

Data Repository Item 2003164, Isotopic results and analytical methods

Carbon and oxygen isotope analyses were carried out in laboratories at the University of Queensland (UQ) and the University of Michigan (UM). Samples (25–50 σ g) of carbonate were drilled from polished slabs using a microscope-mounted microdrilling apparatus and roasted under vacuum at 380°C for 1 h to remove volatile contaminants. Microsamples were reacted at 90°C (UQ) or 73°C (UM) with anhydrous phosphoric acid in individual reaction vessels of an online, automated carbonate device. At UQ, an automated Multiprep device was coupled to a Micromass Isoprime mass spectrometer; at UM, samples were analyzed using a system comprising a Kiel device and Finnigan-MAT 251 mass spectrometer. Oxygen isotope ratios were corrected for ^{17}O contribution (Craig, 1957) and are reported in permil (‰) relative to the Vienna Pee Dee Belemnite (VPDB) standard ($\zeta_{\text{CO}_2\text{-H}_3\text{PO}_4} = 1.008795$) (Table DR1). Precision is better than 0.1‰ for $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ values and was monitored through multiple analyses of National Bureau of Standards (NBS) 19 and 20, and other powdered calcite standards. Prior to analysis, sample mineralogy was determined petrographically and confirmed by XRD. Magnesite-rich samples were allowed to react up to 12 h at 90°C (UQ). Although complete liberation of CO_2 was not achieved for all magnesite samples, Aharon (1988) demonstrated that complete CO_2 evolution is not essential for obtaining reproducible isotope results from homogenous magnesite samples.

Table DR1: Carbon and oxygen isotope data from the Skillogalee Dolomite

| Sample ID | Stratigraphic | | $\delta^{13}\text{C}$ (‰ VPDB) | $\delta^{18}\text{O}$ (‰ VPDB) |
|-----------|---------------|------------------------|--------------------------------|--------------------------------|
| | Height (m) | Component | | |
| MSQ3-2 | 0.75 | Conglomerate clast | 4.2 | 0.9 |
| MSQ3-1 | 0.75 | Conglomerate clast | 6.3 | 0.2 |
| MSQ7B-1 | 3.50 | Cryptalgal dolostone | 5.3 | -1.1 |
| MSQ7B | 3.50 | Dolomicrite | 5.3 | -1.5 |
| MSQ7B-2 | 3.50 | Cryptalgal dolostone | 5.3 | -1.4 |
| MSQ7C-1 | 4.10 | Dolomicrite | 4.9 | -1.8 |
| MSQ7C | 4.10 | Dolomicrite | 5.1 | -0.9 |
| MSQ7C | 4.10 | Dolomicrite | 5.2 | -1.1 |
| MSQ8 | 4.60 | Dolomicrite | 5.4 | -2.0 |
| MSQ9 | 4.75 | Conglomerate clast | 4.9 | -2.9 |
| MSQ10-2 | 5.75 | Dolomitic stromatolite | 4.6 | -0.9 |
| MSQ10-1 | 5.75 | Dolomitic stromatolite | 4.7 | -0.5 |
| MSQ11 | 6.50 | Conglomerate clast | 6.7 | 1.9 |
| MSQ12-3 | 8.25 | Conglomerate clast | 4.6 | 0.8 |
| MSQ12-2 | 8.25 | Dolomicrite | 5.7 | -0.9 |
| MSQ12-5 | 8.25 | Conglomerate clast | 5.9 | -0.6 |
| MSQ12-4 | 8.25 | Conglomerate clast | 6.1 | -0.7 |
| MSQ13-3 | 9.30 | Cryptalgal dolostone | 2.7 | -2.2 |
| MSQ13-4 | 9.30 | Cryptalgal dolostone | 4.7 | -0.2 |
| MSQ13-1 | 9.30 | Cryptalgal dolostone | 5.1 | 0.0 |
| MSQ13-2 | 9.30 | Cryptalgal dolostone | 5.2 | 0.2 |
| MSQ14-2 | 10.00 | Dolomicrite | 5.3 | -0.6 |
| MSQ14-1 | 10.00 | Dolomicrite | 5.6 | -0.4 |
| MSQ21 | 42.85 | Conglomerate clast | 2.2 | -2.6 |
| MSQ21 | 42.85 | Conglomerate clast | 3.7 | -6.6 |
| MSQ22-1 | 51.35 | Dolomitic stromatolite | 3.9 | -0.1 |
| MSQ22-2 | 51.35 | Dolomitic stromatolite | 4.2 | -1.2 |
| MSQ29-1 | 58.10 | Cryptalgal dolostone | 4.5 | -1.8 |
| MSQ30-2 | 59.20 | Cryptalgal dolostone | 4.9 | -2.0 |
| MSQ30-1 | 59.20 | Cryptalgal dolostone | 5.0 | -1.9 |
| MSQ34-2 | 71.00 | Cryptalgal dolostone | 3.4 | -1.2 |
| MSQ34-1 | 71.00 | Cryptalgal dolostone | 3.4 | -0.8 |

References:

Aharon, P., 1988, A stable-isotope study of magnesites from the Rum Jungle uranium field, Australia: implications for the origin of strata-bound massive magnesites: *Chemical Geology*, v. 69, p. 127–145.

Craig, H., 1957, Isotopic standards for carbon and oxygen and correction factors for mass-spectrometric analysis of carbon dioxide: *Geochimica et Cosmochimica Acta*, v. 12, p. 133-149.