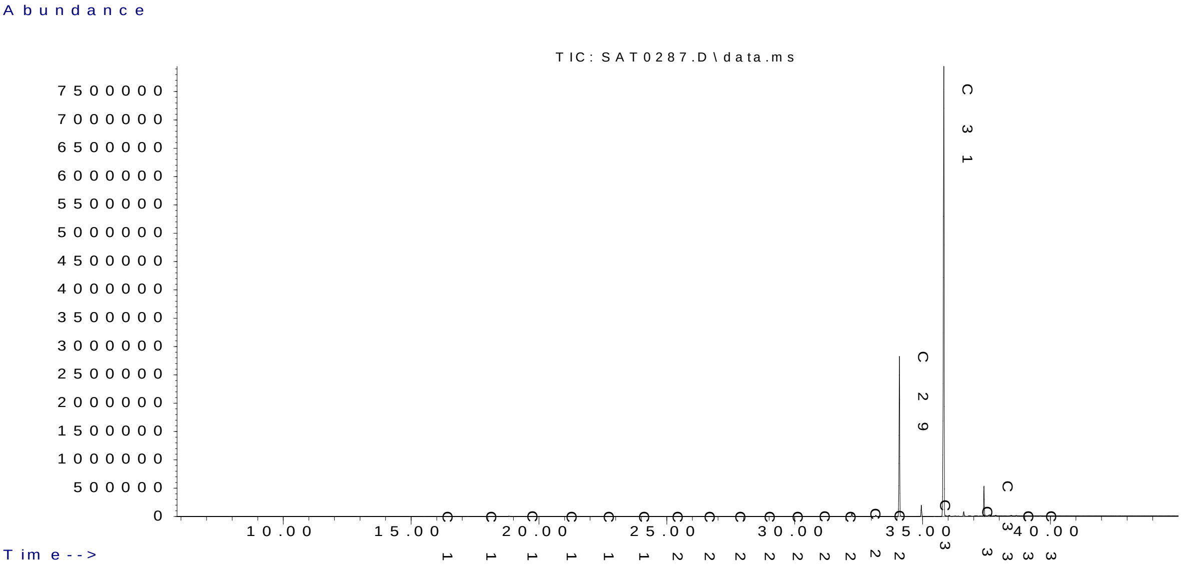
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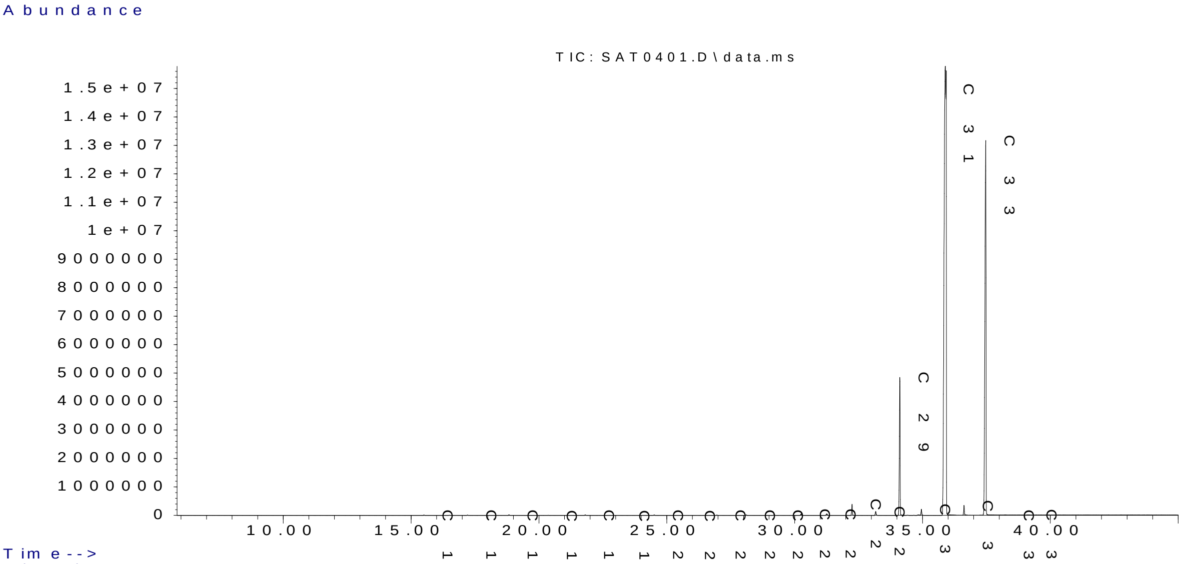
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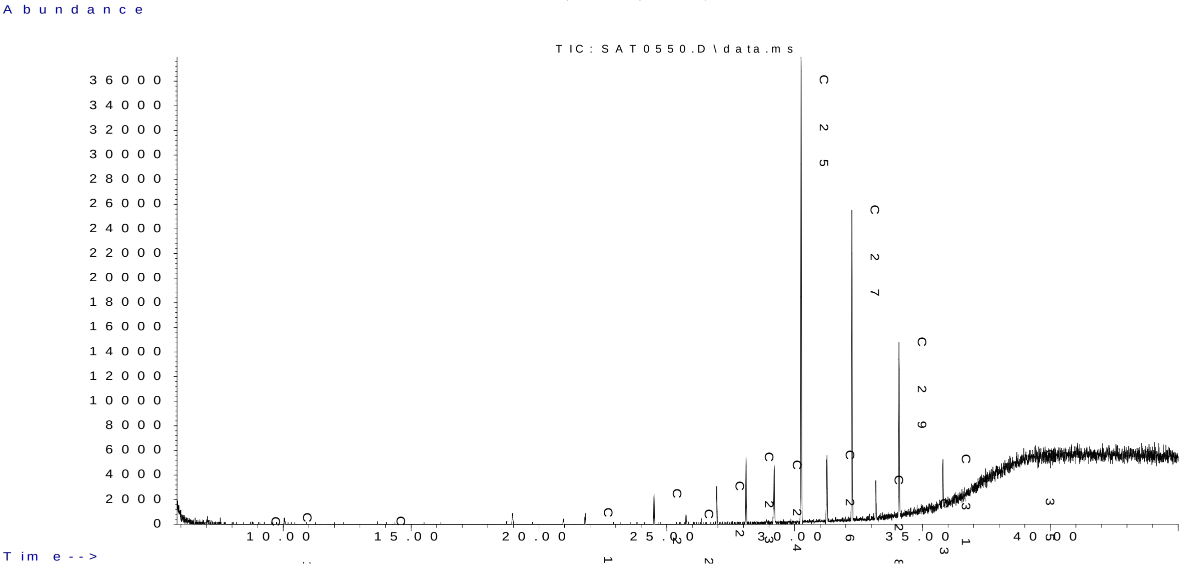
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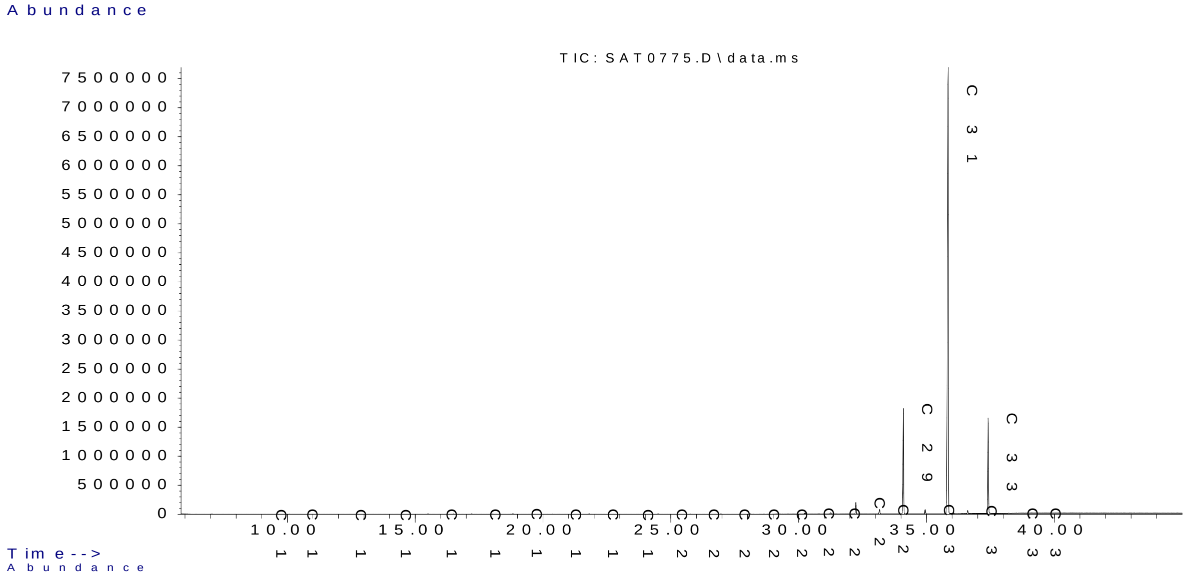
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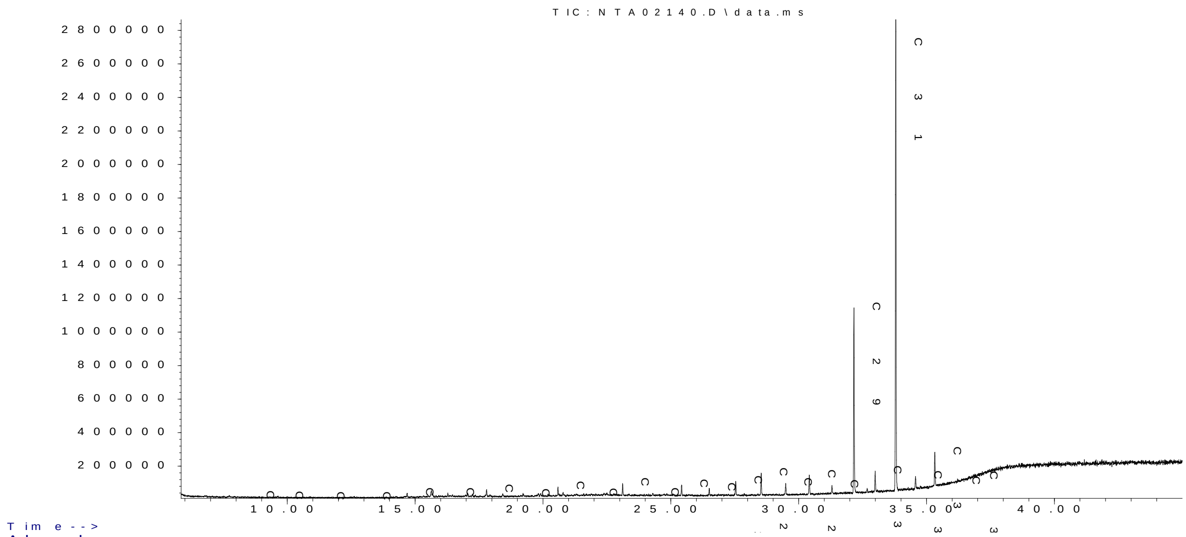
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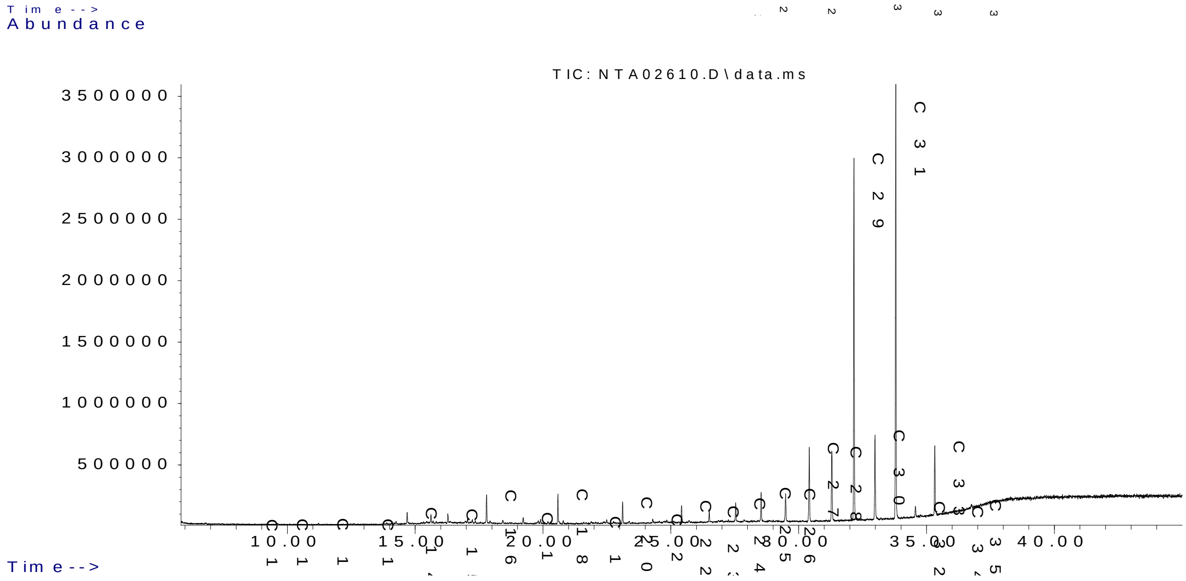
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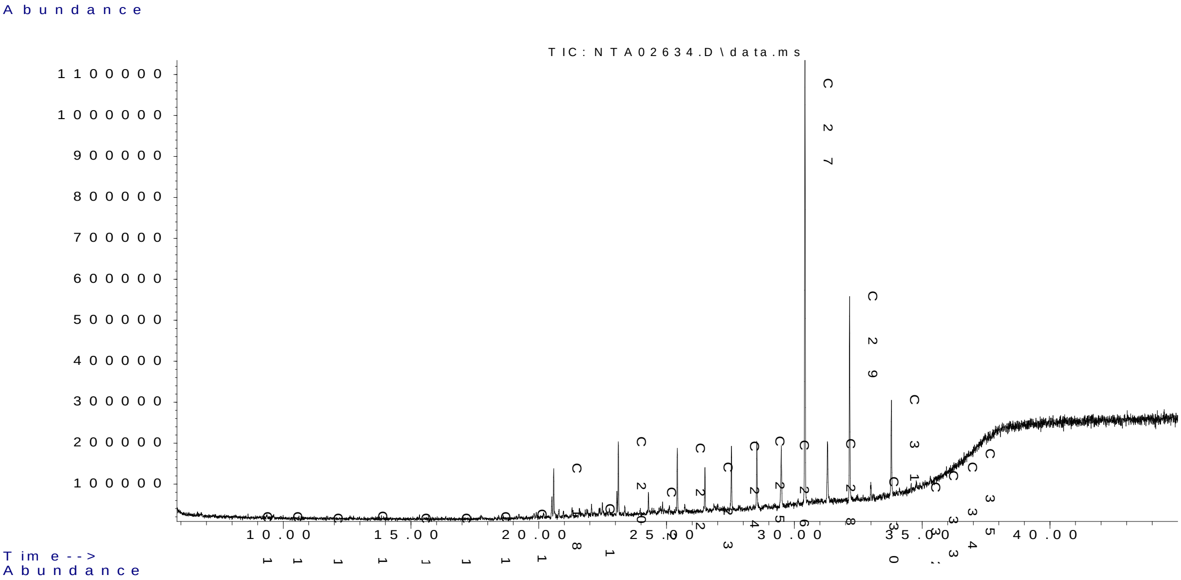
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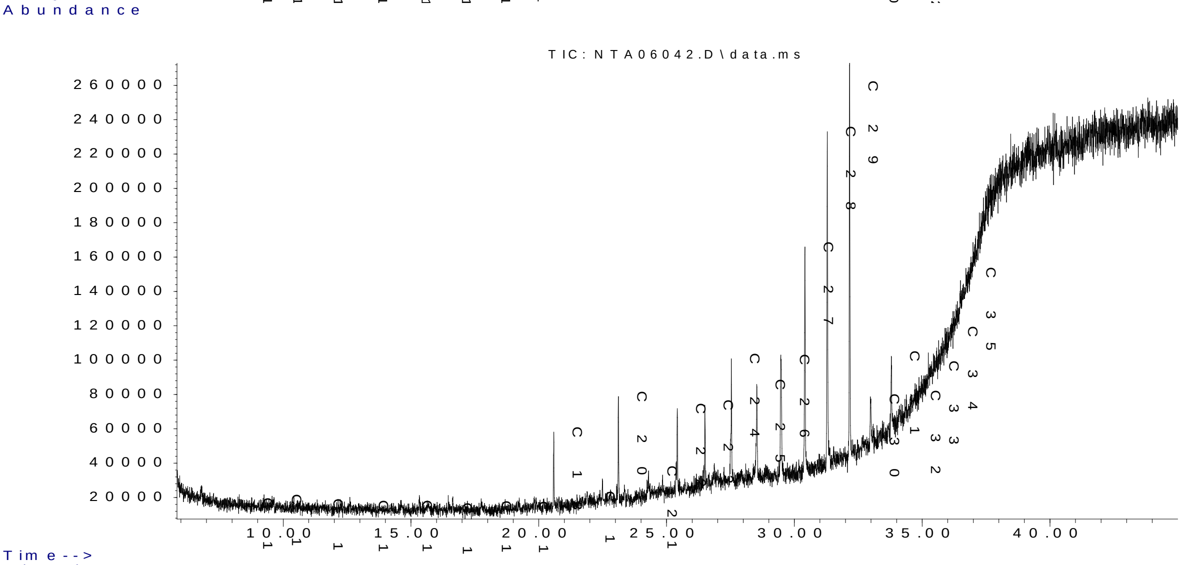
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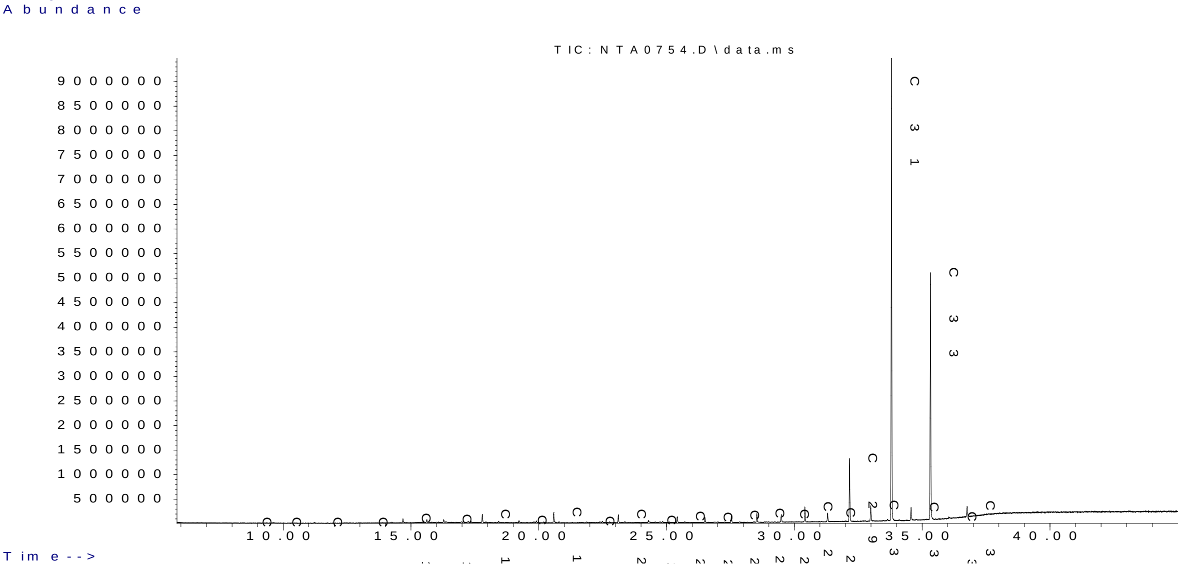
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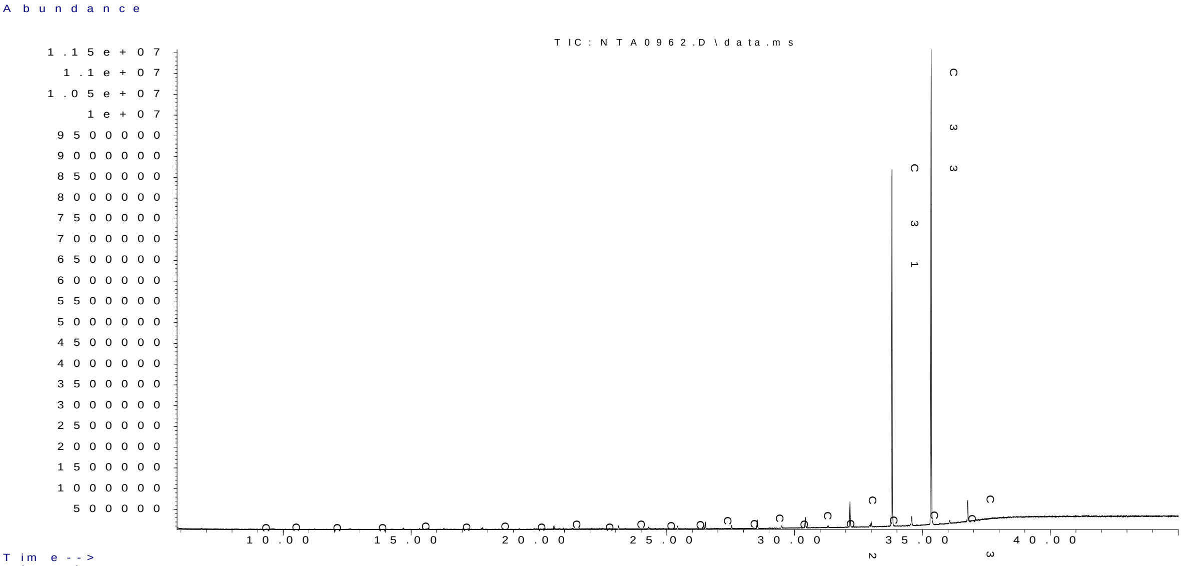
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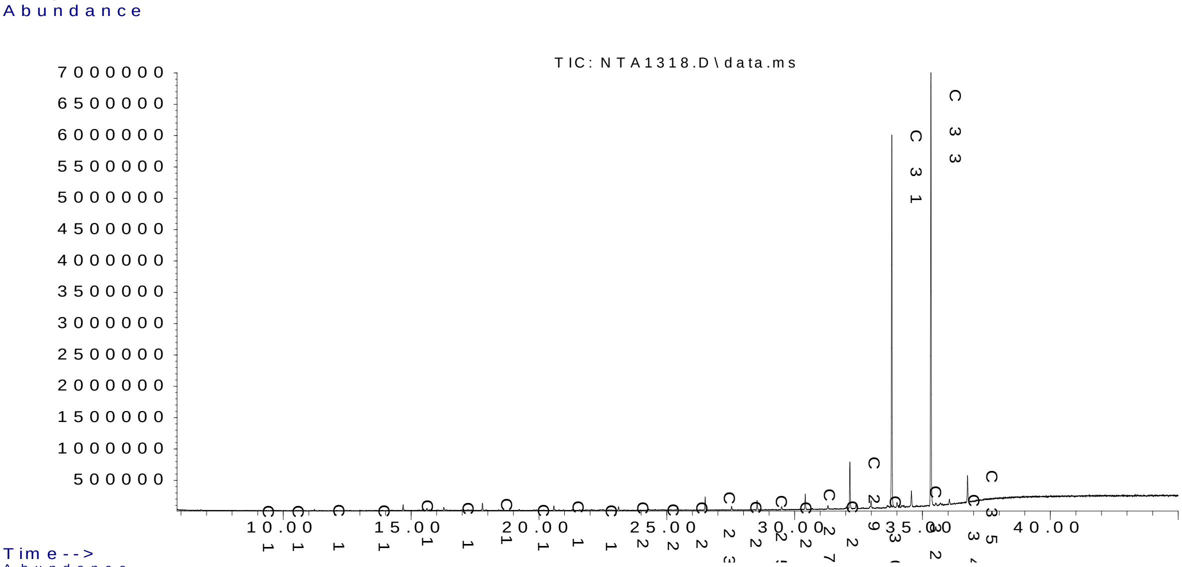
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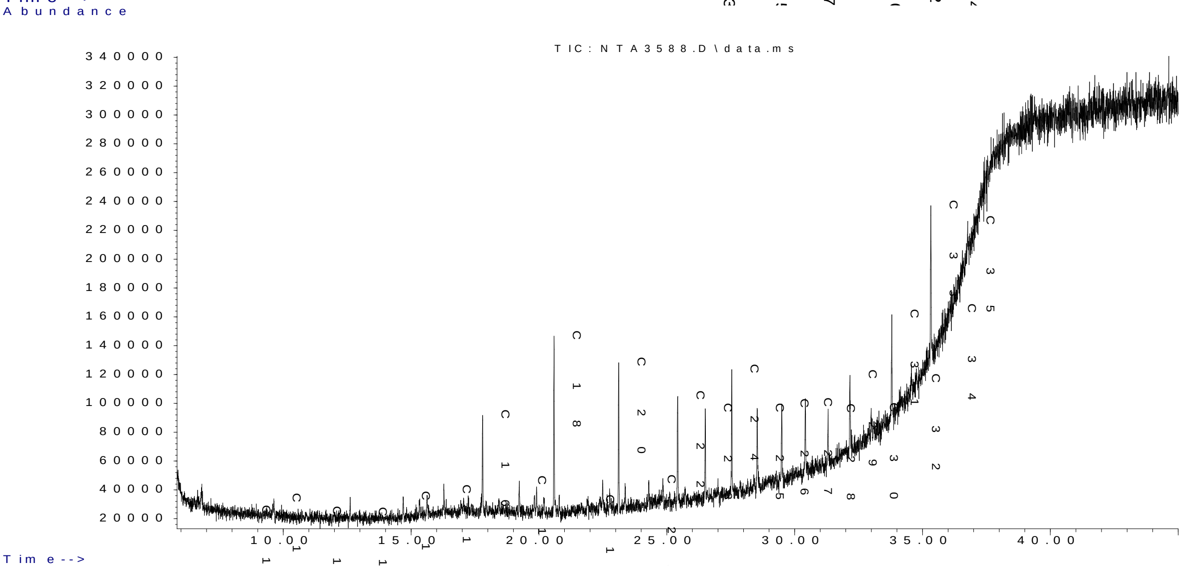
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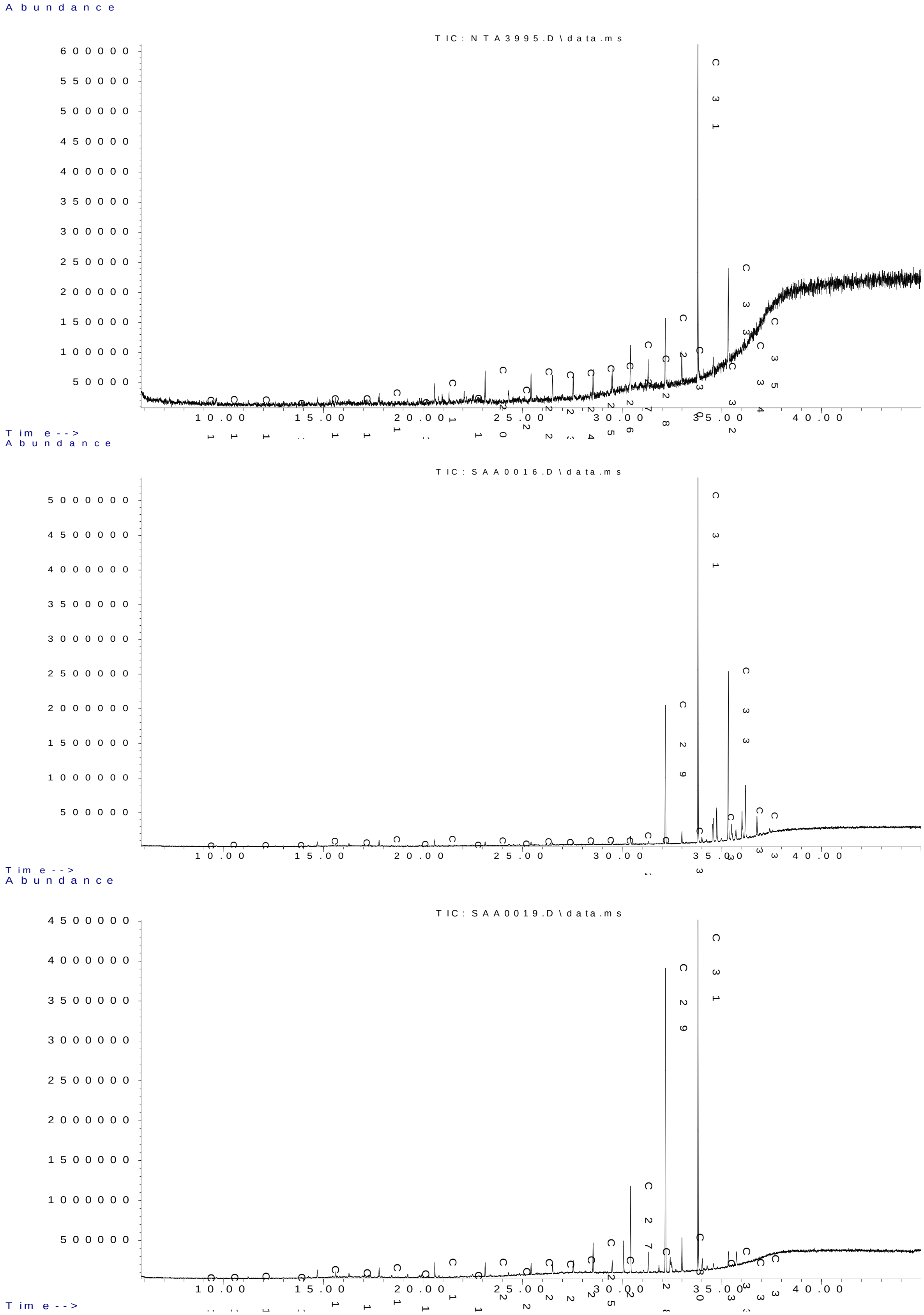
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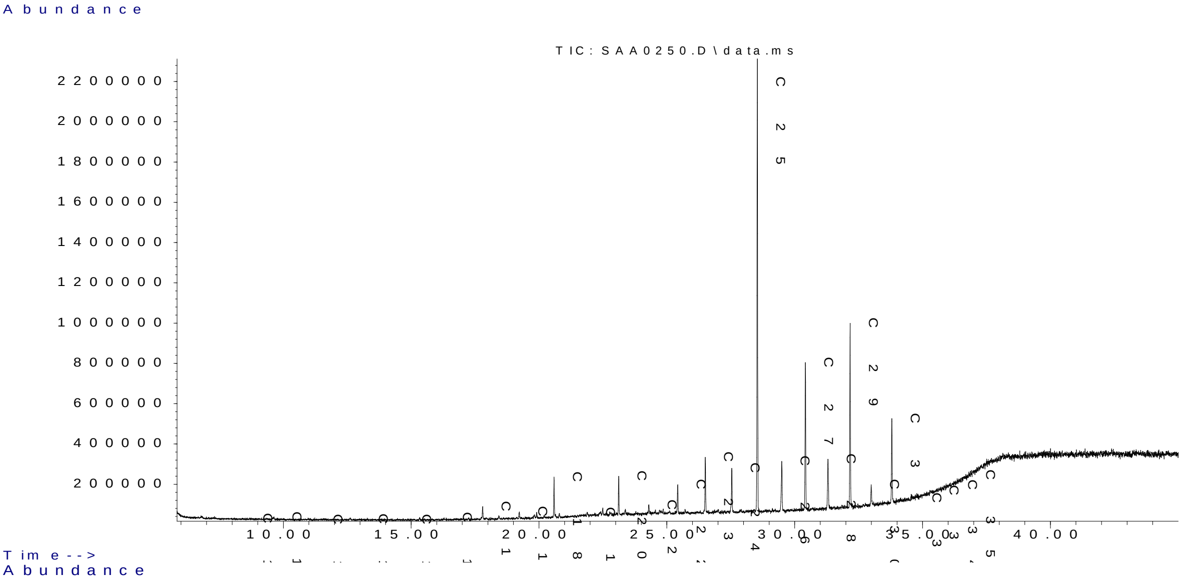
