U-Pb zircon ages and provenance of Quaternary sands: first results for Algarve (Portugal)

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The mineralogical composition of beach sands results from several factors the most important of which are the composition of the source rocks and mixing by coastal processes. Since the pioneering work of Trask (1952) who used augite as a mineral tracer, the study of the heavy mineral assemblage of beach sands have been used to determine sediment sources and to characterize sediment transport and mixing. This is important not only to reconstruct the evolution of hydrographic networks but also to help in understanding ongoing and evolving coastal processes. However, specific mineral tracers are seldom found in most beaches and physicochemical characteristics of heavy mineral assemblages are often difficult to relate to specific sources. In contrast, the crystallization age of single zircon grains, a common constituent of heavy mineral assemblages is a direct indication of the age of the source rock. Although traditionally used for precise dating of geological events such as magmatism and metamorphism, U-Pb dating of zircon has been shown to be a valuable tool in studies of sediment provenance (Machado & Gauthier 1996, Machado *et al.* 1996, Fernandez-Suarez *et al.* 2000). Here we report preliminary results from a feasibility study of using U-Pb ages of zircon from Pliocene-Pleistocene formations and Holocene beach sands from the central Algarve (Portugal) to determine their provenance.

The ages of 103 zircon grains range between 310 Ma and 3.18 Ga. Most grains yielded ages between 310 Ma and ca. 800 Ma, a smaller proportion yielded ages between 1.8 Ga and 2.1 Ga and the least abundant are between 2.69 Ga and 3.18 Ga. No correlation was found between zircon ages and stratigraphic position suggesting that the same sources or sources with identical ages have been available through the Pliocene and the Pleistocene. However, Archean zircons were found exclusively in beach sands even in those that are presumably derived from the adjacent cliffs composed of Plio--Pleistocene detrital formations. As this was found at three locations, it may indicate that Archean zircons have a different source. A brief overview of the lithostratigraphy of southern Portugal reveals the absence of significant magmatic and metamorphic events that could produce zircon-bearing rocks. Rather, it shows that detrital zircon from the Paleozoic flysch units could have been through sedimentary cycles during the Triassic, the Cretacic and the Cenozoic and are undergoing further recycling in the Holocene beaches. Therefore, most detrital zircons are probably derived from Paleozoic flysch, which is compatible with the observation that the most frequent heavy minerals found in both the Holocene beaches and the Plio-Pleistocenic rocks are staurolite and andalousite typical of low- grade schists. This work illustrates the application of U-Pb dating of individual detrital zircon grains to investigate the sources of Plio-Pleistocene detrital formations and of Holocene sands of Algarve. The results suggest that these units comprise both newly liberated and recycled detritus derived mainly from the extensive Paleozoic flysch sequences of the Southern Portuguese Zone.

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