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Integrated stratigraphy of the Smirra Coring: a new reference sedimentary record for the early Paleogene from the Umbria-Marche Basin (Northern Apennines, Italy)

Antonio Turtù (1,2), Vittoria Lauretano (1), Rita Catanzariti (3), Simone Galeotti (4), Luca Lanci (2,5), Matteo Moretti (4), and Lucas J. Lourens (1)

(1) Utrecht University, Earth Sciences Department, Utrecht, Netherlands (a.turtu@uu.nl), (2) Alpine Laboratory of Paleomagnetism (ALP), Peveragno (CN), Italy, (3) Istituto di Geoscienze e Georisorse, CNR, Pisa, Italy, (4) Dipartimento di Scienze della Terra, della Vita e dell'Ambiente, University of Urbino, Urbino, Italy, (5) Department of Base Science and Fundamentals, University of Urbino, Urbino, Italy

The early Paleogene represents a critical time interval in Earth's history characterized by prolonged greenhouse conditions, culminating in a series of extreme global warming events (i.e. hyperthermals), as well as large uncertainties in the Geological Time Scale. Therefore new, high-resolution, geological records are crucial in providing novel constraints on these topics.
The Paleogene Umbria-Marche sections of the Northern Apennines (Italy) have shown to be suitable for integrated stratigraphy allowing regional-to-global correlations and environmental reconstructions across this time interval. Among several well-known sections, a new sedimentary record is provided by the Smirra Coring, which recovered an undisturbed sequence of rocks (∼120 m from 4 overlapping holes) spanning the upper Scaglia Fms. (early Paleocene - middle Eocene) of the Umbria-Marche pelagic succession.
Here we present a new, high-resolution, integrated stratigraphic framework (magnetostratigraphy, calcareous nannofossil biostratigraphy, physical properties, calibrated XRF core scanning and cyclostratigraphy) of the ∼93 m composite section drilled in Smirra Holes 1 and 2. The succession extends almost continuously, with modest tectonic disturbance affecting its lowermost part with minor faulting. The resulting magnetic stratigraphy defines a succession of normal and reversed polarity magnetozones. The correlation of the paleomagnetic polarity sequence with the latest Geomagnetic Polarity Timescales (GPTSs; e.g. CK95, GTS 2004 and 2012), also constrained through nannofossil biostratigraphy, shows that the section spans the late Paleocene – middle Eocene from chrons C21n (∼46 Ma) to C26r (∼60 Ma). The overall sedimentation rates computed at Smirra are fully comparable with those from coeval sections from the Umbria-Marche Basin, ranging from ∼10 m/Ma, between chrons C21n and C22n, to ∼6 m/Ma, between chrons C22r and the base of the section. However, the sedimentation rates vary considerably depending upon the GPTSs used for their computing: this highlights major discrepancies in existing time scales mainly involving the duration of chron C23 as well as the duration of subchrons within C23n and C24n. Thus, the cyclostratigraphic investigation of the high-resolution proxy records (i.e. Magnetic Susceptibility, XRF-Fe and –Ca counts) acquired from the Smirra cores provide new constraints for the early Paleogene chronostratigraphy as well as more insights into the sedimentary response to orbital forcing.