The Durkan Complex in the western Makran Accretionary Prism (SE Iran): Evidence for a Late Cretaceous tectonically disrupted oceanic seamount

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The Makran Accretionary Prism (SE of Iran) represents the less known segment of the Alpine-Himalayan orogenic system. It results from the Cretaceous to present-day convergence between the Arabian and Eurasian plates that was accommodated by the northward subduction of the Neotethys Ocean below the southern margin of Eurasia. As a peculiar feature, the Makran is the only segment of the Alpine-Himalayan orogenic system, in which subduction is still active. The North Makran is the innermost structural domain of the accretionary wedge. It consists of distinct complexes and tectonic units representing remnants of the Cretaceous-Paleocene accretionary-subduction phases. Among these, the Durkan Complex consists of several tectonic units, which include deformed Early Cretaceous-Paleocene carbonatic and volcanic successions, as well as rare Carboniferous, Permian and Jurassic slices of platform limestones. The Durkan Complex is commonly interpreted as representing the disrupted sedimentary cover of the passive margin of a micro-continent known in literature as the Bajgan-Durkan Complex. However, its stratigraphic succession, as well as the age and geochemistry of the volcanic rocks are still poorly known. Nevertheless, such data are fundamental for constraining its meaning for the pre-Eocene geodynamic evolution of the Makran Accretionary Prism. For this reason, we present new stratigraphic and petrological data on the westernmost sector of the Durkan Complex.

Our data show that the Durkan Complex includes distinct tectonic slices showing both slightly metamorphic and non-metamorphic highly-deformed stratigraphic successions. Stratigraphic data allow us to recognize three main types of successions. Type I consists of an alternation of pillow lavas and Albian-Cenomanian pelagic shales and radiolarites. Type II consists of pillow and massive lavas with minor volcanioclastic arenites grading up to an alternation of volcanic and volcanioclastic rocks and Cenomanian pelagic limestones and shales. Local intercalations of mass-transport deposits are common, particularly in the upper part of the sequence. Type III consists of pillow lava flows, volcanic breccia, and volcanioclastic sandstone overlain by an Albian-Cenomanian carbonatic platform. All these successions are stratigraphically overlain by a post-Cenomanian
pelagic and hemipelagic sequence. Ages were determined by foraminifera and radiolarian biostratigraphy. The volcanic rocks in the distinct successions show similar geochemical features. They consist of basalt and minor trachybasalt showing alkaline affinity with high Nb/Y ratios (0.62 – 4.4), as well as marked LREE/HREE enrichment. The overall geochemical features of the rocks are comparable with those of alkaline oceanic within-plate basalts and plume-type MORBs.

In summary, our data show that the rock assemblages of the Durkan Complex represent the remnants of a seamount rather than remnants of continental margin successions, as it was previously described. The distinct successions of the Durkan Complex show tectono-stratigraphic features that can be reconciled to the cap (Type III), the slope (Type II), and the foothill (Type I) of a typical seamount environment. Finally, our new findings and regional-scale comparisons suggest that the Late Cretaceous alkaline magmatic pulse recorded in the Durkan Complex was likely related to mantle plume activity in the Makran sector of the Neotethys.