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# Temporal constraints on the development of Urgonian-type limestones in the western Tethys: New insights from high-resolution strontium isotopes stratigraphy

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Dating uncertainties has so far hampered linking the widespread development of Early Cretaceous Urgonian-type limestones along the western Tethys margin with changes in environmental and oceanographic conditions. This is mostly due to the existence of two conflicting orbitolinid biostratigraphic schemes, which can lead to deviations in age attribution in the order of up to 5 Myr. Despite 30 years of biostratigraphic research, reconciling these two opposing schemes has so far been proven problematic, mostly due to the absence of ammonite findings within Urgonian-type limestones.

In order to shed new light on this challenging question, we have sampled at a high stratigraphical resolution low-Mg calcite rudist shells from a key Urgonian section at Gorges-du-Nan (SE France), where the two distinct orbitolinid biostratigraphic schemes have been previously applied. After thorough diagenetic screening, the best-preserved rudists were analysed for their stable strontium isotopes composition and the results compared to the high-resolution, ammonite calibrated, marine strontium-isotopes curve for the Hauterivian–Aptian interval. Our strontium isotopes stratigraphic framework unambiguously demonstrates that the Urgonian limestones exposed at Gorges-du-Nan cover the Late Barremian – earliest Aptian time interval, in strong contradiction to one of the two orbitolinid biostratigraphic schemes postulating that the bulk of Urgonian-type carbonate platform deposition occurred during the Late Hauterivian – Early Barremian. Therefore, our results fundamentally question the validity of the latter orbitolinid scheme.

Based on our new integrated stratigraphic scheme, it appears clear that the widespread development of Urgonian-type limestones in the Vercors area and further north along the northern Tethyan margin was coeval to a period of relatively low nutrient levels and well-oxygenated seawater that might have promoted the development of this photozoan-dominated carbonate factory. Our approach in general, as well as the here presented results in particular, provides a solid fundament for a high-resolution, and temporally well-constrained, shallow-water palaeotemperature study based on rudist oxygen-isotope analysis.