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Strontium-isotope stratigraphy of Tethyan Late Cretaceous carbonate platforms: Numerical ages constrain the evolution of major carbonate producers

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Strontium-isotope stratigraphy (SIS) is based on secular changes in the strontium-isotope composition of seawater that can be derived from pristine skeletal calcite. As the strontium-isotope composition of seawater is globally uniform, the precise ammonite-based stratigraphy of sequences that were used to establish the curve for the Late Cretaceous can be applied for the stratigraphical correlation of carbonate platforms. Precision of numerical ages derived from SIS for the Late Cretaceous is in the range of 0.5 – 1.0 mil. years and thus significantly better than zonations using benthic foraminifers, or indirect correlation with plankton-bearing pelagic deposits.
In this contribution, numerical ages derived from more than 80 localities from the Caribbean to Oman are evaluated, with a focus on the central-eastern Mediterranean and the Arabian Plate. Stratigraphical ranges for species of rudist bivalves and a biozonation based on species ranges is established from this database for the Late Turonian – Maastrichtian.
In the central-eastern Mediterranean, diversification was rapid in the Turonian – Santonian. Biostratigraphical precision is further enhanced by phyletic size increase that has been demonstrated for several Coniacian - Santonian species. The origination of new taxa was subsequently restricted largely to the Arabian Plate, with limited faunal exchange with the central Mediterranean during the Campanian and Maastrichtian.
Rudist formations are typically found in the transgressive and highstand phases of sedimentary sequences, and their temporal distribution should therefore indicate third order sea-level change. In fact, clusters of occurrences are observed across different tectonic plates. A mid-Campanian extinction phase is related to significant sea-level fall.
The numerical ages presented here have important implications for the ranges of larger benthic foraminifers that typically co-occur with rudists at the localities studied. Many taxa that are conventionally considered as markers for the Maastrichtian (e.g. Loftusia) occurred as early as in the mid-Campanian.