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.

Siân Howard

November 2014

THE UNIVERSITY of ADELAIDE

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

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES