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Ordovician–Silurian transition recorded in the Argentine Precordillera: insights from C, N and Hg isotope chemostratigraphy

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Global geological processes that occurred during the Ordovician–Silurian transition (OST) were investigated exploring sections from the Argentine Precordillera (Cerro La Chilca, Baños de Talacasto and Villicum) which were deposited close to polar zones of Gondwana during the oldest Phanerozoic glaciation. C-N-Hg isotopes and redox-sensitive trace metal chemostratigraphy allowed to assess the relative importance of volcanism, glaciation, post-glacial sedimentation and extinction events during the OST. At Cerro La Chilca and Baños de Talacasto sections, Katian and early Hirnantian strata are missing. Hirnantian and Rhuddanian strata occur in the all three sections. At Cerro La Chilca, coeval positive $\delta^{13}C_{org}$ shift, Hg spike and $\Delta^{199}Hg \sim 0‰$ were recorded in the Sandbian Los Azules Formation, suggesting volcanic Hg loading. Coeval Hg/TOC spikes at the Baños de Talacasto and Villicum sections and $\Delta^{199}Hg \sim 0‰$ in the late Hirnantian (*M. persculptus* Zone) recorded the second pulse of the Late Ordovician mass extinction (LOME 2), for which volcanism was postulated as the cause of warming and anoxia. Another Hg/TOC spike in the early Rhuddanian at Baños de Talacasto and Villicum is coeval with slightly positive $\Delta^{199}Hg$ values, an enrichment related, perhaps, to an enhanced continental runoff that followed the Late Ordovician glacial cycle (LOGC-3). At the Cerro La Chilca, positive $\delta^{15}N$ values in the Sandbian suggest less intense water-column denitrification while negative nitrogen isotope values in the LOME 2 period indicate denitrifying conditions. At the Baños de Talacasto and Villicum sections, sea-level fluctuations and nitrogen upwelling helped shaping the $\delta^{15}N$ pathway within the LOME 2 and early Rhuddanian intervals, with negative $\delta^{15}N$ values attesting that conditions became less reducing closer to the OST. The odd-MIF Hg isotope pattern within the LOME 2 time interval was probably induced by coeval volcanism, glaciation and sea-level fall, and in the early Rhuddanian by deglaciation and sea-level rise.