SPICE-SNICE couplet in one same section, precordillera of Argentina: C and Sr-isotope Stratigraphies

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Introduction

A large and global positive excursion of $\delta^{13}C$ (~+5‰) for the Steptoean stage, Upper Cambrian (SPICE) carbonates represents a major perturbation of the Cambrian carbon cycle at ~500Ma. In contrast, C-isotope variation curves for the Cambrian-Ordovician boundary in Australia and United States reveal a pronounced negative C-isotope excursion (-4‰) in the uppermost Cambrian (Sunwaptan stage). Both anomalies have been recognized in carbonates of the Precordillera, western Argentina: SPICE in the La Flecha Formation, Quebrada de La Angostura, and the negative anomaly (SNICE, acronym for Sunwaptan negative isotope carbon excursion [1]) in the La Flecha Formation, Quebrada de La Flecha.

Discussion of Results

In a continuous section at Quebrada de Juan Pobre, near San Juan town, 64 samples of the Zonda Formation (dolomitic limestones to dolostones) show $\delta^{13}C$ from -2‰ to + 1‰ while $\delta^{18}O$ varies from -7.9 to -4.9‰$_{PDB}$, with two important C-isotope excursions, interpreted as SPICE and SNICE. This finding indicates that Zonda Formation carbonates were mostly deposited during the Steptoean at the Quebrada de Juan Pobre, diachronically with the deposition of the La Flecha Formation carbonates at Quebrada de La Angostura near Guandacol. In this section, $^{87}Sr/^{86}Sr$ ratios (16 samples) are high and surprisingly consistent, even for dolomitic samples (0.70980 to 0.71088), within a range typical for the Upper Cambrian.

This study has confirmed that the Sunwaptan negative anomaly (SNICE), in the La Flecha Formation, Quebrada de La Flecha [1], is not an artifact and together with SPICE are important tools in refining the stratigraphy of the Upper Cambrian. Moreover, it confirms the diachronism of La Flecha and Zonda Formations in the Precordillera.

[1] Sial *et al*. (2008). *Gondwana Res.* **13**, 437-452.

Hydrological and atmospheric changes during the last 325 kyr in the tropical Indian Ocean

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The tropical areas of the Indian Ocean have unique circulation features and biogeochemical properties that may have played major roles in the global climate evolution. These areas have been undersampled and their climate feedbacks with higher altitude regions are largely unknown. Insight into the role of southern tropical regions within the global climate change have been obtained from the study of the variatons in content, distribution and molecular stable carbon isotope composition of marine and terrestrial biomarkers during the last three climate cycles in the South-east Indonesian region (Images core MD98-2165; 9°38′96 S, 118°20′31 E, 2100 m).

The observed distributions of terrestrial biomarkers (C_{23}-C_{33} *n*-alkanes and C_{20}-C_{32} *n*-alkan-1-ols) are typical of higher plant lipids disseminated into the ocean by aeolian transport. The most abundant homologues are C_{31} alkane and $C_{28}OH$. The C_{32} *n*-alkanol becomes an additional major homologue during the glacial times, suggesting an expansion of C_4 tropical plants associated to arid conditions [1]. The $\delta^{13}C$ values of these lipids allow distinguishing between different photosynthetic pathways and corroborates the origin of these lipids. The variations in the overall amount of these terrestrial biomarkers show a clear glacial-interglacial pattern with higher concentrations during glacial periods suggesting stronger wind regimes under glacial conditions.

Marine biomarkers (C_{37} alkenones) show algal lipids maxima during glacial periods. They correspond to characteristic upwellings found in this region. Sea surface temperature calculated through the $U^{K'}_{37}$ index shows a glacial-interglacial pattern with increases of 2-4°C during the deglaciations. Alkenone ($C_{37:2}$) $\delta^{13}C$ values range from -28 to -22‰ with slightly more negative values at the end of the deglaciations and in general during interstadials, which are also characterised by high contents of atmospheric CO_2.

[1] Ferrer, Grimalt & Spangenberg (2007) *Geochim. Cosmochim. Acta*, **71** (15), Suppl. S, A276-A276.