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A multi-proxy approach for correlating shallow marine carbonate successions in the Oligocene-Miocene Mediterranean region with global chronostratigraphy

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In most neritic carbonates time resolution does not allow exact correlation with chronostratigraphic standards since these are, especially for the Cenozoic, defined in deep marine successions. A critical time interval in the Cenozoic is the Oligocene–Miocene transition for which most GSSPs are defined in deep marine sections in the Mediterranean region. However, a sound correlation with shallow water carbonate systems is still missing. A possible candidate for such a correlation is the Decontra section on the Maiella Platform (central Apennines, Italy). The widely continuous carbonate succession is composed of larger benthic foraminiferan, bryozoan and corallinacean limestones interbedded with planktic foraminiferal carbonates representing a mostly outer neritic setting. Integrated multi-proxy and facies analyses indicate that $CaCO_3$ and TOC contents display only local to regional processes on the carbonate platform and are not suited for stratigraphic correlation on a wider scale. In contrast, new biostratigraphic data (planktic and larger benthic foraminifers) allow correlating the Decontra stable C isotope record to the global deep sea C isotope record. This links relative sea level fluctuations, which are reflected by facies and magnetic susceptibility (MS), to third-order eustatic cycles. In addition, observed low frequency cycles in the MS record were used to orbitally tune parts of the Decontra section with the 400ky-eccentricity-cycles which correlate well with the ages defined by both bio- and sequence stratigraphy. Time series analyses of gamma-ray (GR) data indicate that the 400ky-cycle is well preserved in this proxy during the interval between $\sim$17 and 13.5 Ma. Since GR is a direct proxy for raised precipitation of autogenic Uranium caused by increased burial of organic carbon it follows the same long-term orbital pacing as observed in deep-sea carbon and oxygen isotope records. The observed 400ky GR beat is thus assumed to correlate with the carbon isotope maxima observed during the "Monterey event". The cyclicities detected in both MS and GR data allow, within a well constrained bio-, sequence- and isotope stratigraphic framework, a much more precise correlation of the Decontra section with deep sea records of the Mediterranean region.