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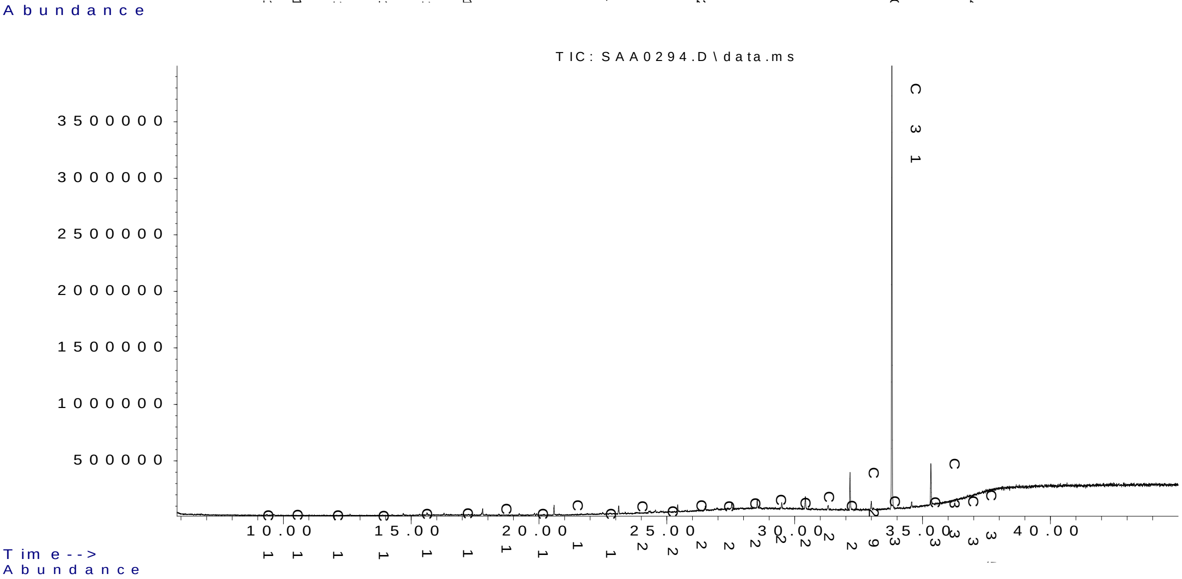
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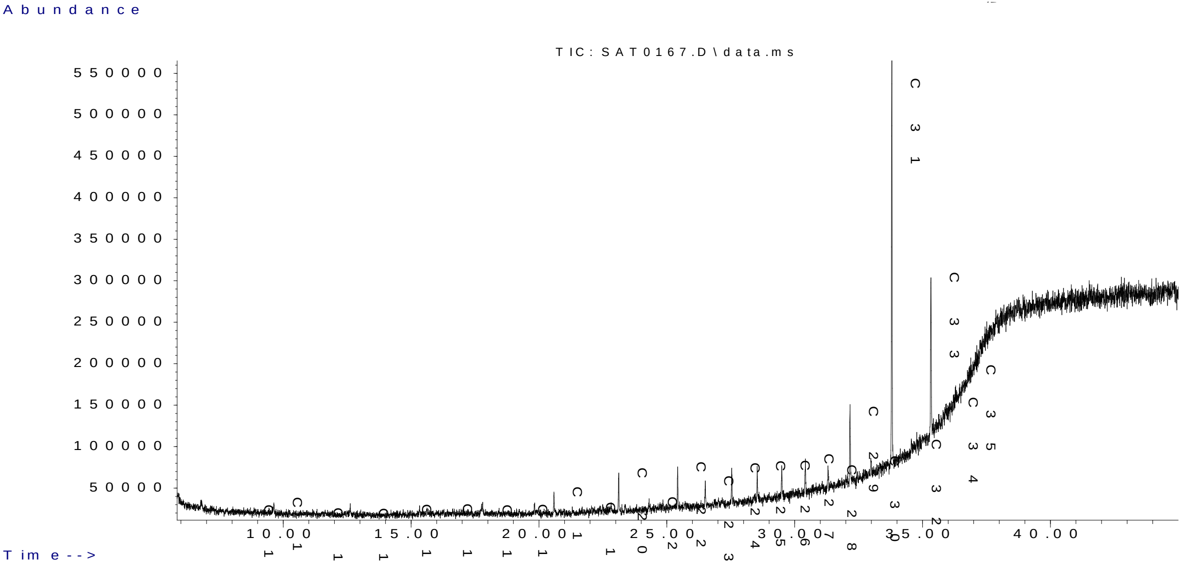
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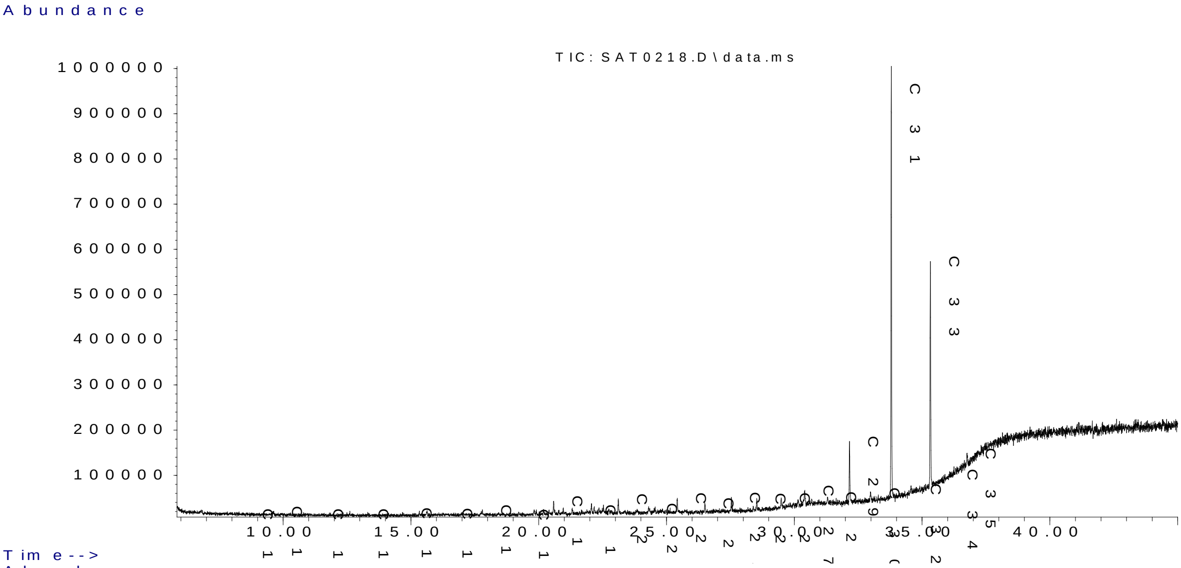
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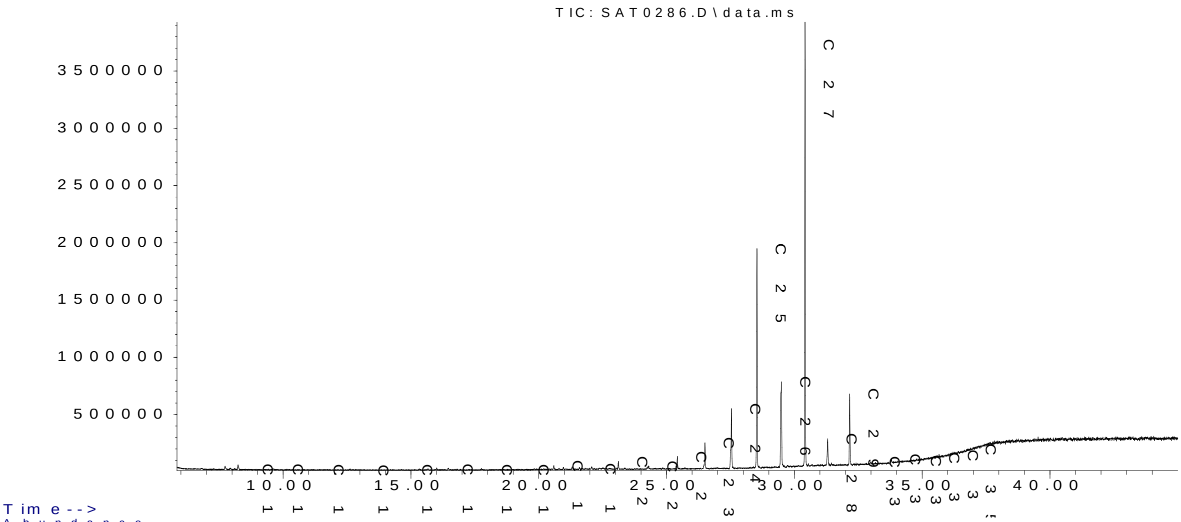
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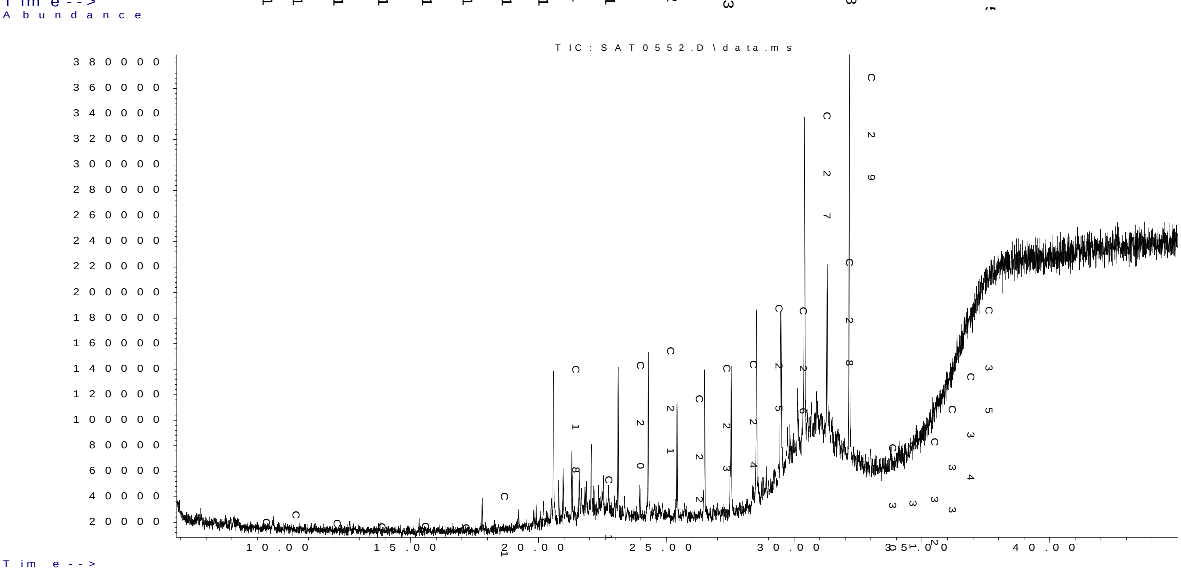
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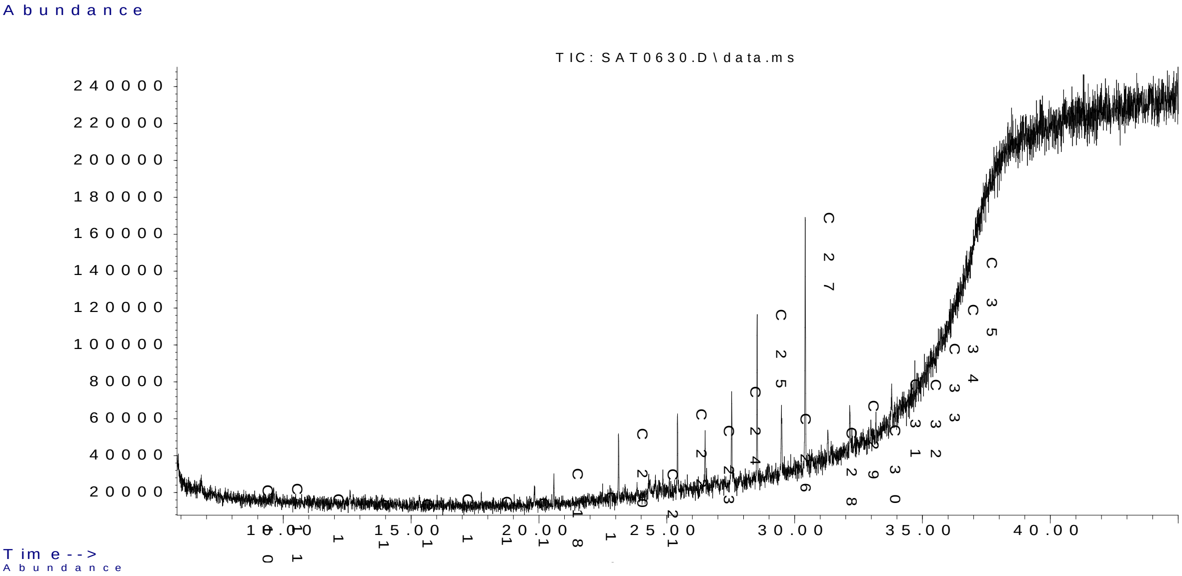
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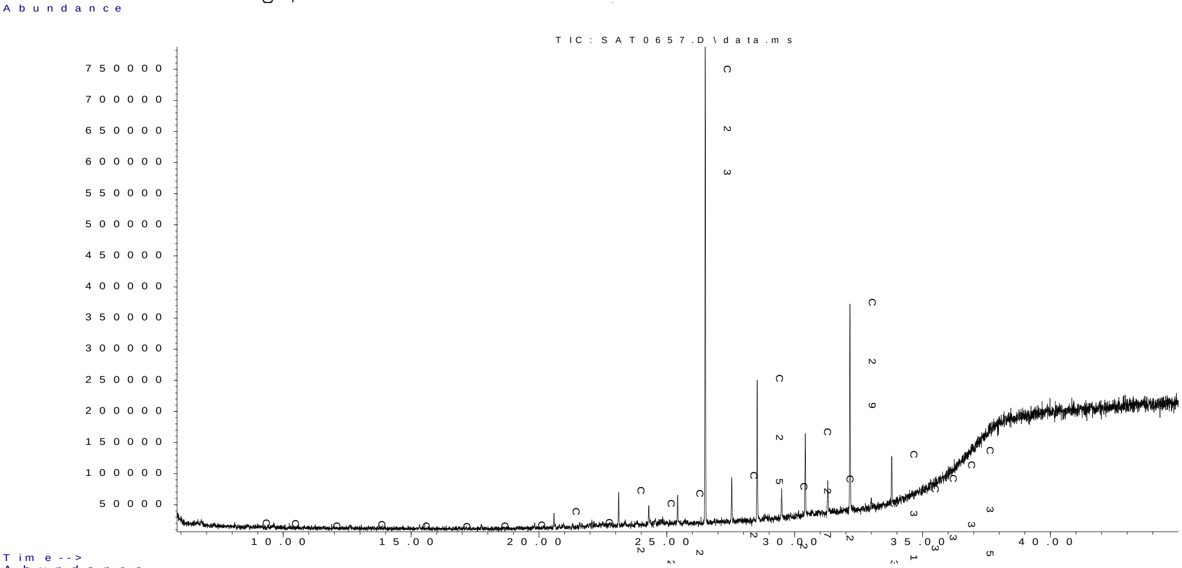
C31
C30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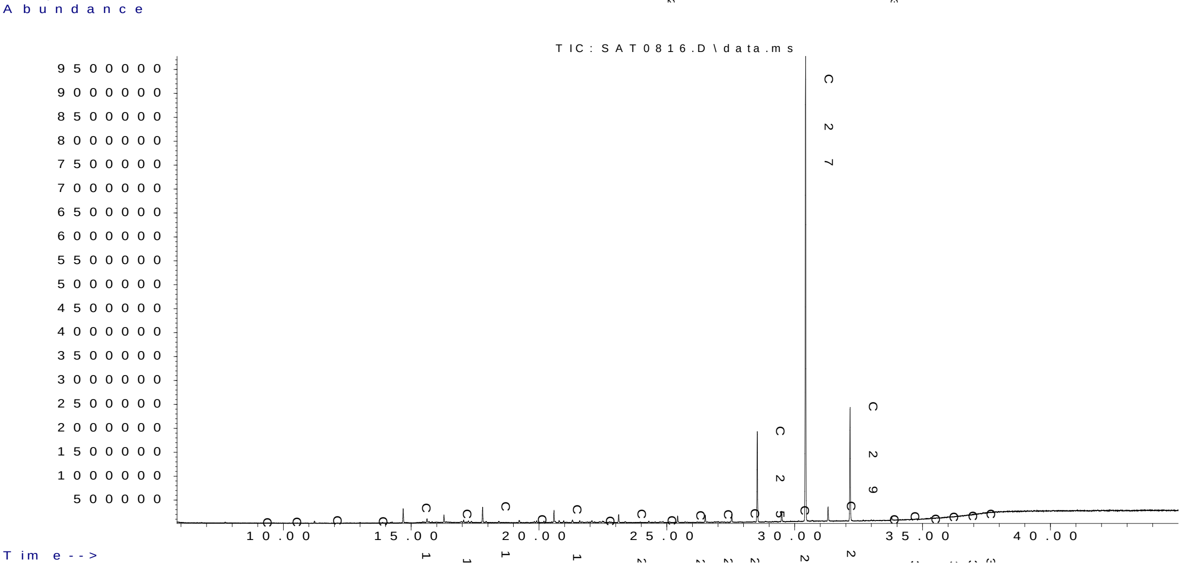
20.00
25.00
30.00
35.00
40.00
Time-->
C23
C29
C25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20.00
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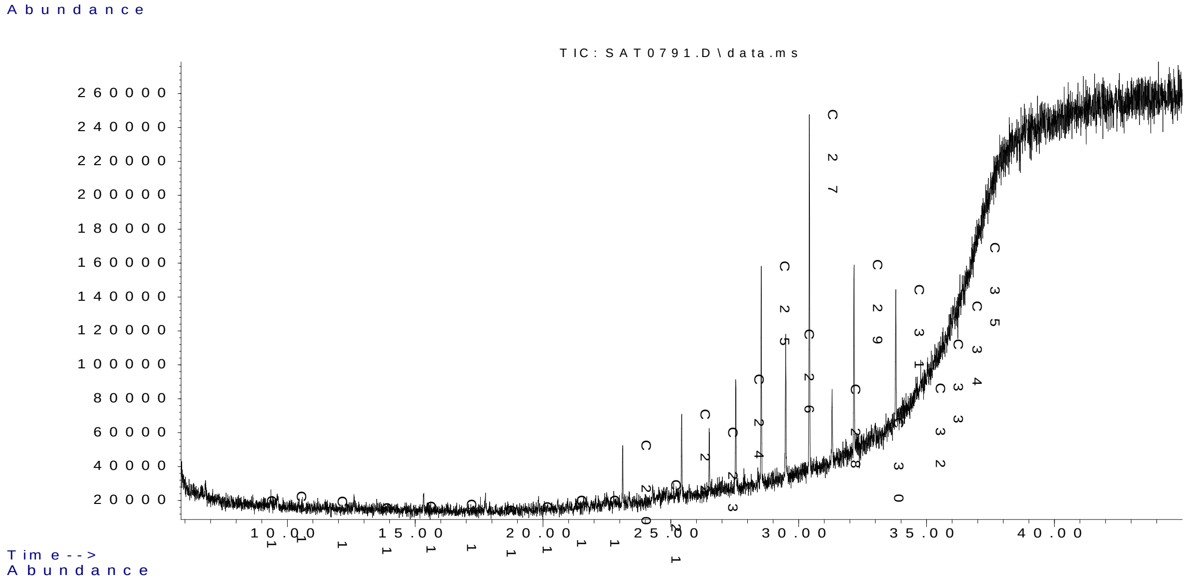
Time-->
C27
C29
C25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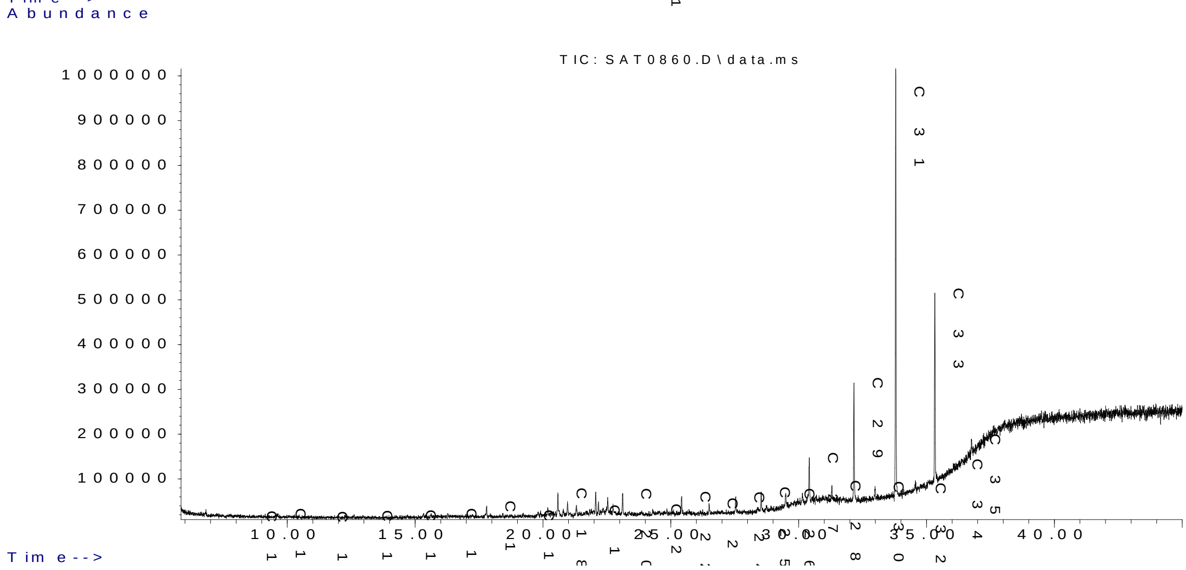
20.00
25.00
30.00
35.00
40.00
Time-->
C27
C25
C29
C31
C35
C34
C26
C24
C33
C22
C23
C28
C32
C20
C30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10.00
15.00
20.00
25.00
30.00
35.00
40.00
Time-->
C31
C33
C29
C35
C34

