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The Late Triassic Carnian Pluvial Episode: carbon-cycle disruption, climate change, and biotic turnover.

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Among the most significant global climate changes recorded in the Mesozoic, the Carnian Pluvial Episode (CPE) represents a topic gathering increasing attention in recent years. It consists of a climate change from arid to markedly humid conditions, recorded worldwide in Carnian stratigraphic successions.
The CPE involved multiple spheres of the Earth System, producing interlinked variations. Increasing of runoff led to high siliciclastic input in marine sedimentary basins and to changes of depositional systems. Physicochemical characteristics of seawater rapidly changed (e.g. initial anoxic conditions, sea-surface warming, fluctuation on CCD). A shift from xerophytic to hygrophytic pollens associations at different latitudes, the most severe decline in microflora diversity after the end Permian mass extinction, and widespread resin production are documented in the geological record, as well as the radiation of modern conifers and benettitales. Biological turnover occurred both among marine groups (important groups of crinoids either completely disappeared or severely declined; 70% of conodont genera became extinct; the dominant ammonoid group (Trachyceratinae) almost disappeared), and on terrestrial vertebrate fauna. The CPE is also linked to some important radiations, such as the first major radiation of dinosaurs, and the appearance of calcifying plankton. Sudden changes in carbonate factories led to the temporary demise of high-relief carbonate platforms, especially in the Tethyan Realm, causing drastic variations in sedimentary systems and in the Upper Triassic stratigraphic architecture.
Organic carbon-isotope records from the Southern Alps (Italy), Northern Calcareous Alps and the Transdanubian Range (Hungary) show multiple negative δ13C excursions during the CPE, suggesting repeated (at least four) injection of isotopically light carbon into the Carnian ocean–atmosphere system over a time interval of > 1 million years, in agreement with has been recently documented from continental succession of Europe. This together with a refined biostratigraphy give the opportunity to understand the links between the carbon-cycle perturbations and the palaeoclimatic and biological changes that mark the CPE. As it stands, eruptions of a Large Igneous Province (Wrangellia) and releases of submarine clathrates are best candidates to explain the geochemical, sedimentological, and palaeontological changes observed during the CPE.