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Processes of seamount materials accretion in subduction complexes: The example of the Durkan Complex (Makran Accretionary Prism, SE Iran)

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Seamounts are topographic highs of the oceanic plates, and they are passively carried toward convergent margins where they may interact with the frontal part of the subduction complexes, modifying their shape and influencing the operating tectonic processes. In this tectonic setting, seamount fragments can be transferred from the subducting plate to the accretionary prism with different mechanisms, including deformation within the subduction channel, accretion via decapitation of the seamount summit by the basal décollement of the prism, and offscraping and underplating of thrust-bounded assemblages at both shallow (4-8 km) and deep (20-30 km) structural levels of the prism. In this complex tectonic scenario, it is not completely clear which are the factors controlling deformation mechanisms and localization of the basal décollement below, inside, or above the subducting seamount. Detailed geological mapping, stratigraphic-structural analysis and petrological studies are promising tools to better understand the mechanism of seamount materials accretion, providing data to recognize the role of subducting seamounts for the geodynamic evolution of exhumed accretionary and collisional orogenic belts.

We present here new structural and thermobarometric data on the Durkan Complex to discuss how Late Cretaceous seamount materials has been accreted into the Makran accretionary prism (SE Iran) during the Late Cretaceous – Paleocene subduction-accretionary stages. Throughout a map- to micro-scale structural studies of the western part of this Complex, we describe its structural and tectono-metamorphic evolution using crosscutting relationships between structural elements and stratigraphic unconformities.

Our results indicated that seamounts material has been incorporated in the prism as imbricated tectonic units separated by NNW-striking thrust zones. During the accretion, seamounts successions are folded by sub-isoclinal folds, associated with a blueschist facies axial plane foliation and shear zones along the limbs. These shear zones show block-in-matrix fabric and are mainly composed of volcaniclastic material from the seamount slope successions indicating that

the seamount stratigraphy play a key role in controlling the position of the basal décollement of the prism during underplating. Thermobarometric estimates indicate that the accretion took place at T = 160-300 °C and P = 0.6-1.2 GPa, corresponding to a depth of 25–40 km. This data indicates the incorporation of seamount materials via underplating at blueschist facies conditions within the Makran subduction complex. The folds and shear zones formed during the accretionary stage are later deformed by open to close folds associated with normal faults, recording the progressive exhumation of the accreted seamount materials at shallower levels of the Makran Accretionary Prism. The unconformable deposition of upper Paleocene – Eocene turbiditic successions onto the exhumed seamount materials of the Durkan Complex constrain the accretionary stages during the Late Cretaceous – early Paleocene evolution of the Makran Accretionary Prism.