Following Tables: Chain length peak areas for each sample (both plants and soils) obtained from GC results with calculations for CPI, ACL, C27/C31 and C29/33

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTAGFU0001	Gulf fall and uplands	Aristida pruinosa	Tree Mallee	NTA 001524

NAME	FOUND_RT	AREA	
C16	17.610	434.566	
C18	19.043	432.281	
C18	20.395	2810.143	
C20	22.919	1054.922	
C22	25.217	1060.543	
C24	27.326	1723.095	
C25	28.329	4502.880	
C26	29.282	3993.667	
C27	30.213	17291.709	
C28	31.100	9724.136	
C29	31.951	24412.240	
C30	32.780	16119.520	
C31	33.602	244365.578	
C32	34.380	5055.872	
C33	35.136	45933.559	
C35	36.583	372.683	
	ACL	**30.847**	Average
	C27/C31		30.73566
	C29/C33	**0.531**	31.61187
	CPI	**8.326748907**	

Dominant Spp 2	Growth form	Genetic Voucher No
Enneapogon polyphyllus	Tussock Grass	NTA 001525

NAME	FOUND_RT	AREA	
C20	21.802	2726	
C21	22.98	982	
C22	24.101	3108	
C23	25.179	2341	
C24	26.216	2273	
C25	27.205	1752	
C26	28.168	1208	
C27	29.079	1053	
C28	29.959	329	
C29	30.828	1107	
C30	31.671	60	
C31	32.462	6210	
C32	33.236	282	
C33	33.996	15930	
C34	0	0	
C35	35.435	1301	
	ACL	**31.736**	Average
	C27/C31	**0.170**	30.42007
	C29/C33	**0.069**	32.7401
	CPI	**4.068112948**	

Dominant Spp 3	Growth form	Genetic Voucher No
Eucalyptus pruinosa	Tree Mallee	NTA 001531

NAME	FOUND_RT	AREA	
C20	21.806	1299	
C21	0	0	
C22	24.105	1084	
C23	25.178	557	
C24	26.215	2077	
C25	27.209	1742	
C26	28.162	3010	
C27	29.089	9496	
C28	29.974	874	
C29	30.838	2567	
C30	0	0	
C31	32.461	292	
C32	0	0	
C33	0	0	
C34	0	0	
C35	35.439	1271	
	ACL	**27.845**	Average
	C27/C31	**32.521**	27.11933
	C29/C33	**#DIV/0!**	29
	CPI	**2.170262598**	

Soil	
NTAGFU0001	Gulf fall and uplands

NAME	FOUND_RT	AREA	
C20	21.808	3845	
C21	22.975	4825	
C22	24.101	5036	
C23	25.179	4623	
C24	26.216	2622	
C25	27.211	2780	
C26	28.174	1473	
C27	29.09	4184	
C28	29.985	906	
C29	30.833	3796	
C30	31.655	775	
C31	32.462	5231	
C32	33.237	422	
C33	34.001	4506	
C34	34.739	54	
C35	35.441	3720	
	ACL	**30.293**	Average
	C27/C31	**0.800**	29.22241
	C29/C33	**0.842**	31.17104
	CPI	**2.603871368**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTAGFU0008	Gulf fall and uplands	Triodia pungens	Hummock grass	NTA 002012

NAME	FOUND_RT	AREA	
C21	24.279	5432.154	
C23	26.5	19156.979	
C24	27.538	8940.808	
C25	28.546	53803.813	
C26	29.503	16381.983	
C27	30.438	499063.969	
C28	31.336	134624.813	
C29	32.22	3318002.75	
C30	33.039	193438.5	
C31	33.879	4474394	
C32	34.631	91291.695	
C33	35.413	2469857.5	
C34	36.136	16801.893	
C35	36.852	56871.539	
	ACL	**30.65159259**	Average
	C27/C31	**0.111537779**	30.59862
	C29/C33	**1.343398455**	30.70692
	CPI	**23.54476491**	

Dominant Spp 2	Growth form	Genetic Voucher No
Aristida contorta	Tussock Grass	NTA 002011

NAME	FOUND_RT	AREA	
C14	14.629	6979.258	
C16	17.748	7971.676	
C18	20.553	9207.618	
C23	26.5	12139.624	
C24	27.545	10316.734	
C25	28.546	33103.785	
C26	29.51	23514.857	
C27	30.445	125840.734	
C28	31.336	50200.406	
C29	32.206	635080.75	
C30	33.039	193015.188	
C31	33.886	6901315.5	
C32	34.639	348517.281	
C33	35.435	6524495.5	
C34	36.136	159758.859	
C35	36.867	1021105.625	
	ACL	**31.99477227**	Average
	C27/C31	**0.018234311**	30.92837
	C29/C33	**0.097337909**	32.64519
	CPI	**18.77255932**	

Dominant Spp 3	Growth form	Genetic Voucher No
Fimbristylis dochotoma	Sedge	NTA 002018

NAME	**TIME**	**PEAK AREA**	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	15.509	48	
C15	17.205	382	
C16	18.828	1415	
C17	20.352	775	
C18	21.802	1616	
C19	23.179	1464	
C20	24.503	1494	
C21	25.749	1499	
C22	26.953	2763	
C23	28.1	3175	
C24	29.194	1963	
C25	30.241	546	
C26	31.257	667	
C27	32.231	628	
C28	33.178	180	
C29	34.074	2013	
C30	34.958	420	
C31	35.796	13042	
C32	36.608	760	
C33	37.403	42991	
C34	38.21	922	
C35	39.105	32702	
	ACL	33.25164814	Average
	C27/C31	**0.048152124**	30.81624
	C29/C33	**0.046823754**	32.82108
	CPI	**10.35771987**	

Soil	
NTAGFU0008	Gulf fall and uplands

NAME	FOUND_RT	AREA	
C20	21.808	2690	
C21	22.98	3716	
C22	24.185	635	
C23	25.185	3278	
C24	26.211	2400	
C25	27.206	2907	
C26	28.169	1890	
C27	29.09	2032	
C28	29.965	1244	
C29	30.839	5979	
C30	31.656	611	
C31	32.467	5504	
C32	33.237	162	
C33	33.996	1199	
C34	0	0	
C35	35.43	699	
	ACL	**29.235**	Average
	C27/C31	**0.369**	29.92144
	C29/C33	**4.987**	29.66815
	CPI	**3.328507635**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTAGFU0010	Gulf fall and uplands	Triodia pungens	Hummock grass	NTA 002136

NAME	FOUND_RT	AREA	
C16	17.603	441.499	
C17	19.035	316.026	
C18	20.395	4760.39	
C20	22.911	5553.133	
C21	24.082	523.02	
C22	25.209	4107.61	
C23	26.293	4357.735	
C24	27.326	3327.128	
C25	28.315	9494.427	
C26	29.282	2922.196	
C27	30.198	60483.355	
C28	31.093	6104.42	
C29	31.951	187612.844	
C30	32.787	6811.742	
C31	33.594	120340.938	
C32	34.365	1625.671	
C33	35.129	75941.594	
	ACL	**29.84936469**	Average
	C27/C31	**0.502599996**	29.66205
	C29/C33	**2.470488623**	30.15258
	CPI	**18.41426136**	

Dominant Spp 2	Growth form	Genetic Voucher No
Eucalyptus leucophloia	Tree Mallee	NTA 002140

NAME	TIME	PEAK AREA	
C10	8.465	619	
C11	9.606	879	
C12	11.219	1197	
C13	13.009	456	
C14	14.69	13210	
C15	16.287	9739	
C16	17.794	20657	
C17	19.234	8997	
C18	20.585	29287	
C19	21.878	3427	
C20	23.114	29082	
C21	24.292	7822	
C22	25.428	30277	
C23	26.506	19808	
C24	27.538	38924	
C25	28.527	63746	
C26	29.49	32399	
C27	30.417	52380	
C28	31.302	20027	
C29	32.16	500833	
C30	32.988	53383	
C31	33.799	1357342	
C32	34.574	36215	
C33	35.318	91997	
C34	36.061	1117	
C35	36.752	18251	
	ACL	30.35877545	Average
	C27/C31	**0.038590127**	30.85137
	C29/C33	**5.444014479**	29.62073
	CPI	**9.885667932**	

Dominant Spp 3	Growth form	Genetic Voucher No
N/A	N/A	N/A

Soil		
NTAGFU0010	Gulf fall and uplands	

NAME	FOUND_RT	AREA	
C20	21.812	15704	
C21	22.98	15651	
C22	24.174	1763	
C23	25.179	12748	
C24	26.21	7326	
C25	27.21	16007	
C26	28.163	4730	
C27	29.085	23477	
C28	29.975	6448	
C29	30.833	84321	
C30	31.666	8650	
C31	32.467	76169	
C32	33.242	2550	
C33	33.995	26914	
C34	34.739	380	
C35	35.43	6520	
	ACL	**29.806**	Average
	C27/C31	**0.308**	30.05758
	C29/C33	**3.133**	29.96782
	CPI	**7.872688165**	

Site	Bioregion
NTAGFU0017	Gulf fall and uplands

Dominant Spp 1	Growth form	Genetic Voucher No	
Melaleuca viridiflora	Shrub	NTA 002634	
NAME	TIME	PEAK AREA	
C10	8.483	1199	
C11	9.661	294	
C12	11.247	474	
C13	12.99	1239	
C14	14.687	1212	
C15	16.268	333	
C16	17.796	2680	
C17	19.226	6632	
C18	20.582	57080	
C19	21.88	6588	
C20	23.11	84286	
C21	24.288	23283	
C22	25.419	71383	
C23	26.503	52515	
C24	27.54	73056	
C25	28.529	79616	
C26	29.487	74378	
C27	30.414	526718	
C28	31.304	80270	
C29	32.163	223566	
C30	32.985	18339	
C31	33.791	107959	
C32	34.618	810	
C33	35.32	3487	
C34	36.058	748	
C35	36.754	23461	
	ACL	27.96220902	Average
	C27/C31	**4.878870682**	27.6804
	C29/C33	**64.11413823**	29.06143
	CPI	**3.188978131**	

Dominant Spp 2	Growth form	Genetic Voucher No	
Chrysopogon fallax	Tussock Grass	NTA 002610	
NAME	TIME	PEAK AREA	
C10	8.462	831	
C11	9.645	262	
C12	11.226	6823	
C13	12.985	2627	
C14	14.687	50926	
C15	16.278	42275	
C16	17.791	118359	
C17	19.221	23127	
C18	20.582	114216	
C19	21.886	7981	
C20	23.111	81614	
C21	24.294	15426	
C22	25.414	66308	
C23	26.498	37141	
C24	27.529	67254	
C25	28.529	111757	
C26	29.488	107288	
C27	30.409	288556	
C28	31.299	290281	
C29	32.163	1366131	
C30	32.985	293784	
C31	33.796	1668989	
C32	34.571	33311	
C33	35.32	282131	
C34	36.048	3002	
C35	36.754	69869	
	ACL	30.01957606	Average
	C27/C31	**0.172892691**	30.41037
	C29/C33	**4.842186786**	29.68468
	CPI	**4.409230192**	

Dominant Spp 3	Growth form	Genetic Voucher No	
Schizachyrium fragile	Tussock Grass	NTA 002681	
NAME	TIME	PEAK AREA	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	0	0	
C15	0	0	
C16	0	0	
C17	20.357	106	
C18	21.802	1191	
C19	0	0	
C20	24.503	1517	
C21	0	0	
C22	26.954	1184	
C23	28.095	1232	
C24	29.194	1088	
C25	30.241	1073	
C26	31.252	439	
C27	32.236	1438	
C28	33.179	916	
C29	34.069	2593	
C30	34.948	1166	
C31	35.791	15380	
C32	36.613	529	
C33	37.393	9232	
C34	0	0	
C35	39.11	1924	
	ACL	31.27762326	Average
	C27/C31	**0.093498049**	30.65799
	C29/C33	**0.280870884**	32.12288
	CPI	**5.995866216**	

Soil			
NTAGFU0017	Gulf fall and uplands		
NAME	TIME	PEAK AREA	
C20	21.804	8792	
C21	22.982	9554	
C22	24.171	1248	
C23	25.186	6915	
C24	26.218	4435	
C25	27.212	5883	
C26	28.171	1179	
C27	29.087	7171	
C28	29.977	1720	
C29	30.835	8824	
C30	31.673	1295	
C31	32.469	13101	
C32	33.244	1084	
C33	34.003	7437	
C34	34.746	184	
C35	35.448	7488	
	ACL	**30.263**	Average
	C27/C31	**0.547**	29.58504
	C29/C33	**1.186**	30.82941
	CPI	**5.190847914**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTAGFU0031	Gulf fall and uplands	Melaleuca viridiflora	Shrub	NTA 003622

NAME	FOUND_RT	AREA	
C14	14.512	8289.107	
C15	16.105	7458.247	
C16	17.61	26645.686	
C17	19.035	4135.528	
C18	20.388	21085.092	
C19	21.682	278.873	
C20	22.904	8810.646	
C21	24.082	565.309	
C22	25.209	5023.824	
C23	26.286	2061.55	
C24	27.326	5705.745	
C25	28.322	6092.261	
C26	29.282	6800.876	
C27	30.198	92419.172	
C28	31.093	11432.354	
C29	31.958	74488.508	
C30	32.787	7730.771	
C31	33.587	116728.352	
C32	34.372	1416.048	
C33	35.129	4215.513	
	ACL	**29.13986132**	Average
	C27/C31	**0.791745711**	29.23246
	C29/C33	**17.6700933**	29.21425
	CPI	**7.774625568**	

Dominant Spp 2	Growth form	Genetic Voucher No
Schizachyrium pachyarthron	Tussock Grass	NTA 003588

NAME	TIME	PEAK AREA	
C10	8.453	676	
C11	9.631	216	
C12	11.223	1770	
C13	13.008	500	
C14	14.688	10030	
C15	16.291	9085	
C16	17.793	36206	
C17	19.233	11006	
C18	20.589	60295	
C19	21.887	4828	
C20	23.112	49690	
C21	24.29	10720	
C22	25.421	38911	
C23	26.51	28746	
C24	27.542	35010	
C25	28.531	29591	
C26	29.489	26119	
C27	30.411	26441	
C28	31.306	15746	
C29	32.164	24480	
C30	32.986	7523	
C31	33.798	31709	
C32	34.636	973	
C33	35.327	48024	
C34	36.049	2049	
C35	36.766	46701	
	ACL	**30.76120341**	Average
	C27/C31	**0.833864203**	29.18119
	C29/C33	**0.509745127**	31.64945
	CPI	**1.723262699**	

Dominant Spp 3	Growth form	Genetic Voucher No
Petalostigma banksii	Shrub	NTA 003613

