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Astrochronology of the Mediterranean Early and Middle Miocene

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An accurate high-resolution astronomical time scale is of crucial importance in Earth Sciences. It allows not only to reconstruct astronomical climate forcing but also to precisely date geological events, to determine rates of changes, and to discriminate between cause and effect related to fundamental processes controlling Earth's history. The accuracy, precision and resolution of the geological time scale for the Neogene have improved considerably over the last decades, thanks to the combination of an integrated stratigraphic approach and astronomical tuning, which resulted in the "Astronomically Tuned Neogene Time Scale" (ATNTS2004, ATNTS2012). The most recent ATNTS2012 (Gradstein et al. 2012) includes direct astronomical ages for chron boundaries back to ∼15 Ma based on the tuning of marine successions from the Mediterranean. Reversal ages for the interval between 15 and 23 Ma were calculated from a seafloor-spreading-rate history model in combination with limited astronomical control.
Completing the Neogene time scale should be exclusively based on deep marine sections. The most suitable section in the Mediterranean is the Monte dei Corvi-La Vedova-Spiaggia della Scalaccia composite section near Ancona in Italy as an integrated stratigraphy and astronomical tuning has been established for the Late to Middle Miocene interval (Hüsing et al. 2007, 2009, 2010, Mourik et al. 2010, Turco et al. 2011). The resultant astronomically tuned reversal ages have already been incorporated into the GTS (Gradstein et al. 2012). The section has now been further extended into the Early Miocene along the cliffs near Ancona (Spiaggia della Scalaccia composite section). We will present our high-resolution integrated stratigraphy including cyclostratigraphy, biostratigraphy, magnetostratigraphy, colour and elemental proxy records. The sedimentary cycle pattern is very complex in this interval, and we thus use the detailed colour and elemental proxy records to achieve a match with an astronomical target curve, which is different to the nominal astronomical solution. The astronomical tuning in turn provides accurate numerical ages for reversal boundaries, which, we suggest, should replace the existing ages in the ATNTS2012.