

The potential of chemical fingerprinting of tephra for stratigraphic correlations in the fossil Lagerstätte of the Pisco Formation (Peru)

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The upper Miocene Pisco Formation (Peru) represents a world-known fossil Lagerstätte containing abundant and exceptionally well-preserved marine vertebrates. A detailed chronostratigraphic reconstruction is indispensable to study this fossil record and to understand the evolution of marine vertebrates. Recent work (Bianucci et al., 2016; Di Celma et al., 2016; Gariboldi et al., in press) in the area of the western Ica River Valley defined a detailed chronostratigraphic framework for the Pisco Formation, containing all the fossil vertebrates observed in the area. Such chronostratigraphic framework, based on new $^{40}\text{Ar}/^{39}\text{Ar}$ ages on biotite from tephra layers integrated with diatom biostratigraphy, implements previous scattered radiometric data (Brand et al., 2011; Esperante et al., 2015). Tephra layers representing primary air-fall deposition of volcanic ash from the Peruvian Andes volcanoes are very frequent in the Pisco Formation. Several of them do not show evidence of reworking or bioturbation. Due to their regional dispersal and to their geologically instantaneous deposition (Lowe, 2011), they provide the opportunity not only to date specific layers, when suitable for radiometric age determination, but also to correlate different localities, through the chemical fingerprinting of tephra.

We collected more than 200 tephra layers from different localities in the Ica Desert along six measured stratigraphic sections. Based on the estimated stratigraphic position, we analyzed specific tephra layers through petrographic characterization, glass shard morphology, electron probe microanalyses of glass shards and, where present, biotite crystals. Despite some difficulties encountered, such as similar magma or mineral composition, local weathering, lack of record due to marine current transport and change in depositional environments among different localities, the correspondence of the obtained data allowed to verify correlations that were supposed during field work and to trace tephra layers from distant outcrop localities, allowing to refine the chronostratigraphy of the Pisco Formation in the western Ica River Valley.

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Lowe D.J. (2011) *Quaternary Geochronology*, 6: 107-153.