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Provenance of Holocene beach sand in the Western Iberian margin: the use of the Kolmogorov–Smirnov test for the deciphering of sediment recycling in a modern coastal system

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ABSTRACT

Detrital zircons from Holocene beach sand and igneous zircons from the Cretaceous syenite forming Cape Sines (Western Iberian margin) were dated using laser ablation – inductively coupled plasma – mass spectrometry. The U–Pb ages obtained were used for comparison with previous radiometric data from Carboniferous greywacke, Pliocene–Pleistocene sand and Cretaceous syenite forming the sea cliff at Cape Sines and the contiguous coast. New U–Pb dating of igneous morphologically simple and complex zircons from the syenite of the Sines pluton suggests that the history of zircon crystallization was more extensive (*ca* 87 to 74 Ma), in contrast to the findings of previous geochronology studies (*ca* 76 to 74 Ma). The U–Pb ages obtained in Holocene sand revealed a wide interval, ranging from the Cretaceous to the Archean, with predominance of Cretaceous (37%), Palaeozoic (35%) and Neoproterozoic (19%) detrital-zircon ages. The paucity of round to subrounded grains seems to indicate a short transportation history for most of the Cretaceous zircons (*ca* 95 to 73 Ma) which are more abundant in the beach sand that was sampled south of Cape Sines. Comparative analysis using the Kolmogorov–Smirnov statistical method, analysing sub-populations separately, suggests that the zircon populations of the Carboniferous and Cretaceous rocks forming the sea cliff were reproduced faithfully in Quaternary sand, indicating sediment recycling. The similarity of the pre-Cretaceous ages (>*ca* 280 Ma) of detrital zircons found in Holocene sand, as compared with Carboniferous greywacke and Pliocene–Pleistocene sand, provides support for the hypothesis that detritus was reworked into the beach from older sedimentary rocks exposed along the sea cliff. The largest percentage of Cretaceous zircons (<*ca* 95 Ma) found in Holocene sand, as compared with Pliocene–Pleistocene sand (secondary recycled source), suggests that the Sines pluton was the one of the primary sources that became progressively more exposed to erosion during Quaternary uplift. This work highlights the application of the Kolmogorov–Smirnov method in comparison of zircon age populations used to identify provenance and sediment recycling in modern and ancient detrital sedimentary sequences.