NAME	TIME	PEAK AREA	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	0	0	
C15	0	0	
C16	0	0	
C17	0	0	
C18	21.812	1043	
C19	0	0	
C20	24.492	1554	
C21	25.754	217	
C22	26.958	1238	
C23	28.1	927	
C24	29.194	1211	
C25	30.246	1297	
C26	31.262	1268	
C27	32.23	2103	
C28	33.168	1560	
C29	34.079	3649	
C30	34.942	1315	
C31	35.791	2800	
C32	36.607	245	
C33	0	0	
C34	0	0	
C35	39.099	416	
	ACL	**28.8735509**	Average
	C27/C31	**0.751071429**	29.28432
	C29/C33		29
	CPI	**1.622422115**	

Soil		
NTAGFU0031	Gulf fall and uplands	

NAME	TIME	PEAK AREA	
C20	21.796	2167679	
C21	22.864	159538	
C22	24.094	1917995	
C23	25.058	117571	
C24	26.204	863067	
C25	27.194	1604077	
C26	28.157	926753	
C27	29.188	7197	
C28	29.974	481740	
C29	30.822	990027	
C30	31.654	222979	
C31	32.45	700874	
C32	33.236	63661	
C33	33.974	344928	
C34	35.79	24189	
C35	35.79	87600	
	ACL	**28.164**	Average
	C27/C31	**0.010**	30.95934
	C29/C33	**2.870**	30.03353
	CPI	**0.863980274**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTAGFU0040	Gulf fall and uplands	Acacia dimidiata	Shrub	NTA 004200

NAME	FOUND_RT	AREA	
C12	11.058	972.519	
C14	14.512	10593.617	
C15	16.097	4189.289	
C16	17.603	13398.804	
C17	19.028	1003.426	
C18	20.381	7687.274	
C20	22.904	2305.004	
C22	25.209	1014.159	
C24	27.326	898.318	
C25	28.315	9513.63	
C26	29.275	1676.128	
C27	30.198	13986.568	
C29	31.951	17421.111	
C30	32.773	1609.915	
C31	33.587	195069.422	
C32	34.358	29118.508	
C33	35.129	172842.672	
C34	35.863	384.847	
	ACL	31.48385251	Average
	C27/C31	0.071700464	30.73239
	C29/C33	0.100791725	32.63375
	CPI	11.78130585	

Dominant Spp 2	Growth form	Genetic Voucher No
Heteropogon contorus	Tussock Grass	NTA 003995

NAME	TIME	PEAK AREA	
C10	8.456	809	
C11	9.618	477	
C12	11.226	1205	
C13	13.006	2654	
C14	14.692	7294	
C15	16.294	1793	
C16	17.791	9783	
C17	19.262	571	
C18	20.581	16276	
C19	21.885	2731	
C20	23.115	23707	
C21	24.293	9146	
C22	25.419	20680	
C23	26.498	18237	
C24	27.539	21291	
C25	28.534	20169	
C26	29.487	21663	
C27	30.408	33870	
C28	31.299	23837	
C29	32.162	57290	
C30	32.99	20564	
C31	33.791	255852	
C32	34.628	848	
C33	35.319	72946	
C34	36.042	1638	
C35	36.759	33086	
	ACL	30.8038135	Average
	C27/C31	0.13238122	30.53238
	C29/C33	0.785375483	31.24043
	CPI	4.338361035	

Dominant Spp 3	Growth form	Genetic Voucher No
Eucalyptus tectifica	Tree/Palm	NTA 003965

NAME	TIME	PEAK AREA	
C10	8.825	452	
C11	10.076	292	
C12	11.793	113	
C13	13.694	49	
C14	15.516	48	
C15	17.212	111	
C16	18.851	99	
C17	20.359	562	
C18	21.866	333	
C19	23.196	347	
C20	24.5	2630	
C21	25.756	1398	
C22	26.95	2351	
C23	28.097	2811	
C24	29.259	404	
C25	30.254	3953	
C26	31.348	339	
C27	32.238	19696	
C28	33.175	2968	
C29	34.075	26519	
C30	34.955	1390	
C31	35.787	3548	
C32	36.683	200	
C33	37.395	882	
C34	38.227	113	
C35	39.091	557	
	ACL	28.25232527	Average
	C27/C31	5.551296505	27.61057
	C29/C33	30.06689342	29.12875
	CPI	7.519188667	

Soil	
NTAGFU0040	Gulf fall and uplands

NAME	TIME	PEAK AREA	
C20	21.813	5205	
C21	22.98	3473	
C22	24.106	2592	
C23	25.189	3586	
C24	26.221	2059	
C25	27.21	6652	
C26	28.168	1395	
C27	29.09	15059	
C28	29.98	1824	
C29	30.838	22981	
C30	31.66	1629	
C31	32.472	7598	
C32	33.231	632	
C33	34.001	4122	
C34	34.723	288	
C35	35.43	3058	
	ACL	28.887	Average
	C27/C31	1.982	28.3414
	C29/C33	5.575	29.60835
	CPI	6.071935886	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTABRT0004	Burt plain	Acacia aptaneura	Shrub	NTA 001301

NAME	FOUND_RT	AREA	
C27	30.220	24283.799	
C29	31.973	64158.770	
C30	32.802	7732.443	
C31	33.616	1145281.750	
C32	34.394	86886.180	
C33	35.165	1398135.000	
C34	35.892	7100.010	
	ACL	31.97680649	Average
	C27/C31	0.021203341	30.91695
	C29/C33	0.045888823	32.8245
	CPI	25.87391554	

Dominant Spp 2	Growth form	Genetic Voucher No
Aristida holathera	Tussock Grass	NTA 001318

NAME	TIME	PEAK AREA	
C10	8.459	1134	
C11	9.626	1218	
C12	11.218	11943	
C13	12.992	4969	
C14	14.684	47497	
C15	16.286	28571	
C16	17.788	59740	
C17	19.223	9466	
C18	20.584	39884	
C19	21.877	1044	
C20	23.113	26861	
C21	24.296	9067	
C22	25.427	25432	
C23	26.5	99747	
C24	27.531	29107	
C25	28.531	73507	
C26	29.495	24386	
C27	30.416	109111	
C28	31.301	24867	
C29	32.16	350802	
C30	32.992	58911	
C31	33.798	2786083	
C32	34.568	114054	
C33	35.332	3177061	
C34	36.055	44970	
C35	36.761	905869	
	ACL	32.13456049	Average
	C27/C31	0.039162868	30.84925
	C29/C33	0.110417143	32.60225
	CPI	21.92473432	

Dominant Spp 3	Growth form	Genetic Voucher No
Triodia schinzii	Hummock Grass	NTA 001317

NAME	TIME	PEAK AREA	
C20	21.808	2018	
C21	22.98	671	
C22	24.106	2117	
C23	25.184	2988	
C24	26.216	2096	
C25	27.211	5346	
C26	28.163	2151	
C27	29.09	10999	
C28	29.975	1759	
C29	30.833	23599	
C30	31.655	680	
C31	32.467	41928	
C32	33.237	343	
C33	33.996	35478	
C34	0	0	
C35	35.435	478	
	ACL	30.57224089	Average
	C27/C31	0.262330662	30.16874
	C29/C33	0.665172783	31.40215
	CPI 13.22026022		

Soil	
NTABRT0004	Burt plain

NAME	TIME	PEAK AREA	
C20	21.807	8433	
C21	22.98	12094	
C22	24.111	14548	
C23	25.184	14402	
C24	26.215	6724	
C25	27.215	7389	
C26	28.173	3424	
C27	29.09	13580	
C28	29.974	5433	
C29	30.833	20706	
C30	31.665	2393	
C31	32.466	62809	
C32	33.241	4856	
C33	33.995	63085	
C34	34.712	417	
C35	35.445	7715	
	ACL	31.097	Average
	C27/C31	0.216	30.2889
	C29/C33	0.328	32.01154
	CPI	5.076742955	

Site	Bioregion
NTAFIN0019	Finke

Dominant Spp 1	Growth form	Genetic Voucher No	
Cenchrus ciliaris	Tussock Grass	NTA 000754	
NAME	**TIME**	**PEAK AREA**	
C10	8.462	831	
C11	9.619	871	
C12	11.221	8372	
C13	13.001	4124	
C14	14.687	46390	
C15	16.278	28870	
C16	17.791	87119	
C17	19.226	25679	
C18	20.587	100796	
C19	21.875	8705	
C20	23.116	73160	
C21	24.294	17462	
C22	25.419	56893	
C23	26.503	45775	
C24	27.54	61564	
C25	28.529	71834	
C26	29.487	73490	
C27	30.409	138675	
C28	31.299	80855	
C29	32.157	595789	
C30	32.99	142674	
C31	33.801	4225591	
C32	34.566	127665	
C33	35.325	2349530	
C34	36.042	13091	
C35	36.759	458649	
	ACL	**29.42785943**	Average
	C27/C31	**0.032817895**	30.8729
	C29/C33	**0.25357795**	32.19087
	CPI	**13.78066976**	

Dominant Spp 2	Growth form	Genetic Voucher No	
Acacia estrophiolata	Tree/Palm	NTA 000784	
NAME	**TIME**	**PEAK AREA**	
C20	21.802	1161	
C21	22.985	99	
C22	24.095	852	
C23	25.179	634	
C24	26.205	878	
C25	27.205	7866	
C26	28.163	8576	
C27	29.095	330778	
C28	29.975	31603	
C29	30.849	637049	
C30	31.666	70294	
C31	32.509	1644877	
C32	33.242	54584	
C33	33.996	54912	
C34	0	0	
C35	35.451	1716	
	ACL	30.0558345	Average
	C27/C31	**0.201095887**	30.33029
	C29/C33	**11.60127112**	29.31743
	CPI	**16.0505525**	

Dominant Spp 3	Growth form	Genetic Voucher No	
Enchylaena tomentosa	Tussock Grass	NTA 000761	
NAME	**TIME**	**PEAK AREA**	
C20	21.785	364482	
C21	22.874	4443	
C22	24.089	270476	
C23	25.052	1962	
C24	26.199	210696	
C25	27.188	219670	
C26	28.152	135009	
C27	29.183	3582	
C28	29.958	32150	
C29	30.822	80787	
C30	31.665	7835	
C31	32.45	16704	
C32	33.225	2997	
C33	33.968	3927	
C34	35.79	2973	
C35	35.806	13563	
	ACL	26.76677616	Average
	C27/C31	**0.214439655**	30.2937
	C29/C33	**20.57219251**	29.18542
	CPI	**0.506897375**	

Soil			
NTAFIN0019	Finke		
NAME	**TIME**	**PEAK AREA**	
C20	21.809	9251	
C21	22.977	12448	
C22	24.102	25007	
C23	25.181	39052	
C24	26.218	33634	
C25	27.207	23952	
C26	28.165	6788	
C27	29.087	18983	
C28	29.977	4041	
C29	30.835	27758	
C30	31.657	4325	
C31	32.463	65116	
C32	33.233	3648	
C33	33.987	21692	
C34	34.736	206	
C35	35.432	9254	
	ACL	**29.832**	Average
	C27/C31	**0.292**	30.09711
	C29/C33	**1.280**	30.75466
	CPI	**2.671045345**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTAFIN0022	Finke	Eremophila freelingii	Shrub	NTA 000964

NAME	FOUND_RT	AREA	
C29	31.973	10959.372	
C30	32.809	2067.108	
C31	33.616	134497.719	
C32	34.394	71675.898	
C33	35.165	1130147.625	
C34	35.892	97422.758	
C35	36.605	196731.594	
	ACL	**33.05476348**	Average
	C29/C33	**0.009697292**	32.96158
	CPI	**8.027133937**	

Dominant Spp 2	Growth form	Genetic Voucher No
Enneapogon polyphyllus	Tussock Grass	NTA 000962

NAME	TIME	PEAK AREA	
C10	8.454	826	
C11	9.627	959	
C12	11.229	5573	
C13	13.004	1349	
C14	14.689	14430	
C15	16.286	10036	
C16	17.794	22991	
C17	19.218	5325	
C18	20.59	44141	
C19	21.888	4582	
C20	23.119	37356	
C21	24.297	22804	
C22	25.427	34056	
C23	26.506	74393	
C24	27.537	31732	
C25	28.537	89773	
C26	29.495	26315	
C27	30.417	117873	
C28	31.307	27137	
C29	32.165	280538	
C30	32.998	54941	
C31	33.809	4068718	
C32	34.579	109802	
C33	35.338	5211515	
C34	36.055	38207	
C35	36.767	1016099	
	ACL	**32.19766339**	Average
	C27/C31	**0.02897055**	30.88738
	C29/C33	**0.053830412**	32.79568
	CPI	**32.16195878**	

Dominant Spp 3	Growth form	Genetic Voucher No
Aristida contorta	Tussock Grass	NTA 000960

NAME	TIME	PEAK AREA	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	15.5	1146	
C15	17.212	1316	
C16	18.825	3320	
C17	20.364	675	
C18	21.804	3278	
C19	23.186	213	
C20	24.495	2421	
C21	25.752	832	
C22	26.95	2034	
C23	28.097	2331	
C24	29.196	1890	
C25	30.249	2877	
C26	31.264	1872	
C27	32.233	5500	
C28	33.17	2861	
C29	34.081	12307	
C30	34.95	4102	
C31	35.798	209798	
C32	36.605	3971	
C33	37.4	117241	
C34	38.222	902	
C35	39.112	18255	
	ACL	**31.66568482**	Average
	C27/C31	**0.026215693**	30.89782
	C29/C33	**0.10497181**	32.62
	CPI	**20.39459505**	

Soil		
NTAFIN0022	Finke	

NAME	TIME	PEAK AREA	
C10	8.483	376	
C11	9.614	788	
C12	11.21	14004	
C13	12.99	63012	
C14	14.687	69181	
C15	16.283	37135	
C16	17.791	40069	
C17	19.226	82292	
C18	20.587	22219	
C19	21.88	19928	
C20	23.116	39308	
C21	24.294	54996	
C22	25.425	207184	
C23	26.503	676729	
C24	27.54	1553380	
C25	28.54	3642344	
C26	29.503	4736688	
C27	30.424	5083554	
C28	31.309	3852169	
C29	32.168	3034447	
C30	32.995	1900639	
C31	33.796	1408055	
C32	34.571	853181	
C33	35.325	644386	
C34	36.053	284950	
C35	36.759	559019	
	ACL	**27.88749423**	Average
	C27/C31	**3.610337664**	27.86762
	C29/C33	**4.709051717**	29.70064
	CPI	**1.105192068**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATFLB0005	Flinders lofty block	Dodonaea viscosa subsp. ar	Shrub	SAT 000316

NAME	FOUND_RT	AREA	
C14	14.526	3445.533	
C15	16.112	285.478	
C16	17.624	1158.885	
C27	30.22	2762.435	
C28	31.122	614.363	
C29	31.98	141293.922	
C30	32.809	3397.923	
C31	33.616	109433.781	
C33	35.158	244.056	
	ACL	**29.84465918**	Average
	C27/C31	**0.025242982**	30.90151
	C29/C33	**578.9405792**	29.0069
	CPI	**63.23930896**	

Dominant Spp 2	Growth form	Genetic Voucher No
Eucalyptus flindersii	Tree Mallee	SAT 000286

NAME	TIME	PEAK AREA	
C10	8.467	420	
C11	9.651	315	
C12	11.232	567	
C13	12.986	424	
C14	14.698	311	
C15	16.289	283	
C16	17.823	369	
C17	19.258	629	
C18	20.582	16343	
C19	21.875	3435	
C20	23.116	32413	
C21	24.294	12486	
C22	25.425	49453	
C23	26.504	105446	
C24	27.54	268200	
C25	28.535	909930	
C26	29.493	449406	
C27	30.42	1799995	
C28	31.305	114210	
C29	32.163	285938	
C30	33.001	7861	
C31	33.802	13975	
C32	34.608	582	
C33	35.325	2190	
C34	36.048	673	
C35	36.755	9518	
	ACL	**26.63502128**	Average
	C27/C31	**128.8010733**	27.03082
	C29/C33	**130.5652968**	29.0304
	CPI	**3.513621636**	

Dominant Spp 3	Growth form	Genetic Voucher No
Chrysocephalum semipapp	Forb	SAT 000287

NAME	TIME	PEAK AREA	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	15.499	2615	
C15	17.205	2382	
C16	18.818	4309	
C17	20.357	603	
C18	21.813	2161	
C19	23.184	203	
C20	24.498	1590	
C21	25.75	634	
C22	26.949	1145	
C23	28.1	1427	
C24	29.195	1189	
C25	30.247	3672	
C26	31.257	1590	
C27	32.236	29766	
C28	33.174	9778	
C29	34.095	1249753	
C30	34.948	93881	
C31	35.833	3636459	
C32	36.608	42122	
C33	37.404	214231	
C34	38.221	3305	
C35	39.105	15636	
	ACL	**30.58256357**	Average
	C27/C31	**0.008185435**	30.96752
	C29/C33	**5.833670197**	29.58534
	CPI	**33.61507745**	

Soil		
SATFLB0005	Flinders lofty block	

NAME	TIME	PEAK AREA	
C20	21.807	5309	
C21	22.985	7949	
C22	24.106	12086	
C23	25.184	38788	
C24	26.215	66156	
C25	27.215	185953	
C26	28.168	139367	
C27	29.09	211334	
C28	29.974	97570	
C29	30.838	184920	
C30	31.66	51355	
C31	32.467	216314	
C32	33.241	21328	
C33	33.995	59389	
C34	34.718	3725	
C35	35.43	16181	
	ACL	**28.54328554**	Average
	C27/C31	**0.976977912**	29.02329
	C29/C33	**3.113707926**	29.97236
	CPI	**2.320718001**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATFLB0008	Flinders lofty block	Triodia scariosa	Hummock grass	SAT 000424

NAME	FOUND_RT	AREA	
C16	17.61	478.964	
C17	19.035	199.162	
C18	20.388	2573.548	
C20	22.919	6143.172	
C22	25.209	5356.313	
C23	26.293	2250.673	
C24	27.326	6162.694	
C25	28.322	7374.059	
C26	29.282	5478.503	
C27	30.205	9924.186	
C28	31.1	3904.074	
C29	31.958	31706.822	
C30	32.78	9219.813	
C31	33.594	137454.375	
C32	34.38	1239.889	
C33	35.136	3478.314	
	ACL	**30.2608204**	Average
	C27/C31	**0.072199855**	30.73065
	C29/C33	**9.115572085**	29.39543
	CPI	**6.128206254**	

Dominant Spp 2	Growth form	Genetic Voucher No
Cassinia laevis	Shrub	SAT 000419

NAME	FOUND_RT	AREA	
C20	21.806	2282	
C21	22.979	1450	
C22	24.11	1696	
C23	25.178	6669	
C24	26.22	3155	
C25	27.209	18274	
C26	28.167	2326	
C27	29.083	34297	
C28	29.973	8873	
C29	30.853	938087	
C30	31.664	130169	
C31	32.518	2377226	
C32	33.24	93439	
C33	33.999	349549	
C34	34.727	4937	
C35	35.434	116321	
	ACL	**30.74995161**	Average
	C27/C31	**0.01442732**	30.94311
	C29/C33	**2.683706719**	30.08586
	CPI	**15.4663321**	

Dominant Spp 3	Growth form	Genetic Voucher No
Casuarina pauper	Shrub	SAT 000401

NAME	**TIME**	**PEAK AREA**	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	15.5	4650	
C15	17.207	4113	
C16	18.83	9045	
C17	20.353	1956	
C18	21.809	7210	
C19	23.191	598	
C20	24.505	4718	
C21	25.756	1288	
C22	26.95	3897	
C23	28.096	5161	
C24	29.201	8648	
C25	30.253	28572	
C26	31.264	28285	
C27	32.243	188350	
C28	33.17	54619	
C29	34.112	2275896	
C30	34.955	86633	
C31	35.871	13251550	
C32	36.625	159715	
C33	37.473	7463781	
C34	38.227	4417	
C35	39.112	45033	
	ACL	**31.41418288**	Average
	C27/C31	**0.014213432**	30.94394
	C29/C33	**0.304925345**	32.06531
	CPI	**67.11591819**	

Soil		
SATFLB0008	Flinders lofty block	

NAME	**TIME**	**PEAK AREA**	
C20	21.792	17758	
C21	22.876	8626	
C22	24.09	74485	
C23	25.043	2151	
C24	26.2	335580	
C25	27.2	731521	
C26	28.153	654838	
C27	29.074	661925	
C28	29.964	390513	
C29	30.823	627299	
C30	31.655	182060	
C31	32.456	1115695	
C32	33.231	49664	
C33	33.99	102767	
C34	35.802	1600	
C35	35.781	9560	
	ACL	**28.52286021**	Average
	C27/C31	**0.593284903**	29.51054
	C29/C33	**6.104089834**	29.56306
	CPI	**1.924778829**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATFLB0010	Flinders lofty block	Eucalyptus odorata	Tree/Palm	SAT 000535

NAME	FOUND_RT	AREA	
C16	17.61	10003.089	
C17	19.043	3046.466	
C18	20.395	29162.174	
C19	21.682	517.617	
C20	22.919	18172.85	
C21	24.089	2451.81	
C22	25.217	15343.378	
C23	26.293	14915.36	
C24	27.326	46022.891	
C25	28.322	102848.398	
C26	29.253	112901.305	
C27	30.205	247856.609	
C28	31.078	26031.719	
C29	31.951	30360.369	
C30	32.78	1026.928	
C31	33.587	3206.943	
	ACL	26.65610771	Average
	C27/C31	77.28750059	27.05109
	C29/C33		29
	CPI	1.988879452	

Dominant Spp 2	Growth form	Genetic Voucher No
Rhagodia paradoxa	Chenopod	SAT 000552

NAME	TIME	PEAK AREA	
C10	8.472	621	
C11	9.645	448	
C12	11.242	126	
C13	13.006	630	
C14	14.707	196	
C15	16.288	884	
C16	17.802	13600	
C17	19.262	718	
C18	20.582	62718	
C19	21.88	9838	
C20	23.11	51829	
C21	24.288	53706	
C22	25.419	36861	
C23	26.498	55844	
C24	27.54	60564	
C25	28.529	72405	
C26	29.492	76341	
C27	30.414	107719	
C28	31.299	53958	
C29	32.157	135063	
C30	32.979	5244	
C31	33.785	5950	
C32	34.623	377	
C33	35.309	1512	
C34	36.042	549	
C35	36.754	19705	
	ACL	27.9225188	Average
	C27/C31	18.10403361	27.20938
	C29/C33	89.32738095	29.04428
	CPI	1.775156695	

Dominant Spp 3	Growth form	Genetic Voucher No
Enchylaena tomentosa var.	Chenopod	SAT 000550

NAME	TIME	PEAK AREA	
C10	8.805	107	
C11	10.045	199	
C12	0	0	
C13	13.695	121	
C14	0	0	
C15	0	0	
C16	0	0	
C17	0	0	
C18	21.81	908	
C19	0	0	
C20	24.501	1814	
C21	25.747	737	
C22	26.956	2269	
C23	28.097	3605	
C24	29.192	3708	
C25	30.254	20983	
C26	31.265	4135	
C27	32.244	14271	
C28	33.176	2177	
C29	34.081	8961	
C30	34.951	401	
C31	35.799	2692	
C32	0	0	
C33	0	0	
C34	0	0	
C35	39.092	303	
	ACL	26.77013345	Average
	C27/C31	5.301263001	27.63479
	C29/C33	-	29
	CPI	4.0214342	

