

Pinpointing the temporal evolution of an intra-oceanic arc system: The case of the Kohistan arc complex

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The Kohistan Arc complex (KAC), in northern Pakistan, represents the exhumed section of an island arc formed within the Neo-Tethys ocean during the Mesozoic. This complex has been obducted during the Late Cretaceous-Palaeocene onto the Indian plate along the Indus Suture. Lower to mid-crustal level rocks of the Jijal and Patan-Dasu metaplutonic complexes represent the plutonic roots of the KAC section studied, accreted during the ~115-85 Ma time interval. The Jijal sequence, the deepest exhumed part of the KAC, is subdivided into a basal ultramafic section and an upper gabbroic zone of granulite facies rocks. The Patan-Dasu metaplutonic complex, more than 22km-thick, is mainly composed of gabbros and amphibolites more or less metamorphosed. Field and petrological investigations combined with detailed Sr-Nd-Pb isotopic and REE analyses performed on whole rocks, plagioclase and clinopyroxene from representative samples across the Jijal and Patan-Dasu sequences allow us to propose a three-stage geodynamical model covering the complete arc evolution through ~30 Ma. The present work is mainly focused on the temporal constraints of this model. The “in-situ” LA-ICPMS U-Pb analyses have been performed on zircons separated from the different lithologies belonging to the three identified steps of the KAC evolution and they provide temporal constraints of the main stages of this model. The model starts with the onset of the subduction at 118±7 Ma [1, 2] and is followed by the building of the volcanic arc. The 2nd stage corresponds to a major thermal event, characterized by abundant magma underplating and by granulitisation of the arc base at 95.8±1.3 Ma. The last stage, between ~95 and 88 Ma seals the end of the intra-oceanic subduction and corresponds to a limited magmatic period. A voluminous, but short, magmatic pulse occurred at ~88-80 Ma and corresponds to the Chilas complex emplacement.

References

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Temporal evolution of the Cabo Verde archipelago: New constraints from ⁴⁰Ar-³⁹Ar data

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The Cabo Verde archipelago, located in the Atlantic between 15 and 17°N, is composed of 10 principal volcanic islands forming two lineaments converging eastward (the Northern and Southern Islands). It occurs over the Cabo Verde Rise, an oceanic mega-swell, considered as the result of a mantle plume (Montelli *et al.* 2006). Those two groups of islands have been considered distinct based on the geochemical (elemental and isotopic) characteristics of the magmatic rocks (Gerlach *et al.*, 1988; Doucelance *et al.*, 2003). Morphological observations and historical volcanic activity argue in favour of a westward migration of the magmatism during the last 20 Ma. However, to date, the age progression of the Cabo Verde islands has not been yet clearly demonstrated by detailed geochronological studies at the scale of the whole archipelago.

We present here 15 new ⁴⁰Ar-³⁹Ar ages obtained on volcanic rocks from São Vicente, São Nicolau, Northern Islands, on one hand, and from Santiago, Southern Islands, on the other hand. Analyses were performed on whole rock samples for which chemical and isotopic characteristics have been previously studied in details. ⁴⁰Ar-³⁹Ar ages range from 6 Ma to 700 ka, from 2.6 Ma to 700 ka and from 3.8 to 1.5 Ma in São Vicente, São Nicolau and Santiago, respectively. Together with previous published ⁴⁰Ar-³⁹Ar and K-Ar studies, these new geochronological results show that the age distribution cannot only be related to the spatial distribution of the islands along the Northern and the Southern segments. We will discuss the temporal evolution of volcanic activity considering the following spatial scales: 1) single island, 2) Northern and Southern segments, 3) whole archipelago.

References

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