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Thin Crust Over the Marion Rise - Remelting the Ancient Gondwana Mantle

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Decade-long investigation of the Yarlung Zangbo Suture Zone (YZSZ), southern Tibet, has revealed it's high complexity in terms of structure, geochronology and metamorphic and igneous histories. For instance, YZSZ comprises rocks as old as Late Devonian to rocks as young as mid-Miocene, metamorphic intensities vary from high-grade to very-low grade and deformation styles range from ductile to brittle. Late Devonian rocks (363.7 ± 1.7 Ma) are alkalic gabbros resulting from activity of a plume active within the Paleo-Tethys basin. The Permian and Triassic rocks are made of metamorphosed limestone associated with radiolarite showing affinities with Indian continental margin and deep Tethyan ocean floor, respectively. Some new findings might bring questions concerning these issues. Two ophiolite sub-groups are recognized. Sub-group 1 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. Spontang and Zedong sequences are good examples of this sub-group. Sub-group 2 is Lower Cretaceous (120–130 Ma) and represents the destruction of a marginal basin comprising an arc-back-arc system. These ophiolites are spatially associated with ophiolitic mélanges and flysch respectively representing the reworking of the Cretaceous ophiolites and Indian continental margin and the Neo-Tethyan ocean floor. Most ophiolitic sequences belong to this sub-group such as Xiugubagu, Saga, Xigaze, etc. Amphibolite and garnet amphibolite blocks (123–130 Ma, with some indications of older ages from Lu-Hf on garnet) found within the ophiolitic mélange share similar geochemical attributes with sub-group 2 ophiolites. Their protoliths were probably generated within back-arc spreading center and metamorphosed in a subduction zone at depth around 50 km. Some radiometric ages suggest events at 80 Ma and 90 old 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 alkaline 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 E-W extensional regime. They carry crustal xenoliths of metamorphic origins representing a window through the deep crustal section underlying the YZSZ. The geochemistry of these shoshonitic intrusives shows strong subduction components resulting from the metasomatism of the mantle wedge over the subduction zones accommodating the closure of Neo-Tethys basin. εNd values suggest the source reservoir for these magmatic rocks has mostly Asian late Precambrian affinity.

YZSZ contains features related to the interplay between India and Eurasian plates separated by the large Tethys Ocean or one of associated smaller basin 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 such a mosaic of terranes now tectonically adjacent within this narrow orogenic collisional zone.

We present series of discriminant diagrams showing the diversity of geodynamic settings for ophiolite and related ophiolitic mélanges and will draw a general model for the suture evolution through time.

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