

# LATE ORDOVICIAN–EARLY SILURIAN TRANSITION IN THE PRECORDILLERA OF ARGENTINA: INSIGHTS FROM C-, N-ISOTOPE AND Hg CHEMOSTRATIGRAPHY

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High-resolution  $\delta^{13}\text{C}_{\text{org}}$ ,  $\delta^{15}\text{N}$  and Hg chemostratigraphic sections from three localities of the Argentine Precordillera were investigated. The sedimentary successions (carbonates, shales, siltites) in these sections have recorded the Ordovician–Silurian boundary (OSB, 443.7 Ma): (a) Los Baños de Talacasto, (b) Cerro La Chilca and (c) Villicum. The Sandbian and Katian stages are not represented in the first section, being Darriwilian limestones of the San Juan Formation unconformably overlain by conglomerates of the Hirnantian Don Braulio Formation. In the Cerro La Chilca section, the Don Braulio Formation is covered by Hirnantian–Rhuddanian carbonates of the La Chilca Formation. In the Villicum section, Hirnantian siltstones/shales with calcareous lenses bearing *normalograptus persculptus* and *talacastograptus leanzai* graptolites are overlain by Hirnantian–Rhuddanian yellowish/ocher bioturbated mudstones (12 m thick Ocher Member) and Rhuddanian ironstone and shales (1.5 m thick Ironstone Member) of the Don Braulio Formation.

A positive  $\delta^{13}\text{C}_{\text{org}}$  excursion was recorded at the late Hirnantian portion of the La Chilca Formation. In the Los Baños de Talacasto section,  $\delta^{13}\text{C}_{\text{org}}$  values around -26.2‰ and  $\delta^{15}\text{N}$  -4.13‰ were observed, while at the Cerro La Chilca,  $\delta^{13}\text{C}_{\text{org}}$  varies around -23‰ and  $\delta^{15}\text{N}$  ranges from 0 to -2‰, gradually decreasing upsection. Positive excursions of  $\delta^{13}\text{C}_{\text{org}}$  with values around -28.7‰ and of  $\delta^{15}\text{N}$  around 1.7‰ (with double peak) were recorded in Villicum. The positive  $\delta^{13}\text{C}_{\text{org}}$  excursion corresponds to the known positive  $\delta^{13}\text{C}_{\text{carb}}$  HICE excursion (+6‰ = HICE) detected in carbonatic rocks of the La Chilca Formation in the Cerro La Chilca section. Similar positive  $\delta^{13}\text{C}_{\text{org}}$  and  $\delta^{15}\text{N}$  excursions are known in stratigraphical sections that recorded the Ordovician–Silurian transition in China and Estonia. This suggests that the Ordovician–Silurian boundary was recorded in the lowermost La Chilca Formation in the Los Baños de Talacasto and Cerro La Chilca sections while at the Villicum section, it was recorded in the Don Braulio Formation.

$\Delta^{13}\text{C}$  for most samples in this study lie within -25 and -28‰, typical for photoautotrophs using C3 photosynthesis (e.g. cyanobacteria and marine algae). The nitrogen isotope data are mostly around 0‰ or moderately positive, favoring cyanobacteria (N-fixation directly from atmospheric N), and coincides with the C-isotopes (marine setting). Only the Don Braulio Formation has more negative values which match a glacial event.

The Ordovician–Silurian mass extinction is the only one among the big five Phanerozoic extinctions that does not seem to be related to volcanism. Hg enrichments in sections straddling geological time-boundaries in which mass extinctions occurred have been regarded as proxy for volcanism. On the other hand, higher Hg accumulation rates are much larger in sediments deposited after glacial maxima than in sediment layers deposited before that. Hg was analyzed in samples from the Los Baños de Talacasto and Cerro La Chilca

sections. Hg values ( $1 \text{ ng.g}^{-1}$ ) from the lowermost portion of the La Chilca Formation are Hg enriched ( $25 \text{ ng.g}^{-1}$ ) right after the OSB, probably related to the runoff increase after glaciation.

**PALAVRAS-CHAVE:** C AND N ISOTOPES; Hg CHEMOSTRATIGRAPHY;  
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