Soil		
SATFLB0010	Flinders lofty block	

NAME	TIME	PEAK AREA	
C20	21.806	4581	
C21	22.984	6327	
C22	24.105	8890	
C23	25.183	27046	
C24	26.215	42035	
C25	27.215	109774	
C26	28.168	91206	
C27	29.094	124117	
C28	29.979	71558	
C29	30.838	149004	
C30	31.665	40599	
C31	32.471	107104	
C32	33.246	16598	
C33	33.995	23495	
C34	34.722	4334	
C35	35.44	12198	
	ACL	28.41799761	Average
	C27/C31	1.158845608	28.85284
	C29/C33	6.341945095	29.54481
	CPI	1.997683671	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATFLB0012	Flinders lofty block	Allocasuarina muelleriana :	Shrub	SAT 000649

NAME	TIME	PEAK AREA	
C20	21.806	6472	
C21	22.974	930	
C22	24.105	4336	
C23	25.183	2655	
C24	26.209	3898	
C25	27.209	4871	
C26	28.168	3121	
C27	29.089	12424	
C28	29.979	3083	
C29	30.832	139072	
C30	31.66	31651	
C31	32.508	2029176	
C32	33.241	56559	
C33	34	351808	
C34	34.728	143	
C35	35.429	2546	
	ACL	**31.14045215**	Average
	C27/C31	**0.006122682**	30.97566
	C29/C33	**0.395306531**	31.86675
	CPI	**24.72730103**	

Dominant Spp 2	Growth form	Genetic Voucher No
Hibbertia crinita	Shrub	SAT 000657

NAME	TIME	PEAK AREA	
C10	8.457	756	
C11	9.603	1346	
C12	11.221	349	
C13	12.986	423	
C14	14.718	481	
C15	16.3	253	
C16	17.792	380	
C17	19.242	837	
C18	20.582	11772	
C19	21.881	2757	
C20	23.116	22020	
C21	24.289	13409	
C22	25.425	24365	
C23	26.498	355444	
C24	27.53	29525	
C25	28.535	106894	
C26	29.488	23809	
C27	30.414	56710	
C28	31.299	20408	
C29	32.158	153049	
C30	33.022	859	
C31	33.791	36043	
C32	34.629	874	
C33	35.325	3471	
C34	36.043	780	
C35	36.77	8265	
	ACL	**27.88748518**	Average
	C27/C31	**1.573398441**	28.55436
	C29/C33	**44.09363296**	29.0887
	CPI	**7.179964222**	

Dominant Spp 3	Growth form	Genetic Voucher No
Eucalyptus fasciculosa	Tree Mallee	SAT 000630

NAME	TIME	PEAK AREA	
C10	8.459	900	
C11	9.611	794	
C12	11.223	652	
C13	12.993	339	
C14	14.705	420	
C15	16.281	208	
C16	17.815	173	
C17	19.254	444	
C18	20.579	7582	
C19	21.877	1067	
C20	23.113	16371	
C21	24.296	4870	
C22	25.416	19899	
C23	26.495	14542	
C24	27.537	25140	
C25	28.537	39722	
C26	29.495	14744	
C27	30.411	61653	
C28	31.306	9936	
C29	32.155	11046	
C30	33.003	796	
C31	33.793	7152	
C32	34.594	526	
C33	35.322	466	
C34	36.044	460	
C35	36.777	11549	
	ACL	**27.50493966**	Average
	C27/C31	**8.620385906**	27.41578
	C29/C33	**23.70386266**	29.16192
	CPI	**1.997041999**	

Soil		
SATFLB0012	Flinders lofty block	

NAME	TIME	PEAK AREA	
C20	21.81	2031	
C21	22.983	11236	
C22	24.103	28169	
C23	25.182	39312	
C24	26.218	34027	
C25	27.208	43840	
C26	28.166	38284	
C27	29.087	36753	
C28	29.977	22501	
C29	30.831	27158	
C30	31.658	9412	
C31	32.464	36999	
C32	33.239	3703	
C33	33.998	6132	
C34	34.721	734	
C35	35.412	1661	
	ACL	**28.07977423**	Average
	C27/C31	**0.993351172**	29.00667
	C29/C33	**4.428897586**	29.7368
	CPI	**1.437130015**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATFLB0014	Flinders lofty block	Eucalyptus odorata	Tree Mallee	SAT 000746

NAME	FOUND_RT	AREA	
C16	17.617	735.08	
C17	19.035	497.925	
C18	20.395	13539.137	
C19	21.682	93.445	
C20	22.911	9733.062	
C21	24.09	301.117	
C22	25.209	8253.909	
C23	26.293	9196.23	
C24	27.326	20096.285	
C25	28.322	39957.383	
C26	29.275	14191.534	
C27	30.191	27456.541	
C28	31.093	1121.091	
C29	31.951	5905.064	
C30	32.787	252.312	
C31	33.594	7707.731	
C32	34.372	545.024	
C33	35.129	33019.504	
	ACL	**28.41033439**	Average
	C27/C31	**3.562207996**	27.87677
	C29/C33	**0.178835636**	32.39318
	CPI	**2.775361703**	

Dominant Spp 2	Growth form	Genetic Voucher No
Xanthorrhoea quadrangulata	Shrub	SAT 000791

NAME	TIME	PEAK AREA	
C10	8.472	918	
C11	9.634	222	
C12	11.231	485	
C13	12.98	778	
C14	14.707	406	
C15	16.294	229	
C16	17.838	274	
C17	19.257	427	
C18	20.597	3542	
C19	21.885	468	
C20	23.11	19167	
C21	24.288	5206	
C22	25.424	22250	
C23	26.508	18163	
C24	27.539	28597	
C25	28.534	53835	
C26	29.492	37415	
C27	30.414	97943	
C28	31.309	21619	
C29	32.162	46907	
C30	32.995	4390	
C31	33.791	33093	
C32	34.618	869	
C33	35.319	2951	
C34	36.052	479	
C35	36.759	9724	
	ACL	**27.87548118**	Average
	C27/C31	**2.959628925**	28.0102
	C29/C33	**15.89528973**	29.23675
	CPI	**2.251853069**	

Dominant Spp 3	Growth form	Genetic Voucher No
Allocasuarina verticillata	Shrub	SAT 000775

NAME	TIME	PEAK AREA	
C10	8.828	100	
C11	10.048	236	
C12	11.948	96	
C13	13.702	61	
C14	15.493	3168	
C15	17.205	3307	
C16	18.822	6189	
C17	20.356	1256	
C18	21.807	3664	
C19	23.183	400	
C20	24.503	2561	
C21	25.749	955	
C22	26.948	2232	
C23	28.089	2410	
C24	29.194	4411	
C25	30.251	12374	
C26	31.257	13637	
C27	32.236	93724	
C28	33.162	30427	
C29	34.089	766889	
C30	34.948	31305	
C31	35.843	4160270	
C32	36.607	24460	
C33	37.408	651395	
C34	38.22	911	
C35	39.11	5116	
	ACL	**30.88406135**	Average
	C27/C31	**0.022528346**	30.91187
	C29/C33	**1.177302558**	30.83714
	CPI	**52.98881108**	

Soil	
SATFLB0014	Flinders lofty block

NAME	TIME	PEAK AREA	
C20	21.806	19088	
C21	22.984	93277	
C22	24.11	228195	
C23	25.193	429424	
C24	26.23	477236	
C25	27.225	514420	
C26	28.172	341313	
C27	29.094	345717	
C28	29.979	167213	
C29	30.843	250225	
C30	31.665	74756	
C31	32.476	357614	
C32	33.246	35144	
C33	34	131417	
C34	34.727	8288	
C35	35.434	45434	
	ACL	**28.24878787**	Average
	C27/C31	**0.966732287**	29.03383
	C29/C33	**1.904053509**	30.37739
	CPI	**1.575033123**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATFLB0015	Flinders lofty block	Eucalyptus obliqua	Tree/Palm	SAT 000816

NAME	TIME	PEAK AREA	
C10	8.467	450	
C11	9.624	1027	
C12	11.215	28188	
C13	12.995	11060	
C14	14.687	153012	
C15	16.283	82567	
C16	17.791	161749	
C17	19.22	27370	
C18	20.587	124591	
C19	21.88	7696	
C20	23.11	78591	
C21	24.294	16111	
C22	25.419	61948	
C23	26.503	67014	
C24	27.54	74205	
C25	28.534	883171	
C26	29.487	100433	
C27	30.424	4430991	
C28	31.304	137263	
C29	32.168	1107100	
C30	32.984	9531	
C31	33.796	30970	
C32	34.618	630	
C33	35.314	8878	
C34	36.063	1287	
C35	36.764	16958	
	ACL	**27.11742235**	Average
	C27/C31	**143.0736519**	27.02776
	C29/C33	**124.7015093**	29.03182
	CPI	**16.98600949**	

Dominant Spp 2	Growth form	Genetic Voucher No
Lepidosperma semiteres	Sedge	SAT 000860

NAME	TIME	PEAK AREA	
C10	8.463	460	
C11	9.599	1187	
C12	11.227	135	
C13	12.986	624	
C14	14.693	2946	
C15	16.285	3415	
C16	17.798	9999	
C17	19.3	1282	
C18	20.583	26425	
C19	21.881	2983	
C20	23.117	22323	
C21	24.29	5874	
C22	25.426	20783	
C23	26.494	13373	
C24	27.536	17981	
C25	28.536	19991	
C26	29.494	15914	
C27	30.41	42859	
C28	31.3	16611	
C29	32.164	114433	
C30	32.986	11791	
C31	33.797	447281	
C32	34.624	460	
C33	35.326	197379	
C34	36.059	942	
C35	36.761	129347	
	ACL	**31.41196481**	Average
	C27/C31	**0.095821195**	30.65023
	C29/C33	**0.579762791**	31.53203
	CPI	**10.6877974**	

Dominant Spp 3	Growth form	Genetic Voucher No
Hibbertia crinita	Shrub	SAT 000866

NAME	TIME	PEAK AREA	
C20	21.805	3003	
C21	22.988	2570	
C22	24.108	2773	
C23	25.182	9295	
C24	26.218	2934	
C25	27.213	11958	
C26	28.166	2964	
C27	29.098	177661	
C28	29.977	11479	
C29	30.857	337029	
C30	31.668	1279	
C31	32.464	6396	
C32	0	0	
C33	33.998	101	
C34	0	0	
C35	35.412	353	
	ACL	**28.27302445**	Average
	C27/C31	**27.77689181**	27.139
	C29/C33	**3336.920792**	29.0012
	CPI	**25.38156237**	

Soil	
SATFLB0015	Flinders lofty block

NAME	TIME	PEAK AREA	
C20	21.813	5940	
C21	22.986	35028	
C22	24.111	73878	
C23	25.195	150538	
C24	26.227	170542	
C25	27.227	206709	
C26	28.174	117779	
C27	29.111	377398	
C28	29.98	69997	
C29	30.86	418056	
C30	31.666	20149	
C31	32.472	53210	
C32	33.247	6323	
C33	33.996	12290	
C34	34.729	1778	
C35	35.431	4520	
	ACL	**27.69524885**	Average
	C27/C31	**7.09261417**	27.49428
	C29/C33	**34.01594793**	29.11423
	CPI	**2.688643185**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATKAN0001	Kanmantoo	Eucalyptus baxteri	Tree/Palm	SAT 000122

NAME	FOUND_RT	AREA	
C18	20.395	135.159	
C25	28.329	2485.209	
C27	30.213	77272.953	
C28	31.107	576.377	
C29	31.965	62820.504	
C31	33.609	22881.779	
C32	34.394	235.546	
C33	35.151	27998.75	
	ACL	**28.96522169**	Average
	C27/C31	**3.377051802**	27.91386
	C29/C33	**2.243689593**	30.23316
	CPI	**238.272835**	

Dominant Spp 2	Growth form	Genetic Voucher No
Lepidosperma semiteres	Sedge	SAT 000167

NAME	TIME	PEAK AREA	
C10	8.517	186	
C11	9.627	234	
C12	11.229	1586	
C13	13.009	1071	
C14	14.69	3558	
C15	16.292	3069	
C16	17.842	572	
C17	19.224	3413	
C18	20.59	12309	
C19	21.878	2121	
C20	23.114	23752	
C21	24.297	5532	
C22	25.423	20384	
C23	26.501	16103	
C24	27.538	20466	
C25	28.527	18302	
C26	29.496	15358	
C27	30.423	17070	
C28	31.313	12197	
C29	32.155	44421	
C30	32.993	7610	
C31	33.799	222951	
C32	34.621	549	
C33	35.328	93157	
C34	36.056	1254	
C35	36.752	24634	
	ACL	**31.04260287**	Average
	C27/C31	**0.076563909**	30.71552
	C29/C33	**0.476840173**	31.70849
	CPI	**5.488280346**	

Dominant Spp 3	Growth form	Genetic Voucher No
Pultenaea involucrata	Shrub	SAT 000124

NAME	TIME	PEAK AREA	
C20	21.813	2558	
C21	22.98	663	
C22	24.137	571	
C23	25.174	888	
C24	26.216	1682	
C25	27.211	1596	
C26	28.163	1787	
C27	29.09	4690	
C28	29.975	2001	
C29	30.834	25476	
C30	31.656	2996	
C31	32.477	180401	
C32	33.237	2827	
C33	34.001	136195	
C34	34.713	185	
C35	35.436	49734	
	ACL	**31.98479246**	Average
	C27/C31	**0.025997639**	30.89864
	C29/C33	**0.187055325**	32.36968
	CPI	**31.07681135**	

Soil		
SATKAN0001	Kanmantoo	

NAME	TIME	PEAK AREA	
C20	21.811	3775	
C21	22.983	12104	
C22	24.109	13289	
C23	25.182	35128	
C24	26.219	35722	
C25	27.214	90750	
C26	28.167	57957	
C27	29.104	377555	
C28	29.978	55893	
C29	30.852	541364	
C30	31.664	23944	
C31	32.47	133756	
C32	33.245	14277	
C33	33.999	64296	
C34	34.727	2756	
C35	35.439	34052	
	ACL	**28.6866561**	Average
	C27/C31	**2.822714495**	28.04638
	C29/C33	**8.419870598**	29.42463
	CPI	**6.210456343**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SATKAN0002	Kanmantoo	Eucalyptus obliqua	Tree/Palm	SAT 000191

NAME	FOUND_RT	AREA	
C16	17.61	1515.702	
C18	20.395	6484.721	
C20	22.919	6201.095	
C22	25.217	4159.367	
C23	26.293	3248.991	
C24	27.297	705.974	
C24	27.326	6489.75	
C25	28.322	74610.914	
C26	29.26	25091.488	
C27	30.205	377055.563	
C28	31.085	16187.328	
C29	31.958	146942.688	
C30	32.78	868.014	
C31	33.594	950.179	
	ACL	**27.2476223**	Average
	C27/C31	**396.8258223**	27.01005
	C29/C33	-	29
	CPI	**14.750266**	

Dominant Spp 2	Growth form	Genetic Voucher No
Lepidosperma semiteres	Sedge	SAT 000218

NAME	TIME	PEAK AREA	
C10	8.475	594	
C11	9.611	1427	
C12	11.228	622	
C13	12.993	697	
C14	14.684	1509	
C15	16.281	1742	
C16	17.794	5006	
C17	19.27	741	
C18	20.589	16587	
C19	21.883	3377	
C20	23.113	18572	
C21	24.291	6345	
C22	25.417	15990	
C23	26.495	9406	
C24	27.537	13593	
C25	28.532	10913	
C26	29.49	11863	
C27	30.411	12805	
C28	31.296	7664	
C29	32.16	58660	
C30	32.997	9416	
C31	33.793	426614	
C32	34.605	812	
C33	35.322	237749	
C34	36.05	1627	
C35	36.757	92392	
	ACL	**31.72818969**	Average
	C27/C31	**0.030015424**	30.88344
	C29/C33	**0.246730796**	32.20839
	CPI	**13.21275322**	

Dominant Spp 3	Growth form	Genetic Voucher No
Hakea rostrata	Shrub	SAT 000207

NAME	TIME	PEAK AREA	
C10	0	0	
C11	10.053	99	
C12	0	0	
C13	0	0	
C14	15.508	351	
C15	17.215	423	
C16	18.822	2936	
C17	20.34	233	
C18	21.806	2361	
C19	0	0	
C20	24.503	1489	
C21	25.749	184	
C22	26.953	1232	
C23	28.099	1015	
C24	29.188	1288	
C25	30.246	1814	
C26	31.256	1062	
C27	32.235	4890	
C28	33.167	2043	
C29	34.078	97442	
C30	34.947	8232	
C31	35.801	236536	
C32	36.607	1825	
C33	37.397	2698	
C34	0	0	
C35	39.104	1412	
	ACL	**30.37851226**	Average
	C27/C31	**0.020673386**	30.91898
	C29/C33	**36.11638251**	29.10777
	CPI	**22.01205203**	

Soil		
SATKAN0002	Kanmantoo	

NAME	TIME	PEAK AREA	
C20	21.807	2812	
C21	22.985	7617	
C22	24.1	10797	
C23	25.179	35353	
C24	26.215	57568	
C25	27.21	160753	
C26	28.168	135714	
C27	29.095	425304	
C28	29.974	108480	
C29	30.844	448177	
C30	31.66	48957	
C31	32.461	84612	
C32	33.236	18449	
C33	33.995	20089	
C34	34.728	4936	
C35	35.43	9941	
	ACL	**27.96908457**	Average
	C27/C31	**5.026521061**	27.66373
	C29/C33	**22.3095724**	29.1716
	CPI	**3.073691677**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SAASTP0001	Stony plains	Maireana aphylla	Chenopod	SAA 000250

NAME	TIME	PEAK AREA	
C10	8.483	1450	
C11	9.619	1015	
C12	11.221	1054	
C13	13.001	1298	
C14	14.703	562	
C15	16.289	4265	
C16	17.797	30181	
C17	19.226	20335	
C18	20.587	95505	
C19	21.891	11707	
C20	23.116	84853	
C21	24.289	25598	
C22	25.425	68877	
C23	26.509	129020	
C24	27.54	104415	
C25	28.54	1071819	
C26	29.493	139183	
C27	30.419	357702	
C28	31.304	126898	
C29	32.168	425130	
C30	32.99	45860	
C31	33.796	203971	
C32	34.644	849	
C33	35.32	6702	
C34	36.037	1560	
C35	36.744	33440	
	ACL	**26.91911334**	Average
	C27/C31	**1.753690476**	28.4526
	C29/C33	**63.43330349**	29.06208
	CPI	**4.560441882**	

Dominant Spp 2	Growth form	Genetic Voucher No
Eragrostis setifolia	Tussock Grass	SAA 000294

NAME	TIME	PEAK AREA	
C10	8.482	658	
C11	9.628	391	
C12	11.215	645	
C13	12.99	590	
C14	14.691	10037	
C15	16.283	7762	
C16	17.791	27935	
C17	19.22	8789	
C18	20.592	44911	
C19	21.879	3458	
C20	23.115	37934	
C21	24.298	10965	
C22	25.424	30367	
C23	26.502	20356	
C24	27.534	30810	
C25	28.534	32264	
C26	29.487	25885	
C27	30.413	55108	
C28	31.303	17886	
C29	32.162	147976	
C30	32.989	34732	
C31	33.801	1803911	
C32	34.565	21651	
C33	35.324	177797	
C34	36.052	2531	
C35	36.759	55315	
	ACL	**30.94142066**	Average
	C27/C31	**0.030549179**	30.88143
	C29/C33	**0.83227501**	31.18308
	CPI	**13.856489**	

Dominant Spp 3	Growth form	Genetic Voucher No
Acacia aneura var. tenuis	Shrub	SAA 000338

NAME	FOUND_RT	AREA	
C27	30.213	37465.891	
C28	31.107	2316.905	
C29	31.965	67062.852	
C30	32.802	3415.121	
C31	33.616	478592.156	
C32	34.394	33662.105	
C33	35.158	558756.188	
C34	35.885	1478.545	
	ACL	**31.72995869**	Average
	C27/C31	**0.078283546**	30.7096
	C29/C33	**0.120021672**	32.57136
	CPI	**27.93741929**	

Soil		
SAASTP0001	Stony plains	

NAME	FOUND_RT	AREA	
C20	21.809	10493	
C21	22.987	14012	
C22	24.107	23673	
C23	25.186	59744	
C24	26.222	79654	
C25	27.217	121279	
C26	28.175	99897	
C27	29.092	93862	
C28	29.982	63607	
C29	30.84	61038	
C30	31.667	32517	
C31	32.468	39882	
C32	33.243	13651	
C33	34.002	15686	
C34	34.725	3822	
C35	35.442	14986	
	ACL	**27.72981228**	Average
	C27/C31	**2.353492804**	28.19279
	C29/C33	**3.891240597**	29.81779
	CPI	**1.281449146**	

Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
SAASTP0004	Stony plains	Malvastrum americanum va	Forb	SAA 000019

NAME	TIME	PEAK AREA	
C10	8.446	384	
C11	9.635	917	
C12	11.216	11775	
C13	12.996	2338	
C14	14.692	46846	
C15	16.284	27882	
C16	17.792	62889	
C17	19.226	23866	
C18	20.588	93883	
C19	21.881	10092	
C20	23.121	84877	
C21	24.299	20628	
C22	25.425	69453	
C23	26.504	62511	
C24	27.54	73483	
C25	28.535	178626	
C26	29.498	77015	
C27	30.42	512838	
C28	31.31	117003	
C29	32.168	1740982	
C30	32.996	202182	
C31	33.802	2032081	
C32	34.577	36098	
C33	35.325	97370	
C34	36.037	604	
C35	36.786	9884	
	ACL	**29.60649581**	Average
	C27/C31	**0.252370845**	30.19394
	C29/C33	**17.88006573**	29.21186
	CPI	**8.05723832**	

Dominant Spp 2	Growth form	Genetic Voucher No
Rutidosis helichrysoides subsp	Forb	SAA 000016

NAME	TIME	PEAK AREA	
C10	8.479	673	
C11	9.609	1741	
C12	11.217	3017	
C13	12.997	3652	
C14	14.688	35594	
C15	16.279	20433	
C16	17.798	46197	
C17	19.227	8432	
C18	20.583	40806	
C19	21.876	3891	
C20	23.112	30028	
C21	24.3	6430	
C22	25.415	22929	
C23	26.499	14050	
C24	27.541	20405	
C25	28.53	22813	
C26	29.494	19091	
C27	30.41	51425	
C28	31.3	19133	
C29	32.164	929720	
C30	32.996	79294	
C31	33.802	2419093	
C32	34.567	146253	
C33	35.326	1239854	
C34	36.017	252058	
C35	36.761	663899	
	ACL	**31.55066528**	Average
	C27/C31	**0.021257967**	30.91674
	C29/C33	**0.749862484**	31.28589
	CPI	**8.96361079**	

