

Integrated biostratigraphy and geochronology of sedimentary successions in the East Pisco Basin that crop out on the western side of the Ica River Valley (Ocucaje, Peru)

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Fossil marine vertebrates are abundant and well preserved in the sedimentary succession in the East Pisco Basin that Dunbar *et al.* (1990) and DeVries (1998) divided into four unconformity-bounded units: the middle-upper Eocene Paracas Formation, the uppermost Eocene-lower Oligocene Otuma Formation, the uppermost Oligocene-lower Miocene Chilcatay Formation, and the upper Miocene-Pliocene Pisco Formation.

During the Italian PRIN project, accurate field mapping (Di Celma *et al.*, 2016a and b, 2017) and detailed measurement of outcrop sections enabled the collection of sediment and volcanic ash samples for biostratigraphic and Ar-Ar dating (Gariboldi *et al.*, in press).

Calcareous nannofossils now constrain the Eocene section to Zones NP18-20 with the FO of *Isthmolithus recurvus* occurring at mid-section, which is consistent with the rare silicoflagellates, including *Naviculopsis foliacea*, that are present. Silicoflagellates assigned the base of the Chilcatay Formation to the early Miocene, so upper Oligocene deposits are missing in the study area. The lower lithogenic portion is assigned to the silicoflagellate *Naviculopsis ponticula* Zone (19–18Ma), which is consistent with the presence of *Discoaster druggii* among the rare calcareous nannofossils, the diatom *Raphidodiscus marylandicus* (LO at ~16.7Ma), and Ar-Ar dating

of 18.80 ± 0.06 Ma. The upper diatomaceous portion is assigned to the silicoflagellate *Cannopilus schulzii* Subzone (18–13.5Ma) of the *Corbisema triacantha* Zone, and the diatoms *Coscinodiscus lewisianus* and *Cestodiscus pulchellus* confirm an upper age of >14Ma. The scarce calcareous nannofossils are represented by long-ranging Oligocene-Miocene species, and *Helicosphaera carteri* (FO at ~23Ma) is the youngest species present. Ar-Ar dating of an ash layer close to the section top provided an age of 17.99 ± 0.10 Ma (Di Celma *et al.*, 2017). The overlying Pisco Formation has been recently subdivided into three unconformity-bounded depositional sequences (P0, P1, and P2, from oldest to youngest; Di Celma *et al.*, 2017) and constrained by diatoms and Ar-Ar dating (Gariboldi *et al.*, in press) to <17Ma, 9.5–8.5Ma, and 8.5–6.71Ma, respectively. No calcareous nannofossils and rare silicoflagellates were observed in the diatomaceous Pisco Formation.

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