

**Carbon Isotope Stratigraphy of the late Proterozoic Wonoka
Formation of the Adelaide Fold Belt: Diagenetic Assessment and
Interpretation of Isotopic Signature and Correlations with
Previously Measured Isotopic Curves**

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ABSTRACT

The Wonoka Formation of the Adelaide Fold Belt represents the only well-described example of a late Proterozoic storm dominated carbonate shelf sequence with the considerable thickness and lateral extent of the formation making it an excellent opportunity for applying the principles of isotope stratigraphy. Sequences exposed at Warraweena, which lies on the boundary between the Central and Northern Flinders Zones, were analysed for stable isotope ratios of carbon and oxygen.

Geochemical, petrographic and cathodoluminescent analysis of individual samples was used to identify those carbonates which have experienced significant diagenetic alteration. These values were not included in the interpretation of the formation's isotopic signal.

Plotting of the least altered values against stratigraphic height revealed a consistent carbon isotopic trend. This trend was divided into two sections, termed the Lower Wonoka Signal and the Upper Wonoka Signal. The Lower Wonoka Signal is defined by the extremely consistent negative signal ($\delta^{13}\text{C} = -8$ to -7 ‰) characteristic of the lower- to mid-Wonoka Formation. This signal is interpreted to be a product of deposition and lithification in basinal waters that contain anomalously light dissolved carbonate. The Upper Wonoka Signal comprises a shift to more positive values ($\delta^{13}\text{C} = -5$ to $+6$ ‰) and is interpreted to be a reflection of carbonate deposition in shallow surface waters, possibly in association with the formation of a partially restricted lagoon.

Strontium isotopic analysis reveals $^{87}\text{Sr}/^{86}\text{Sr}$ values that are interpreted to be of primary origin. These values, when compared to data obtained by previous authors for the equivalent time period, give an estimated age of 560-590 Ma for the Wonoka Formation.

Table of Contents

Chapter 1: Introduction

- 1.1 Preamble
- 1.2 Geological Setting
- 1.3 Location and Local Geology
- 1.4 Previous Investigations
- 1.5 Regional Late Proterozoic Stratigraphy
 - 1.5.1 Nuccaleena Formation
 - 1.5.2 Brachina Formation
 - 1.5.3 ABC Range Quartzite
 - 1.5.4 Bunyeroo Formation
 - 1.5.5 Wonoka Formation

Chapter 2: Stratigraphic Subdivisions of the Wonoka Formation

- 2.1 Unit 1
- 2.2 Unit 2
- 2.3 Unit 3
- 2.4 Burr Well Member
- 2.5 Units 4 to 8
- 2.6 Unit 9
- 2.7 Unit 10
- 2.8 Unit 11
- 2.9 Origin of the Wonoka Carbonate

Chapter 3 Analytical Methods

- 3.1 Geochemical Analysis
- 3.2 Petrographic Analysis

Chapter 4 Stable Isotope Composition of the Wonoka Formation

4.1 Carbon Isotopic Signal

4.2 Oxygen Isotopic Signal

Chapter 5 Diagenesis of Limestones

5.1 Diagenetic Processes

5.1.1 Dolomitization

5.1.2 Metamorphism

5.1.3 Bacterial Decay of Organic Matter

5.1.4 Thermal Alteration of Organic Matter

5.2 Diagenetic Assessment

5.2.1 Trace and Major Element Ratios

5.2.2 $\delta^{13}\text{C} : \delta^{18}\text{O}$ Cross-Plots

5.2.3 Petrographic Analysis

5.2.4 Summary of "Least Altered" Samples

Chapter 6 Correlation and Interpretation of the Wonoka Formation Isotope Signature

6.1 Interpretation of the "Lower Wonoka Signal"

6.2 Interpretation of the "Upper Wonoka Signal"

Chapter 7 Strontium Isotope Analysis

7.1 Theory and Sample Selection

7.2 Sample Selection and Discussion of Results

Chapter 8 Discussion and Conclusion

List of Figures

- Figure 1.1 Subdivisions of the Adelaide Fold Belt, showing detail of the Wilpena Group.
- Figure 1.2 Location of study area within the Adelaide Fold Belt.
- Figure 1.3 Local geology, stratigraphy and section locality map for Warraweena.
- Figure 2.1 Sample location along measured sections.
- Figure 4.1.a Carbon and oxygen isotope curve for North Mount Goddard.
- Figure 4.1.b Carbon and oxygen isotope curve for Black Range Springs.
- Figure 5.1 Mn v Sr Cross-plot.
- Figure 5.2.a Mn/Sr ratio v $\delta^{13}\text{C}$ for Black Range Springs.
- Figure 5.2.b Mn/Sr ratio v $\delta^{13}\text{C}$ for North Mount Goddard.
- Figure 5.3.a Carbon and oxygen isotope cross-plot for Black Range Springs.
- Figure 5.3.b Carbon and oxygen isotope cross-plot for North Mount Goddard.
- Figure 5.4.a Least altered isotope curve for Black Range Springs.
- Figure 5.4.b Least altered isotope curve for North Mount Goddard.
- Figure 6.1 Stratigraphic and isotopic intra-basinal correlation of the Wonoka Formation.
- Figure 6.2 Proposed model for isotope curve formation.
- Figure 6.3 Associated deposition of Wonoka units.
- 7.1 Sr v % Yield.
- 7.2 Sr isotope values compared to data compiled by Asmerom et al. (1991).
- Enclosure 1: Stratigraphic and isotopic correlations for the Warraweena study area.

List of Plates

- Plate 2.a Units 4-8 at South Mount Goddard, showing distinctive packets of limestone and shale interbeds.
- Plate 2.b Limestone turbidite from upper Units 4-8.
- Plate 2.c Finely interbedded shale and limestone unit.

- Plate 5.a Vug filled with luminescent ferroan burial cement, found in fine-grained, thin limestone beds of lower Unit 4-8.
- Plate 5.b Recrystallized limestone from the upper Wonoka Formation.
- Plate 5.c Shallow-water limestone showing meteoric and burial cements.
- Plate 5.d Fractured limestone with mudclast and peloid.

List of Tables

- Table 4.1 Summary of isotope values.
- Table 5.1 Summary of isotopic fractionation associated with dolomitization.
- Table 5.2 Summary of trace and major element analysis.
- Table 5.3 Summary of petrographic analysis.
- Table 5.4 Summary of least altered values.
- Table 6.1 Summary of present and previous investigations of the lower Wonoka Formation.
- Table 6.2 Positive isotope shift, magnitude and occurrence.
- Table 7.1 Summary of strontium isotope analysis.

List of Appendices

- Appendix 1. Analytical methods
- Appendix 2. Hand Specimen Descriptions
- Appendix 3. Thin-section Descriptions
- Appendix 4. XRD Mineralogy
- Appendix 5. Geochemical Results