Dominant Spp 3	Growth form	Genetic Voucher No
Sida fubulifera	Forb	SAA 000022

NAME	TIME	PEAK AREA	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	0	0	
C15	0	0	
C16	18.818	458	
C17	0	0	
C18	21.797	1498	
C19	0	0	
C20	24.498	1381	
C21	25.755	524	
C22	26.954	1430	
C23	28.09	1763	
C24	29.252	511	
C25	30.252	3295	
C26	31.252	1908	
C27	32.236	10689	
C28	33.173	1185	
C29	34.079	15287	
C30	34.943	501	
C31	35.791	1548	
C32	0	0	
C33	37.404	255	
C34	0	0	
C35	39.079	511	
	ACL	**28.13325946**	Average
	C27/C31	**6.90503876**	27.50601
	C29/C33	**59.94901961**	29.06563
	CPI	**6.026106594**	

Soil		
SAASTP0004	Stony plains	

NAME	TIME	PEAK AREA	
C20	21.807	11124	
C21	22.98	15045	
C22	24.1	26360	
C23	25.184	56157	
C24	26.215	103310	
C25	27.215	206761	
C26	28.168	221183	
C27	29.089	237569	
C28	29.979	170842	
C29	30.833	148488	
C30	31.665	80646	
C31	32.466	108762	
C32	33.241	35558	
C33	33.99	37119	
C34	34.718	10367	
C35	35.43	32650	
	ACL	**28.04027619**	Average
	C27/C31	**2.184301502**	28.25616
	C29/C33	**4.000323285**	29.79995
	CPI	**1.262912909**	

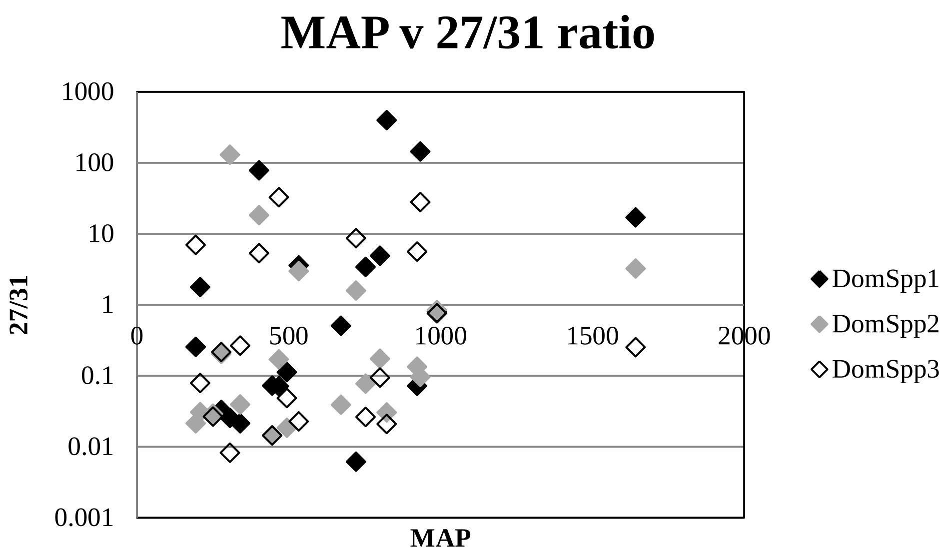
Site	Bioregion	Dominant Spp 1	Growth form	Genetic Voucher No
NTADAC0001	Darwin Coastal	Eucalyptus tetrodonta		NTA 006020

NAME	FOUND_RT	AREA	
C16	17.61	2659.282	
C17	19.043	458.763	
C18	20.388	4531.807	
C20	22.919	2763.422	
C22	25.217	1536.286	
C24	27.333	1964.098	
C25	28.322	203.287	
C26	29.275	4915.825	
C27	30.205	8447.58	
C28	31.078	9375.743	
C29	31.958	92122.781	
C30	32.787	2983.688	
C31	33.594	499.75	
C32	34.38	295.635	
	ACL	**28.83501286**	Average
	C27/C31	**16.90361181**	27.22342
	C29/C33	-	29
	CPI	**4.806230188**	

Dominant Spp 2	Growth form	Genetic Voucher No	
Eucalyptus miniata		NTA 006042	
NAME	**TIME**	**PEAK AREA**	
C10	8.477	571	
C11	9.603	1284	
C12	11.226	247	
C13	13.006	335	
C14	14.713	166	
C15	16.283	184	
C16	17.817	265	
C17	19.273	599	
C18	20.582	21021	
C19	21.87	2504	
C20	23.116	25755	
C21	24.294	4858	
C22	25.414	19893	
C23	26.498	16722	
C24	27.534	25157	
C25	28.529	27567	
C26	29.487	41353	
C27	30.414	62952	
C28	31.288	62516	
C29	32.163	107823	
C30	32.99	13129	
C31	33.796	19531	
C32	34.602	499	
C33	35.33	1555	
C34	36.063	654	
C35	36.77	7759	
	ACL	**28.36468196**	Average
	C27/C31	**3.223183657**	27.94715
	C29/C33	**69.33954984**	29.05687
	CPI	**1.48564347**	

Dominant Spp 3	Growth form	Genetic Voucher No	
Sorghum plumosum		NTA 005954	
NAME	**TIME**	**PEAK AREA**	
C10	0	0	
C11	0	0	
C12	0	0	
C13	0	0	
C14	0	0	
C15	0	0	
C16	0	0	
C17	0	0	
C18	21.805	1027	
C19	0	0	
C20	24.496	1554	
C21	25.747	259	
C22	26.962	1342	
C23	28.093	922	
C24	29.203	970	
C25	30.244	889	
C26	31.26	822	
C27	32.239	1035	
C28	33.182	182	
C29	34.072	1126	
C30	34.946	733	
C31	35.794	4120	
C32	36.611	213	
C33	37.401	4411	
C34	0	0	
C35	39.098	2103	
	ACL	**31.40251388**	Average
	C27/C31	**0.251213592**	30.1969
	C29/C33	**0.255270914**	32.18656
	CPI	**3.210699202**	

Soil			
NTADAC0001	Darwin Coastal		
NAME	**TIME**	**PEAK AREA**	
C20	21.806	8689	
C21	22.979	21196	
C22	24.105	57536	
C23	25.183	131951	
C24	26.225	215617	
C25	27.22	419993	
C26	28.178	408853	
C27	29.099	447884	
C28	29.989	335212	
C29	30.848	483570	
C30	31.67	198341	
C31	32.471	162782	
C32	33.246	89721	
C33	34	62660	
C34	34.727	26491	
C35	35.439	57110	
	ACL	**27.98599938**	Average
	C27/C31	**2.751434434**	28.06626
	C29/C33	**7.717363549**	29.45885
	CPI	**1.31253271**	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1000
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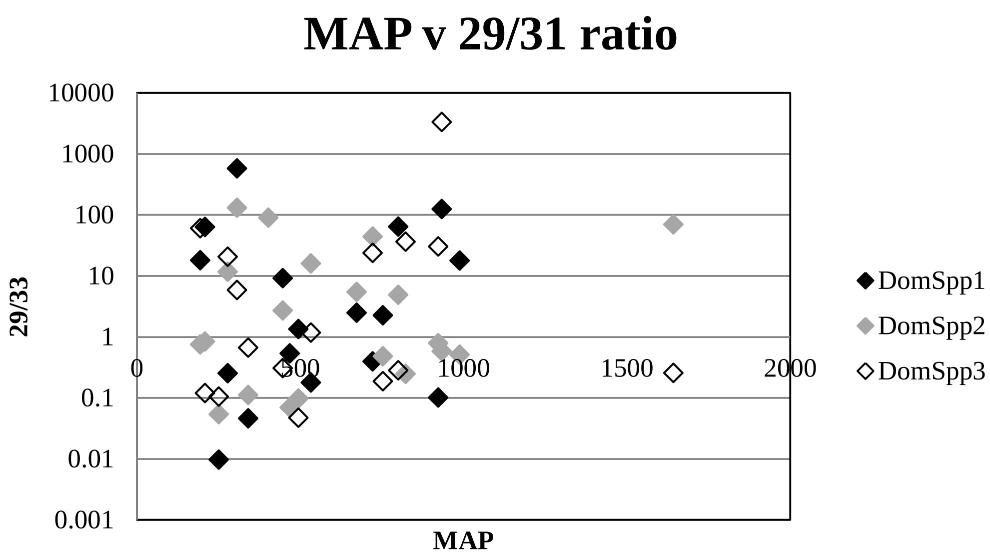
MAP
DomSpp1
DomSpp2
DomSpp3

(a)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29/33
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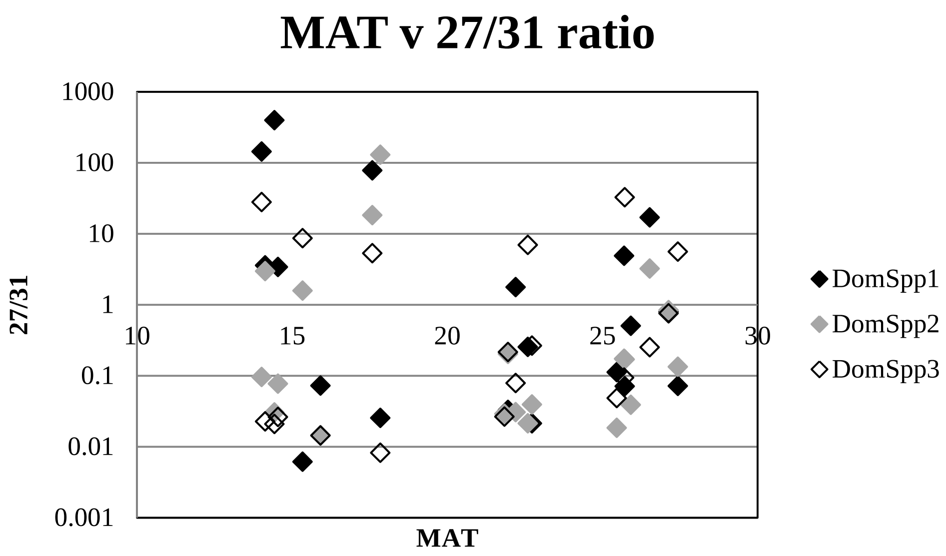
DomSpp2
DomSpp3

(b)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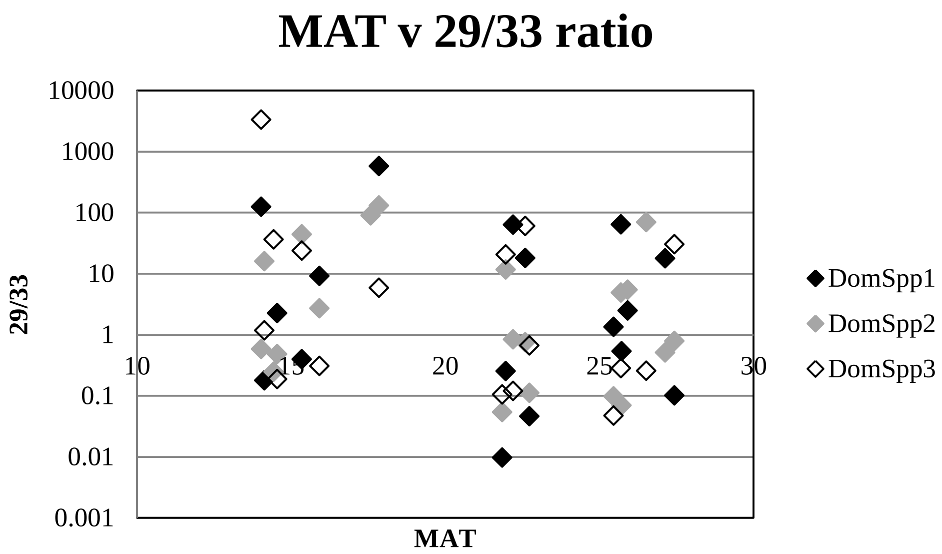
27/31
MAT
DomSpp1
DomSpp2
DomSpp3

(c)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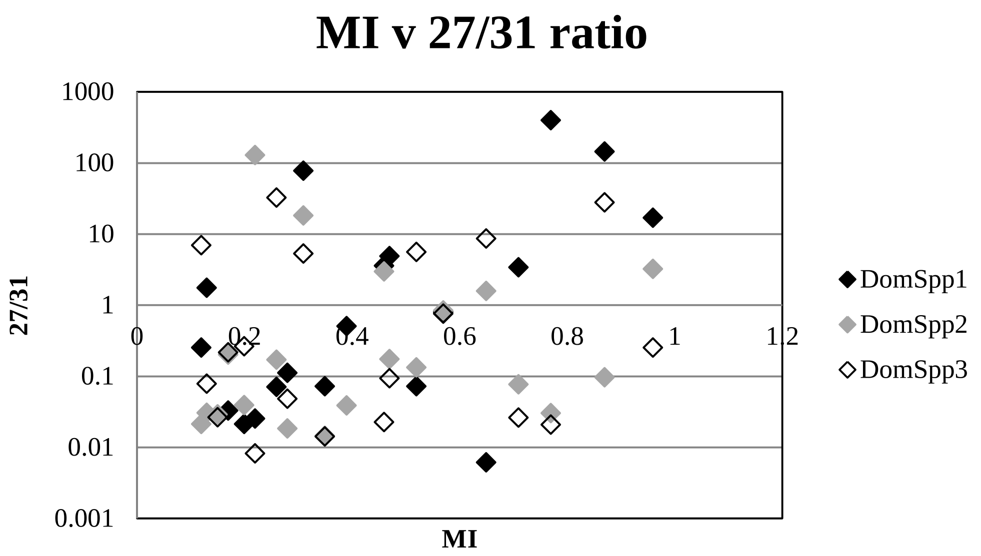
20
25
30
29/33
MAT
DomSpp1
DomSpp2
DomSpp3

(d)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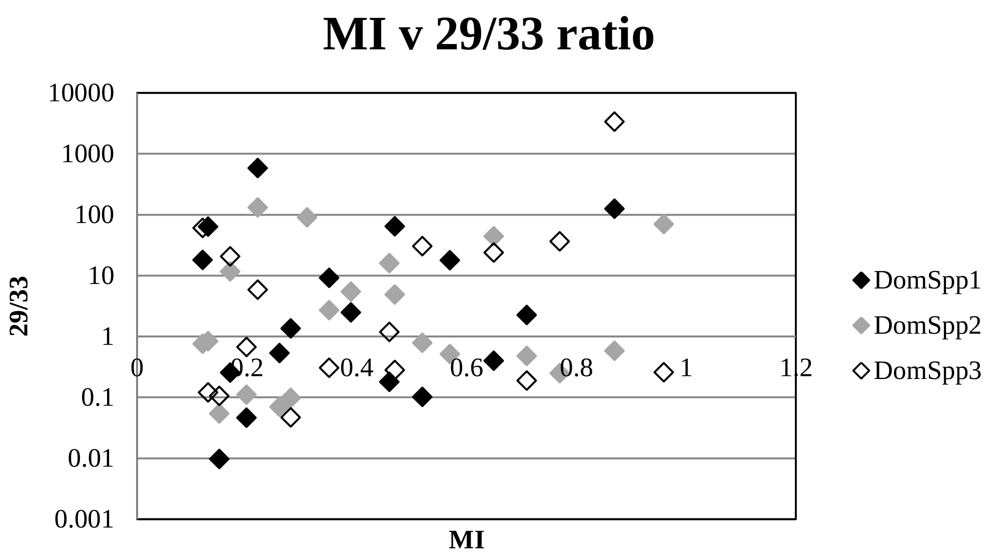
0.01
0.001
0
0.2
0.4
0.6
0.8
1
1.2
27/31
MI
DomSpp1
DomSpp2
DomSpp3

(e)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100
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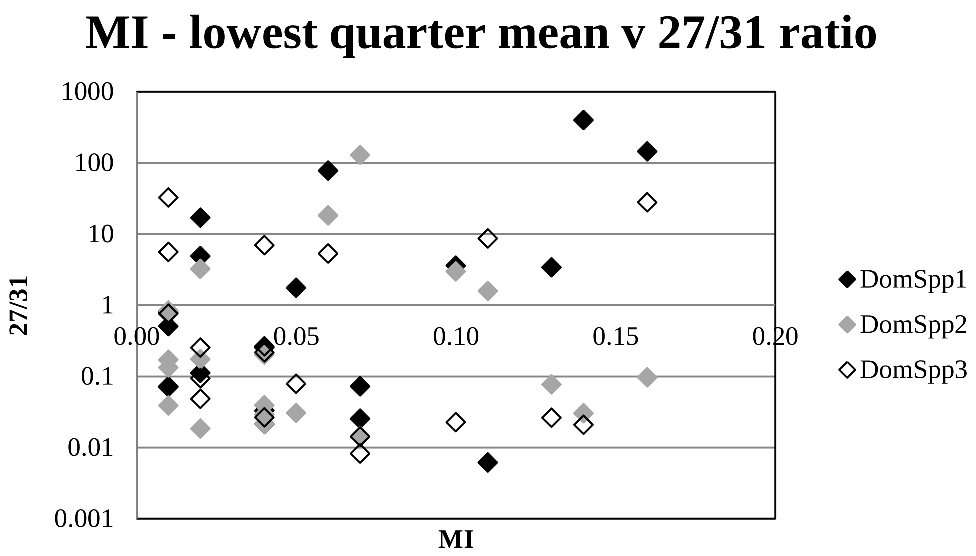
0.1
0.01
0.001
0
0.2
0.4
0.6
0.8
1
1.2
29/33
MI
DomSpp1
DomSpp2
DomSpp3

(f)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10
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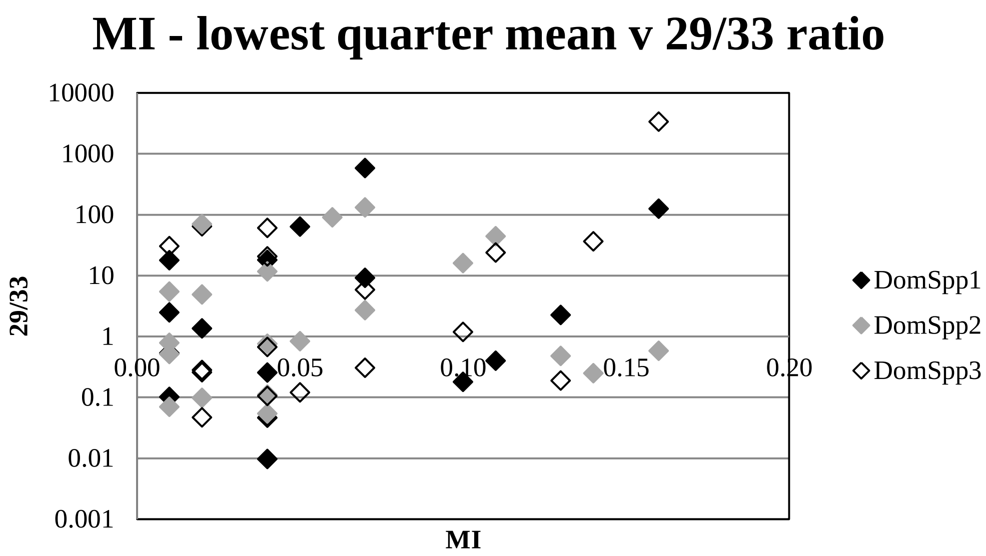
0.1
0.01
0.001
0.00
0.05
0.10
0.15
0.20
27/31
MI
DomSpp1
DomSpp2
DomSpp3

(g)


MI - lowest quarter mean v 29/33 ratio
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1000
100
10
1
0.1
0.01
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0.00
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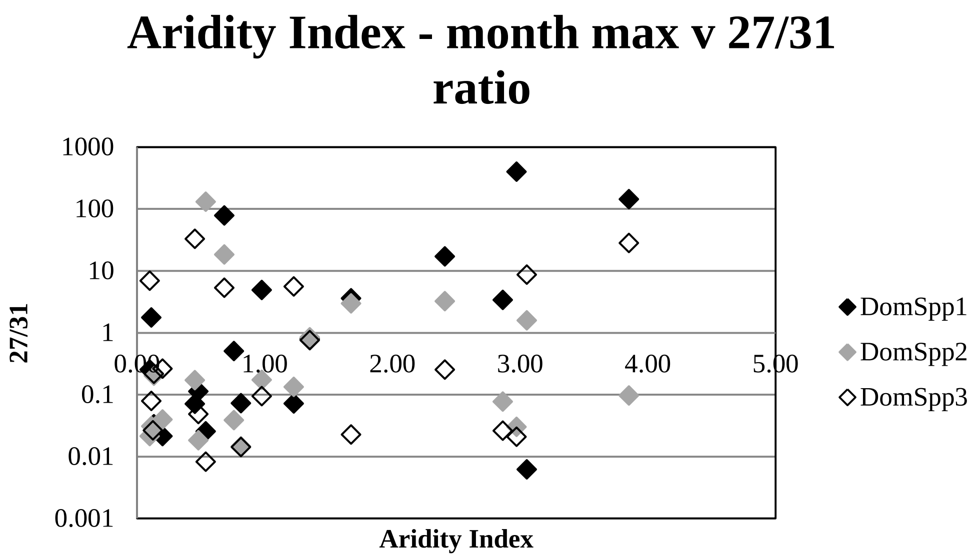
0.10
0.15
0.20
29/33
MI
DomSpp1
DomSpp2
DomSpp3

(h)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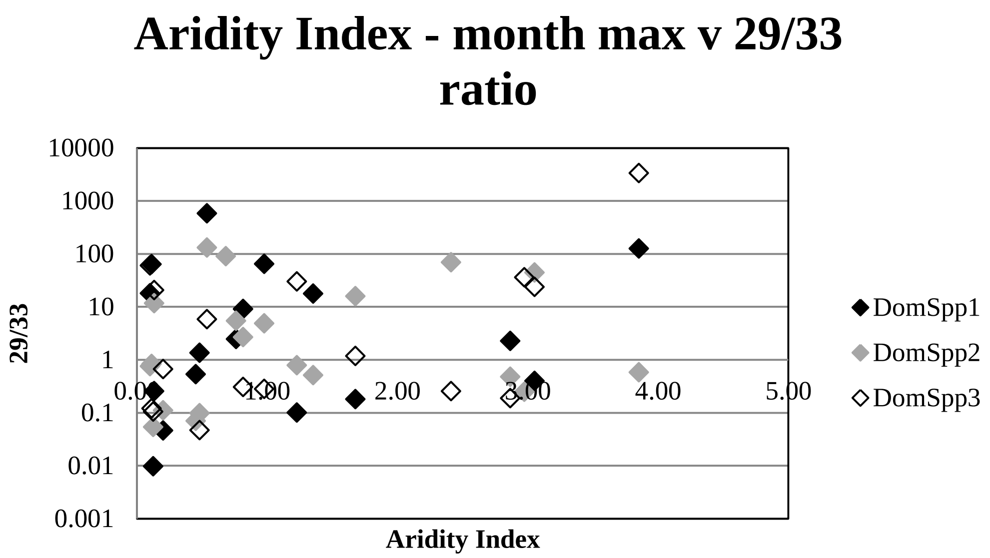
3.00
4.00
5.00
27/31
Aridity Index
DomSpp1
DomSpp2
DomSpp3

