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Paleoclimatic changes during the early Cretaceous (Hauterivian-Cenomanian): evidence from multistratigraphic records

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We investigated Hauterivian-Albian hemipelagic successions from the Dolomites in northern Italy for nanno- (calcareous nannofossis, dinoflagellates), micro- (foraminifera), and macrofossil groups (ammonoids, belemnoids, bivalves, brachiopods, echinoids); and for carbon and oxygen stable isotope signatures. Paleomagnetic and geochemical analysis are combined to detect the early Cretaceous history of environmental changes, as displayed by the sea-level and climatic fluctuations on the Trento Plateau. An integrated biostratigraphic approach including high-resolution magnetostratigraphic sampling was chosen.

Oxygen isotope values from the early Cretaceous Puez Formation show a decreasing trend throughout the log, from -1.5‰ in the Hauterivian to -4.5‰ in the Albian/Cenomanian. The decreasing values mirror an increasing trend in paleotemperatures from ~ 15-18°C in the Hauterivian up to ~ 25-30 °C in the Albian/Cenomanian. We relate the remarkable warming trend to the initiation of Super-Greenhouse climatic conditions enduring the mid-Cretaceous, Albian interval. Similar isotopic trends allow the correlation of the early Cretaceous succession form the Dolomites with other parts of the world, and provide insights on the paleoclimatic evolution of Tehyan water masses at that time. A biostratigraphic subdivision, based on ammonoids, is proposed for the Lower Cretaceous pelagic to hemipelagic succession of the Puez area (Southern Alps, Italy). It also highlights the paleoenvironmental evolution of basins and plateaus and provides insights into the faunal composition and distribution within the investigated interval. The intermediary paleogeographic situation of the Puez region during the Lower Cretaceous serves as a key for the understanding of the Mediterranean ammonite distribution.