Ophiolites Associated with Suture Zones of the Collisional System between India and Eurasia: a Synthesis

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Reinvestigation of the Yarlung Zangbo Suture Zone (YZSZ) and other similar sutures occurring within the India-Eurasia collisional system has shown that they are very complex in terms of geochronology and metamorphic and igneous history. YZSZ comprises rocks from as old as Late Devonian to rocks as young as mid-Miocene. Metamorphic facies vary from high-grade to very-low grade. Late Devonian rocks (363.7 ± 1.7 Ma) are alkalic gabbros resulting from activity of a plume active within the Paleo-Tethys. The Permian and Triassic rocks are limestone associated with radiolarite showing affinities with Indian continental margin and deep Tethyan ocean floor, respectively. Two ophiolite sub-groups are recognized. Sub-group I is mid- to late Jurassic (150-177 Ma) in age and ill-defined because only few sequences have been found and studied so far. It is probably derived from the destruction of a marginal basin comprising intra-oceanic arc and fore-arc settings. The Spontang and Zedong sequences are type-examples. Sub-group II is Lower Cretaceous in age (120-130 Ma) and represents the destruction of a large-scale suprasubduction environment comprising marginal basins, arcs, and back-arc systems. These ophiolites are spatially associated with ophiolitic mélanges and flysch respectively representing the reworking of the Cretaceous ophiolites and Indian continental margin and part of the Neo-Tethyan ocean floor. Most ophiolitic sequences found in suture zones belong to sub-group II such as Yungbwa, Xiugubagu, Saga, Xigaze, etc... Amphibolite and garnet amphibolite blocks (123-130 Ma) found within the ophiolitic mélange share the same geochemical attributes with sub-group 2 ophiolites. Their protoliths were probably generated within a back-arc spreading center and metamorphosed in a nascent subduction zone at around 50 km depth. Some radiometric ages suggest events at 80 Ma and 90 Ma represent the entry of Indian continental margin into the intra-oceanic subduction zone and/or obduction of ophiolites. However these ages seem to be very rare throughout the whole suture zone and are therefore considered as resulting from local metamorphic events. Some alkalic igneous rocks (131-144 Ma) within the flysch could represent Kerguelen OIB plume products. The study of igneous blocks and the sedimentary matrix suggests a continuous passive-margin model. The Miocene (11-17 Ma) post-collisional ultrapotassic rocks discovered in 2006-2007 result from the collapse of the Tibet Plateau accommodated by the E-W extensional regime. They carry crustal xenoliths of metamorphic origin representing a window through the deep crustal section underlying the YZSZ. The geochemistry of these shoshonitic intrusives shows strong subduction components resulting from metasomatism of the mantle wedge over the subduction zones accommodating the closure of the Neo-Tethys basin. εNd values suggest the source reservoir for these magmatic rocks has mostly Asian late-Precambrian affinity.

The YZSZ contains features related to the interplay between India and Eurasian plates formerly separated by the Tethys Ocean or associated smaller marginal basins such as the Neo-Tethys basin. However, the complexity of the YZSZ and the diversity of rock types call for a redefinition of the suture zone to include the mosaic of terranes now tectonically juxtaposed within this narrow orogenic collisional zone.

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