(i)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1000
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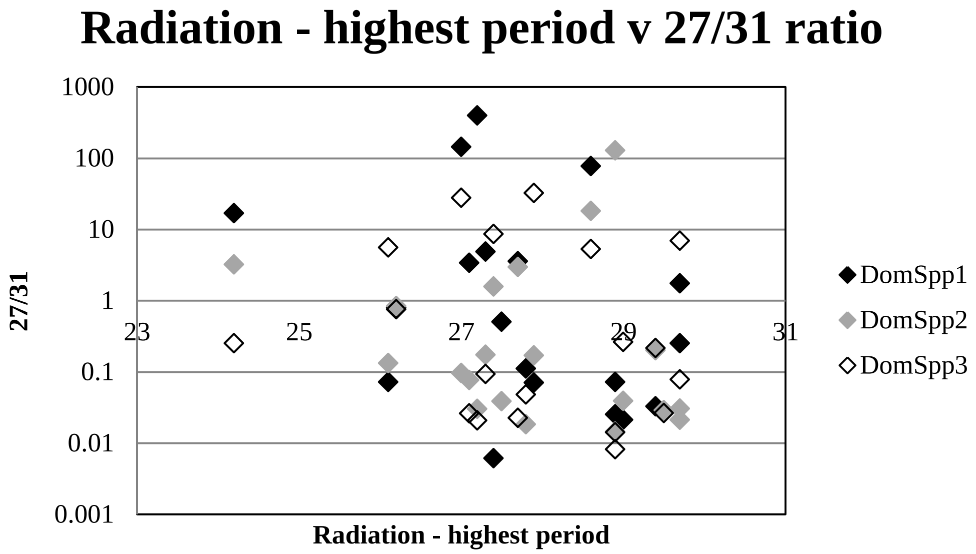
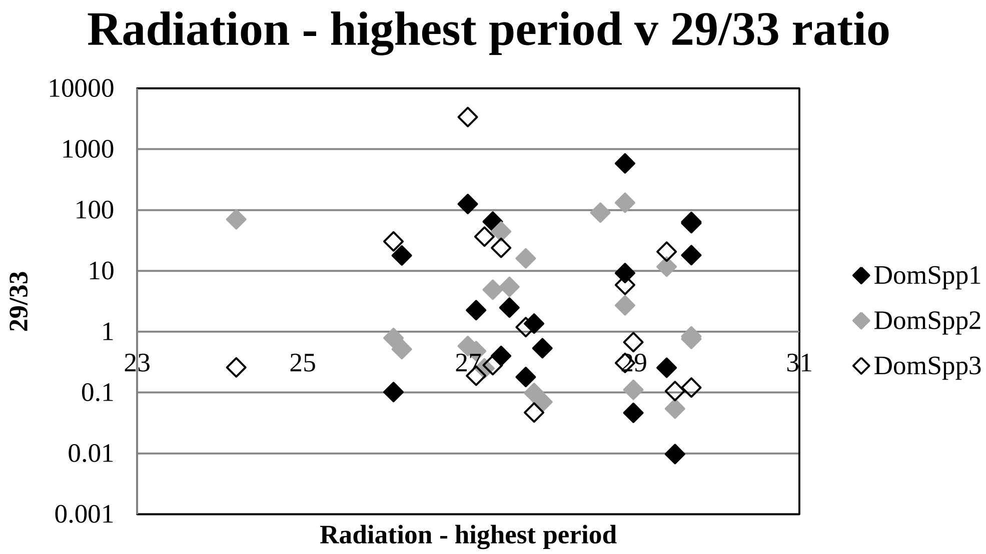
3.00
4.00
5.00
29/33
Aridity Index
DomSpp1
DomSpp2
DomSpp3

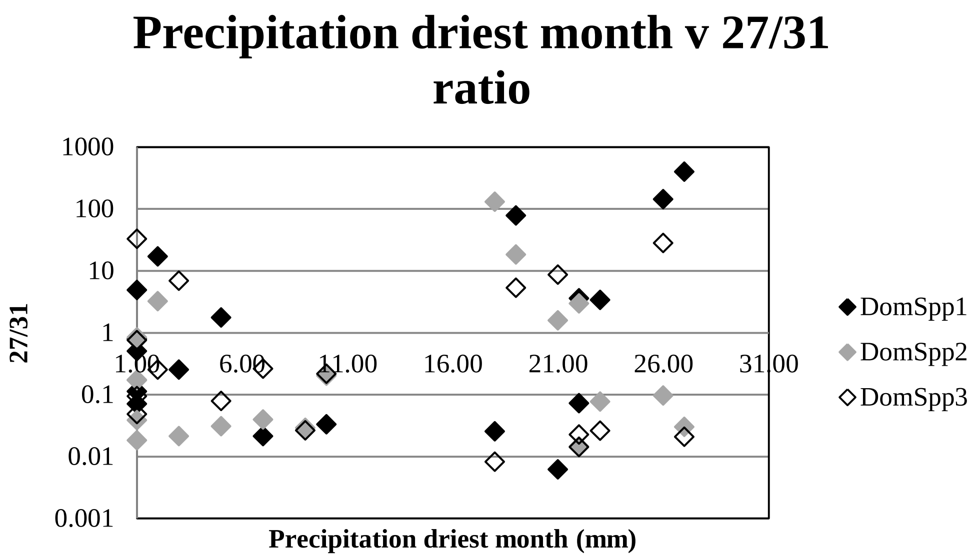
(j)


Radiation - highest period v 27/31 ratio
1000
100
10
1
0.1
0.01
0.001
23
25
27
29
31
27/31
Radiation - highest period
DomSpp1
DomSpp2
DomSpp3

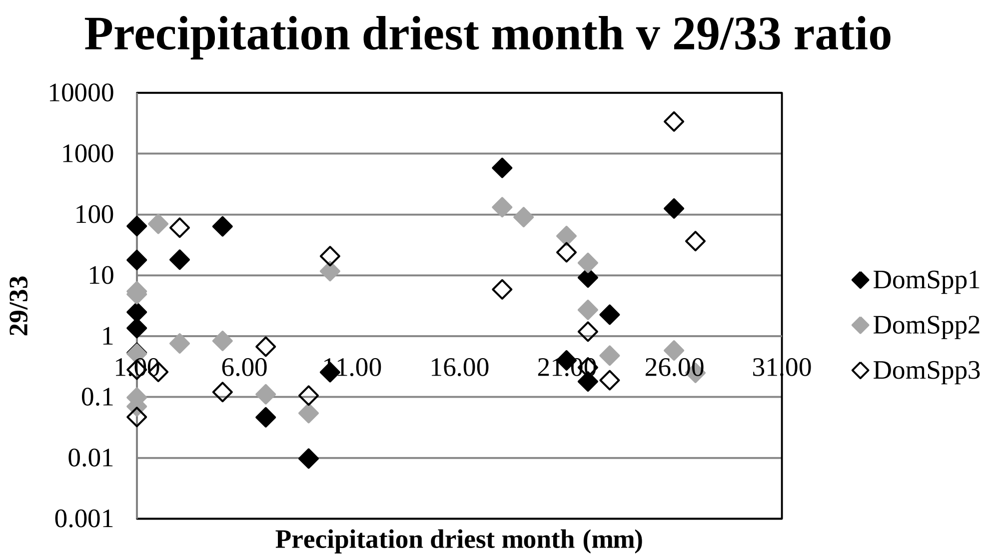
(k)


Radiation - highest period v 29/33 ratio
10000
1000
100
10
1
0.1
0.01
0.001
23
25
27
29
31
29/33
Radiation - highest period
DomSpp1
DomSpp2
DomSpp3

(l)


Precipitation driest month v 27/31 ratio
1000
100
10
1
0.1
0.01
0.001
27/31
1.00
6.00
11.00
16.00
21.00
26.00
31.00
Precipitation driest month (mm)
DomSpp1
DomSpp2
DomSpp3

(m)


Precipitation driest month v 29/33 ratio
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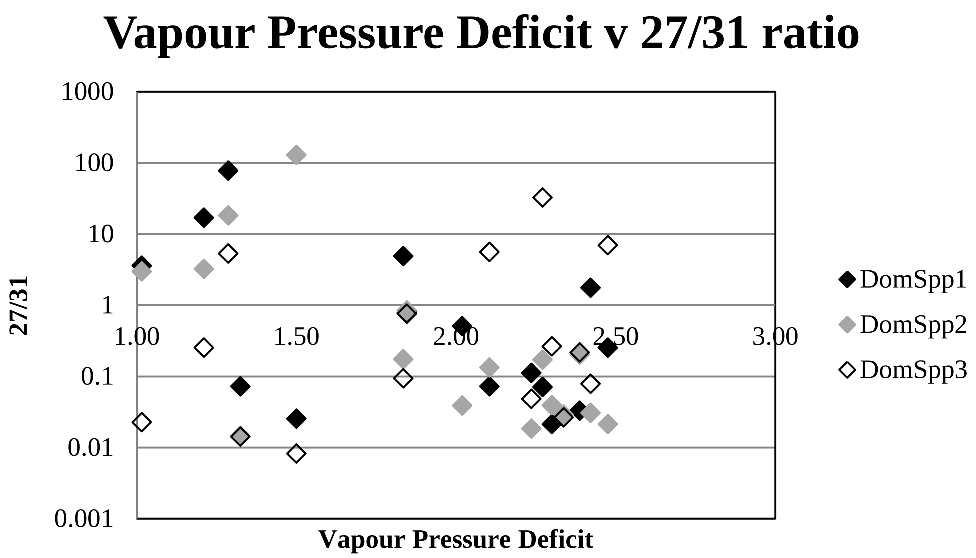
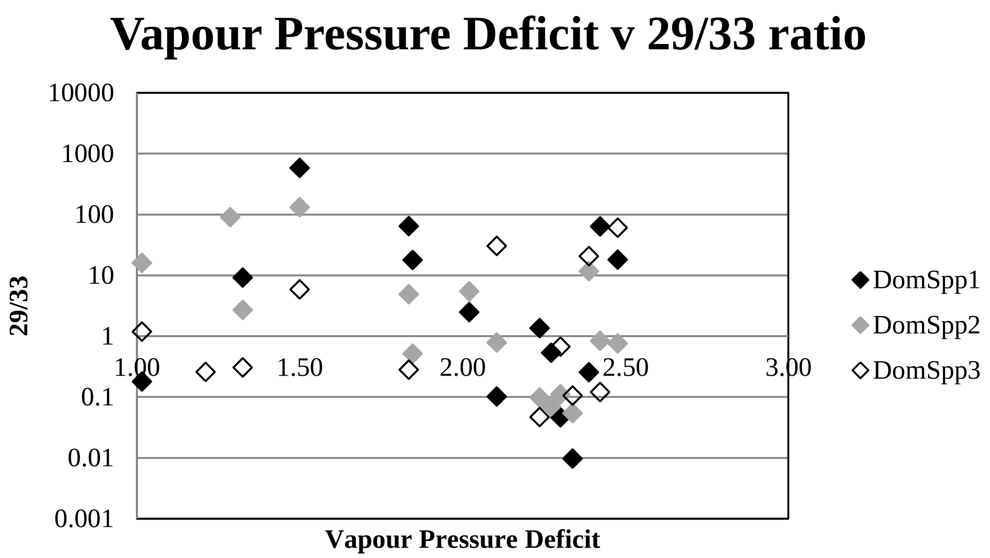
1000
100
10
1
0.1
0.01
0.001
29/33
1.00
6.00
11.00
16.00
21.00
26.00
31.00
Precipitation driest month (mm)
DomSpp1
DomSpp2
DomSpp3

(n)

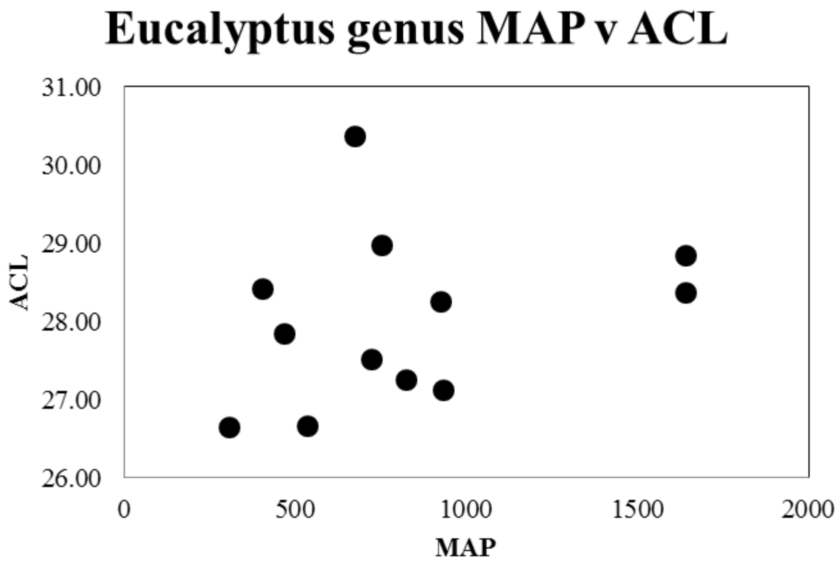


(o)

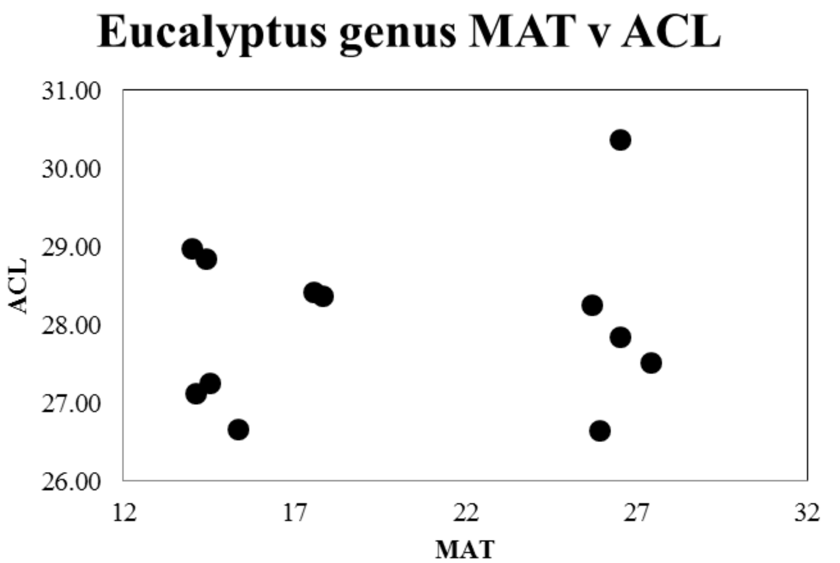


(p)

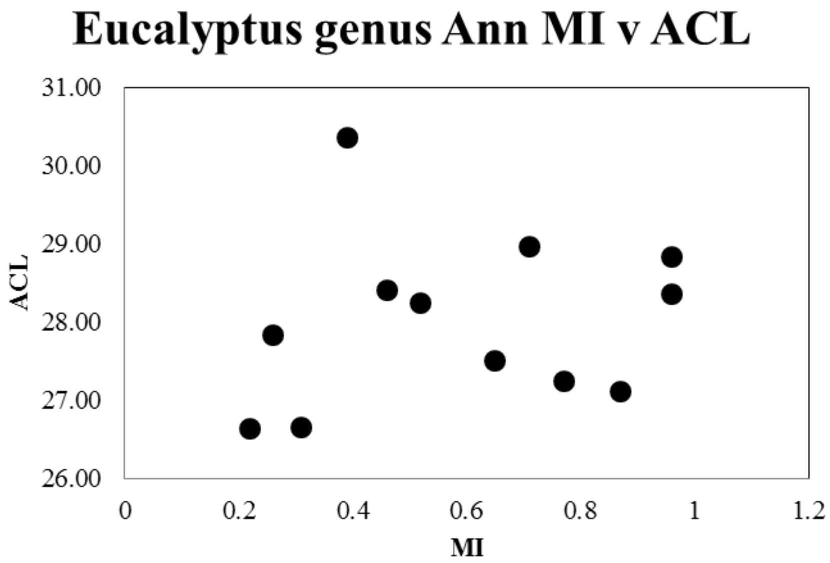
Figure 2: Plots (a)-(p) showing that there is no relationship between the plant 27/31 and 29/33 chain length ratios to the different climate variables MAP, MAT, annual MI, lowest quarter mean MI, aridity index, radiation, driest month precipitation and vapour pressure deficit.


Eucalyptus genus MAP v ACL
31.00
30.00
29.00
28.00
27.00
26.00
ACL
0
500
1000
1500
2000
MAP

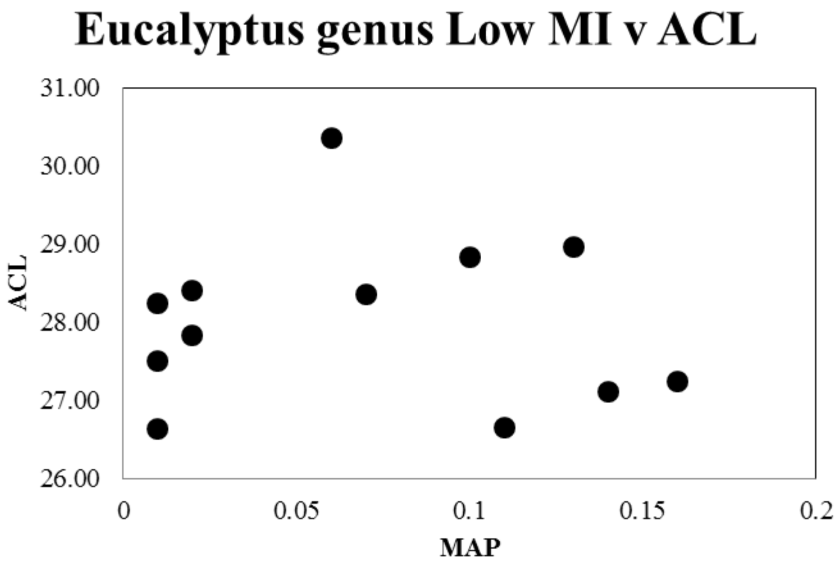
(a)


Eucalyptus genus MAT v ACL
31.00
30.00
29.00
28.00
27.00
26.00
ACL
12
17
22
27
32
MAT

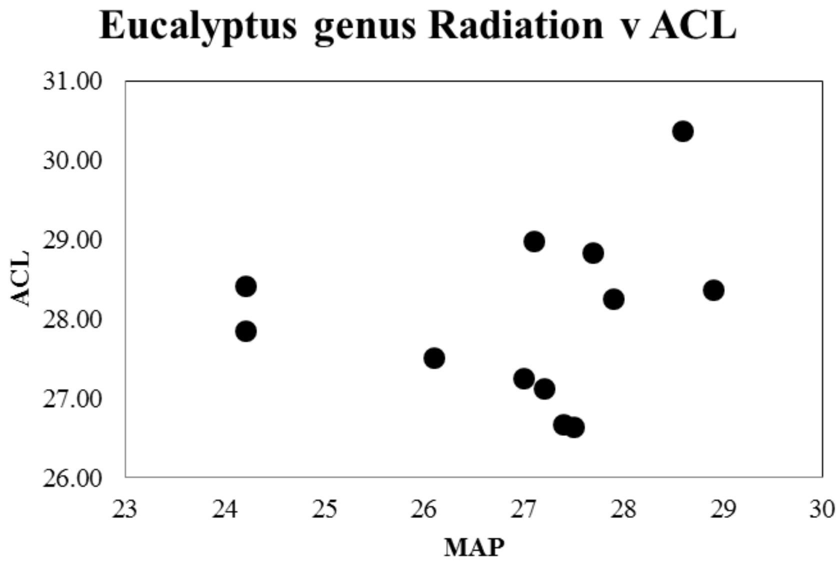
(b)


Eucalyptus genus Ann MI v ACL
31.00
30.00
29.00
28.00
27.00
26.00
ACL
0
0.2
0.4
0.6
0.8
1
1.2
MI

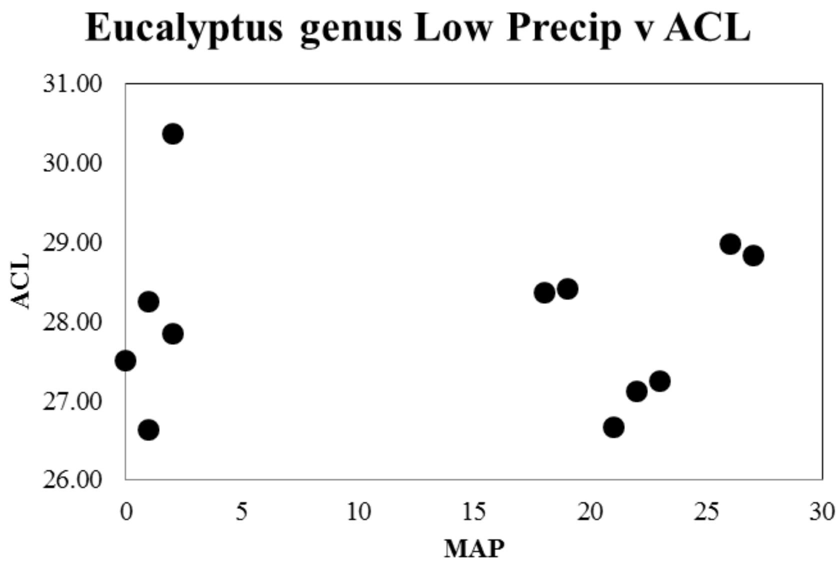
(c)


Eucalyptus genus Low MI v ACL
31.00
30.00
29.00
28.00
27.00
26.00
ACL
0
0.05
0.1
0.15
0.2
MAP

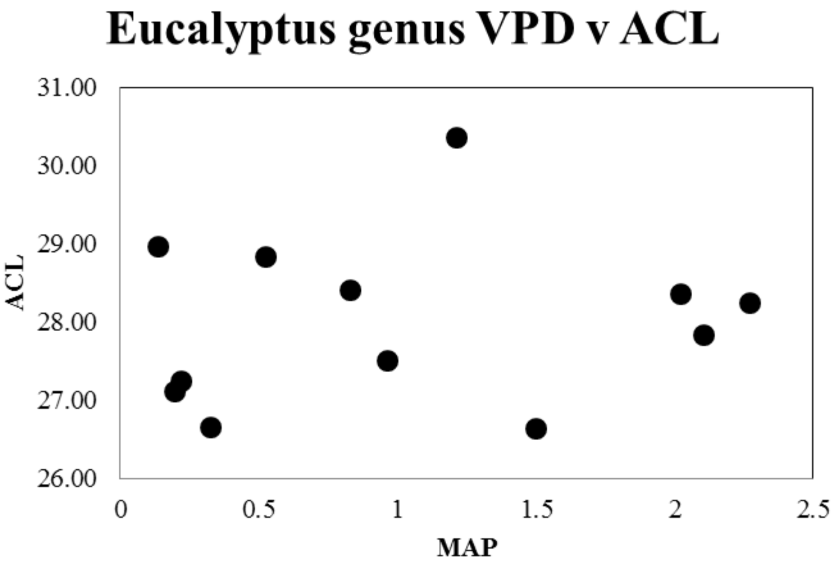
(d)


Eucalyptus genus Radiation v ACL
31.00
30.00
29.00
28.00
27.00
26.00
ACL
23
24
25
26
27
28
29
30
MAP

(e)


Eucalyptus genus Low Precip v ACL
31.00
30.00
29.00
28.00
27.00
26.00
ACL
0
5
10
15
20
25
30
MAP

(f)



(g)

Figure 2: Plots (a)-(p) showing that there is no relationship Eucalyptus genus ACL with the different climate variables MAP, MAT, annual MI, lowest quarter mean MI, aridity index, radiation, driest month precipitation and vapour pressure deficit.

Following Tables: Regression analyses for plants and soils

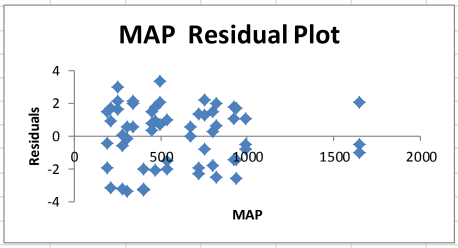
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.093468
R Square	0.008736
Adjusted I	-0.00865
Standard I	1.813193
Observati	59

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	1.651582	1.651582	0.502356	0.481355
Residual	57	187.3971	3.287669		
Total	58	189.0487			

	Coefficient	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	30.17651	0.475957	63.40174	1.49E-54	29.22342	31.12959	29.22342	31.12959
MAP	-0.00048	0.000679	-0.70877	0.481355	-0.00184	0.000879	-0.00184	0.000879



Plant ACL v MAP

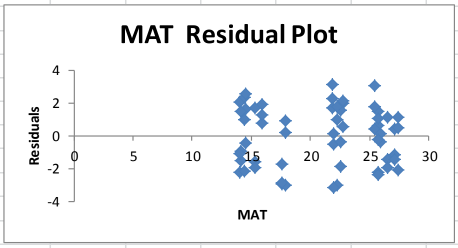
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.198398
R Square	0.039362
Adjusted I	0.022508
Standard I	1.784964
Observati	59

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	7.441289	7.441289	2.335551	0.131981
Residual	57	181.6074	3.186095		
Total	58	189.0487			

	Coefficient	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	28.34801	1.03131	27.48737	1.41E-34	26.28285	30.41317	26.28285	30.41317
MAT	0.07356	0.048134	1.528251	0.131981	-0.02283	0.169947	-0.02283	0.169947



Plant ACL v MAT

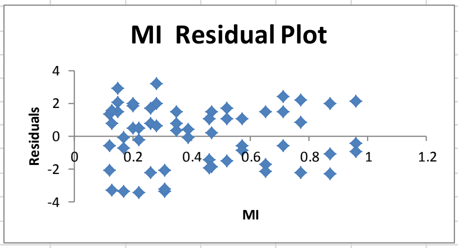
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.151021
R Square	0.022807
Adjusted I	0.005664
Standard I	1.800278
Observati	59

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	4.311717	4.311717	1.330366	0.253554
Residual	57	184.737	3.241		
Total	58	189.0487			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	30.34331	0.462386	65.62326	2.15E-55	29.4174	31.26922	29.4174	31.26922
MI	-1.07253	0.929871	-1.15341	0.253554	-2.93456	0.789508	-2.93456	0.789508



Plant ACL v Annual MI

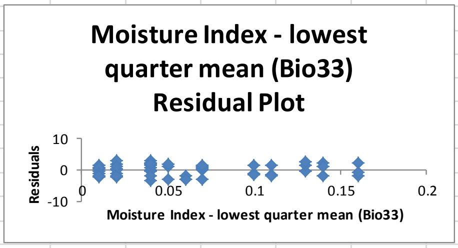
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.170011
R Square	0.028904
Adjusted I	0.011867
Standard I	1.794653
Observati	59

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	5.46421	5.46421	1.696548	0.197978
Residual	57	183.5845	3.220781		
Total	58	189.0487			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	30.2712	0.378354	80.00762	3.01E-60	29.51356	31.02884	29.51356	31.02884
Moisture I	-6.64815	5.104084	-1.30252	0.197978	-16.8689	3.5726	-16.8689	3.5726



Plant ACL v lowest quarter mean MI

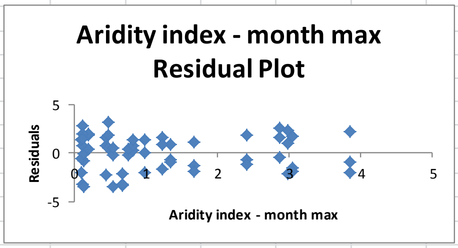
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.177663
R Square	0.031564
Adjusted I	0.014574
Standard I	1.792194
Observati	59

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	5.96713	5.96713	1.857786	0.178241
Residual	57	183.0816	3.211958		
Total	58	189.0487			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	30.23002	0.345031	87.6154	1.77E-62	29.53911	30.92094	29.53911	30.92094
Aridity inc	-0.27741	0.203529	-1.36301	0.178241	-0.68497	0.130148	-0.68497	0.130148



Plant ACL v aridity index month max

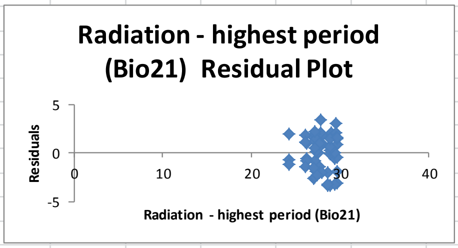
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.08117
R Square	0.006589
Adjusted I	-0.01084
Standard I	1.815156
Observati	59

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	1.245574	1.245574	0.378043	0.541099
Residual	57	187.8032	3.294792		
Total	58	189.0487			

	Coefficient	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	26.95145	4.774675	5.644667	5.45E-07	17.39033	36.51258	17.39033	36.51258
Radiation	0.105241	0.171165	0.614852	0.541099	-0.23751	0.447993	-0.23751	0.447993



Plant ACL v radiation highest period

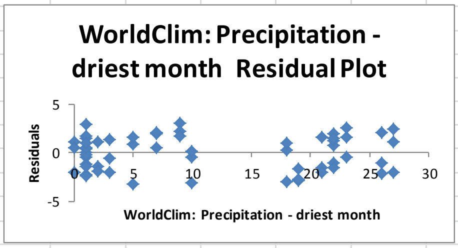
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.215792
R Square	0.046566
Adjusted I	0.029839
Standard I	1.778258
Observati	59

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	8.80328	8.80328	2.783909	0.1007
Residual	57	180.2454	3.162201		
Total	58	189.0487			

	Coefficient	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	30.32409	0.351145	86.35772	4.01E-62	29.62094	31.02725	29.62094	31.02725
WorldClin	-0.03962	0.023746	-1.66851	0.1007	-0.08717	0.00793	-0.08717	0.00793



Plant ACL v precipitation – driest month

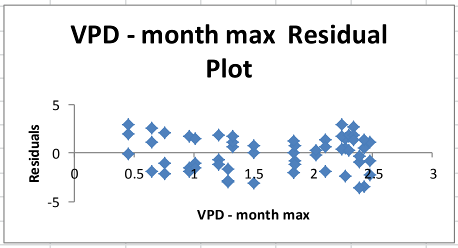
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.240763
R Square	0.057967
Adjusted I	0.04144
Standard I	1.767594
Observati	59

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	10.95854	10.95854	3.507417	0.066226
Residual	57	178.0902	3.124389		
Total	58	189.0487			

	Coefficient	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	28.78363	0.630797	45.63058	1.44E-46	27.52048	30.04678	27.52048	30.04678
VPD - mor	0.660739	0.352806	1.87281	0.066226	-0.04574	1.36722	-0.04574	1.36722



Plant ACL v vapour pressure deficit month max

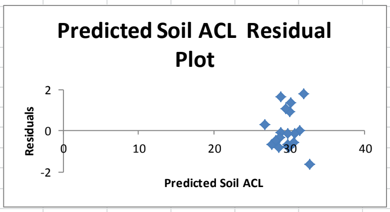
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.333832985
R Square	0.111444462
Adjusted R Square	0.059176489
Standard Error	0.969467409
Observations	19

ANOVA

	df	SS	MS	F	gnificance F
Regression	1	2.003961	2.003961	2.132174946	0.16247
Residual	17	15.97774	0.939867		
Total	18	17.9817			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	21.93751098	4.708313	4.659314	0.000224815	12.00384	31.87118	12.00384	31.87118
Predicted Soil ACL	0.231271592	0.158384	1.460197	0.162470209	-0.10289	0.565432	-0.10289	0.565432



Predicted v Actual Soil ACL

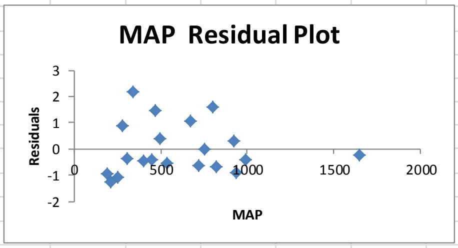
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.185174
R Square	0.034289
Adjusted I	-0.01936
Standard I	0.999454
Observati	20

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	0.638423	0.638423	0.639121	0.434453
Residual	18	17.98035	0.998908		
Total	19	18.61877			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	29.07987	0.453985	64.05468	1.08E-22	28.12608	30.03366	28.12608	30.03366
MAP	-0.00052	0.000648	-0.79945	0.434453	-0.00188	0.000844	-0.00188	0.000844



All Soils ACL v MAP

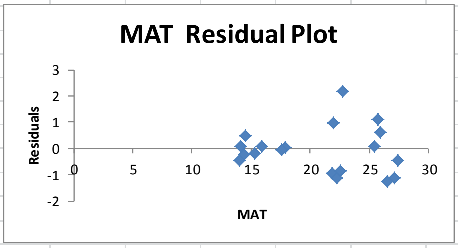
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.434091
R Square	0.188435
Adjusted I	0.143348
Standard I	0.916222
Observati	20

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	3.508429	3.508429	4.179372	0.055829
Residual	18	15.11034	0.839463		
Total	19	18.61877			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	26.9468	0.91217	29.54143	1.05E-16	25.0304	28.8632	25.0304	28.8632
MAT	0.0867	0.04241	2.044351	0.055829	-0.0024	0.1758	-0.0024	0.1758



All Soils ACL v MAT

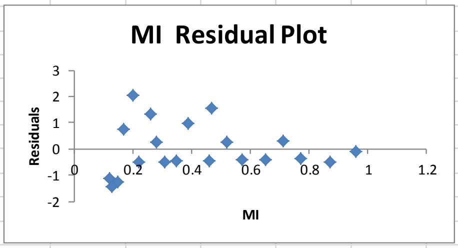
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.340886
R Square	0.116203
Adjusted I	0.067103
Standard I	0.956127
Observati	20

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	2.163557	2.163557	2.366668	0.141345
Residual	18	16.45521	0.914178		
Total	19	18.61877			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	29.32706	0.423896	69.18456	2.7E-23	28.43648	30.21763	28.43648	30.21763
MI	-1.31566	0.855213	-1.5384	0.141345	-3.11239	0.481078	-3.11239	0.481078



All Soils ACL v Annual MI

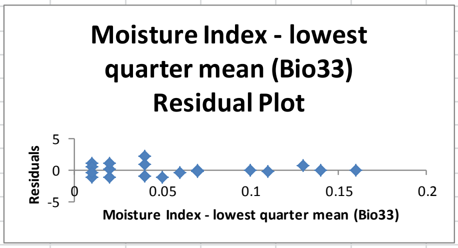
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.46878
R Square	0.219754
Adjusted I	0.176407
Standard I	0.898369
Observati	20

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	4.091555	4.091555	5.069657	0.037077
Residual	18	14.52721	0.807067		
Total	19	18.61877			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	29.33165	0.322372	90.98695	1.98E-25	28.65437	30.00893	28.65437	30.00893
Moisture I	-9.87299	4.384899	-2.25159	0.037077	-19.0853	-0.66066	-19.0853	-0.66066



All Soils ACL v lowest quarter mean MI

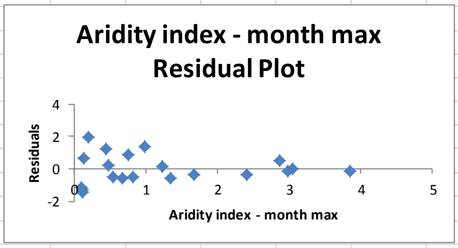
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.425022
R Square	0.180644
Adjusted I	0.135124
Standard I	0.92061
Observati	20

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	3.36336	3.36336	3.96846	0.061752
Residual	18	15.25541	0.847523		
Total	19	18.61877			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	29.21085	0.304471	95.93967	7.63E-26	28.57118	29.85052	28.57118	29.85052
Aridity inc	-0.36019	0.18081	-1.9921	0.061752	-0.74006	0.019676	-0.74006	0.019676



All Soils ACL v Aridity Index month max

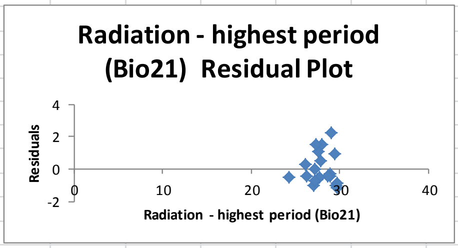
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.118481
R Square	0.014038
Adjusted I	-0.04074
Standard I	1.009879
Observati	20

ANOVA

	df	SS	MS	F	gnificance F
Regressio	1	0.261368	0.261368	0.256279	0.618832
Residual	18	18.3574	1.019856		
Total	19	18.61877			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	26.43938	4.597383	5.750964	1.88E-05	16.78064	36.09813	16.78064	36.09813
Radiation	0.083453	0.164848	0.50624	0.618832	-0.26288	0.429785	-0.26288	0.429785



All Soils ACL v radiation highest period

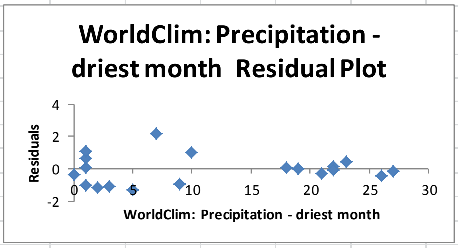
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.428826
R Square	0.183891
Adjusted I	0.138552
Standard I	0.918784
Observati	20

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	3.423831	3.423831	4.055888	0.059213
Residual	18	15.19494	0.844163		
Total	19	18.61877			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	29.22842	0.308865	94.63159	9.76E-26	28.57952	29.87733	28.57952	29.87733
WorldClin	-0.04242	0.021062	-2.01392	0.059213	-0.08667	0.001832	-0.08667	0.001832



All Soils ACL v precipitation driest month

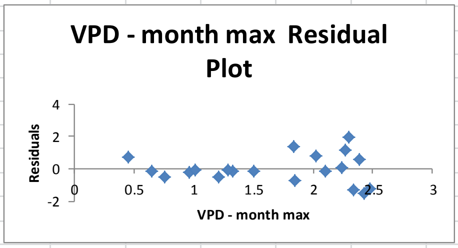
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.430006
R Square	0.184905
Adjusted I	0.139622
Standard I	0.918213
Observati	20

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	3.442712	3.442712	4.083328	0.058441
Residual	18	15.17606	0.843114		
Total	19	18.61877			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	27.69496	0.567463	48.80491	1.4E-20	26.50276	28.88715	26.50276	28.88715
VPD - mor	0.639868	0.316653	2.020725	0.058441	-0.02539	1.305131	-0.02539	1.305131



All Soils ACL v vapour pressure deficit month max

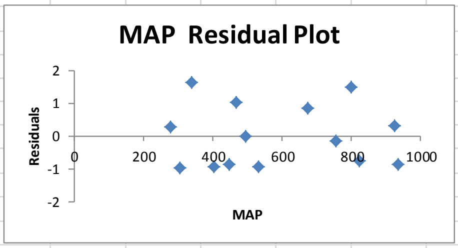
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.343359
R Square	0.117896
Adjusted I	0.044387
Standard I	0.986836
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	1.561882	1.561882	1.603831	0.229392
Residual	12	11.68614	0.973845		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	29.98308	0.745928	40.19567	3.63E-14	28.35784	31.60832	28.35784	31.60832
MAP	-0.00151	0.001194	-1.26642	0.229392	-0.00411	0.001089	-0.00411	0.001089



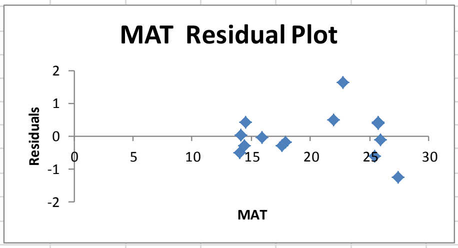
Soils CPI>1.5 v MAP

SUMMARY OUTPUT	
Regression Statistics	
Multiple F	0.748655
R Square	0.560484
Adjusted I	0.523858
Standard I	0.696582
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	7.425302	7.425302	15.30276	0.002065
Residual	12	5.822716	0.485226		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	26.16642	0.77254	33.87066	2.79E-13	24.4832	27.84964	24.4832	27.84964
MAT	0.14484	0.037026	3.911874	0.002065	0.064168	0.225512	0.064168	0.225512



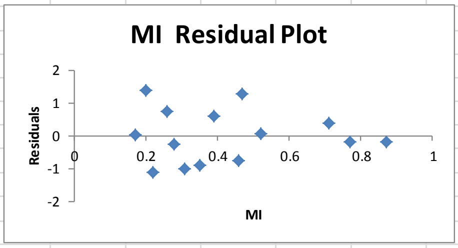
Soils CPI>1.5 v MAT

SUMMARY OUTPUT	
Regression Statistics	
Multiple F	0.60753
R Square	0.369092
Adjusted I	0.316517
Standard I	0.83458
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	4.88974	4.88974	7.020212	0.021196
Residual	12	8.358278	0.696523		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	30.28336	0.499412	60.63799	2.68E-16	29.19523	31.37148	29.19523	31.37148
MI	-2.77171	1.046101	-2.64957	0.021196	-5.05097	-0.49246	-5.05097	-0.49246



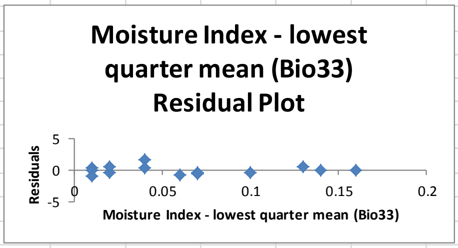
Soils CPI>1.5 v Annual MI

SUMMARY OUTPUT	
Regression Statistics	
Multiple F	0.735455
R Square	0.540894
Adjusted I	0.502635
Standard I	0.711936
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	7.165775	7.165775	14.13776	0.002721
Residual	12	6.082242	0.506854		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	30.00552	0.307041	97.72493	8.82E-19	29.33653	30.6745	29.33653	30.6745
Moisture I	-14.4149	3.833731	-3.76002	0.002721	-22.7679	-6.06193	-22.7679	-6.06193



Soils CPI>1.5 v lowest quarter mean MI

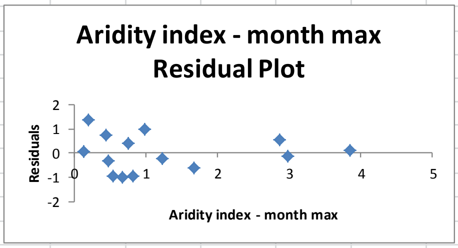
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.669763
R Square	0.448582
Adjusted I	0.402631
Standard I	0.780235
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	5.942822	5.942822	9.762076	0.008782
Residual	12	7.305195	0.608766		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	29.83557	0.314633	94.82666	1.26E-18	29.15005	30.5211	29.15005	30.5211
Aridity inc	-0.58381	0.186854	-3.12443	0.008782	-0.99093	-0.17669	-0.99093	-0.17669



Soils CPI>1.5 v aridity index month max

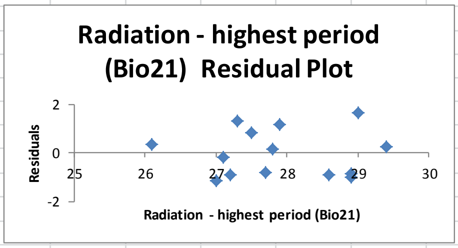
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.283115
R Square	0.080154
Adjusted I	0.0035
Standard I	1.007726
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	1.061883	1.061883	1.045664	0.326681
Residual	12	12.18613	1.015511		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	20.69748	8.220863	2.517678	0.027024	2.785762	38.60921	2.785762	38.60921
Radiation	0.3013	0.294647	1.022577	0.326681	-0.34068	0.943281	-0.34068	0.943281



Soils CPI>1.5 v radiation highest period

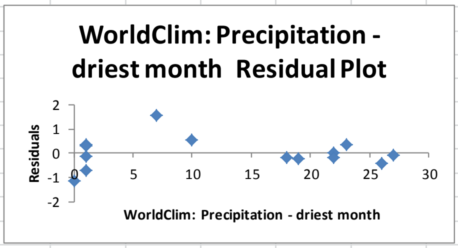
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.77697
R Square	0.603683
Adjusted I	0.570656
Standard I	0.661464
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	7.997601	7.997601	18.27878	0.001078
Residual	12	5.250416	0.437535		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	30.03506	0.281325	106.7628	3.05E-19	29.42211	30.64802	29.42211	30.64802
WorldClin	-0.07359	0.017212	-4.27537	0.001078	-0.11109	-0.03609	-0.11109	-0.03609



Soils CPI>1.5 v precipitation driest month

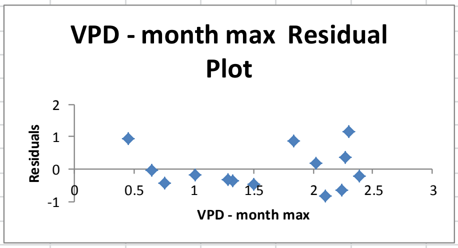
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.792683
R Square	0.628346
Adjusted I	0.597374
Standard I	0.640552
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	8.324335	8.324335	20.28807	0.000721
Residual	12	4.923683	0.410307		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	27.21997	0.45102	60.35203	2.83E-16	26.23729	28.20266	26.23729	28.20266
VPD - mor	1.18785	0.263719	4.504228	0.000721	0.613256	1.762444	0.613256	1.762444



Soils CPI>1.5 v vapour pressure deficit month max

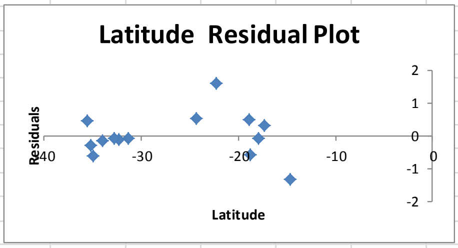
SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.739554
R Square	0.546941
Adjusted I	0.509186
Standard I	0.707233
Observati	14

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	7.245881	7.245881	14.4866	0.002502
Residual	12	6.002136	0.500178		
Total	13	13.24802			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	31.58525	0.679909	46.45512	6.47E-15	30.10385	33.06664	30.10385	33.06664
Latitude	0.093916	0.024675	3.806127	0.002502	0.040154	0.147677	0.040154	0.147677



Soils CPI>1.5 v latitude