Geophysical Research Abstracts
Vol. 16, EGU2014-5792, 2014
EGU General Assembly 2014
© Author(s) 2014. CC Attribution 3.0 License.

Kinematic evolution of the Yarlung Zangpo Suture Zone ophiolites (Southern Tibet): Early Cretaceous saloon-door spreading?

Marco Maffione (1), Douwe van Hinsbergen (1), Wentao Huang (1), Louise Koornneef (1), Carl Guilmette (2), Nathaniel Borneman (3), Kip Hodges (3), Shun Li (4), Paul Kapp (5), and Lin Ding (4)

(1) Department of Earth Sciences, Utrecht University, Budapestlaan 4, 3584 CD Utrecht, the Netherlands, (2) Department of Earth Sciences, University of Waterloo, 125 St Patrick Street, Stratford, Ontario N5A 0C1, Canada, (3) School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287, USA., (4) Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Building 3,Courtyard 16, Lin Cui Road, Chaoyang District, Beijing 100101P.R. China, (5) Department of Geosciences, The University of Arizona, Tucson, AZ 85721-0077 (USA)

The broad deformation zone of the Himalayan belt and Tibetan plateau is largely the product of continent-continent collision between India and Eurasia plates since the Early Eocene. Continental collision, however, is only the ultimate effect of long-lasting plate convergence and subduction below the Lhasa block since at least early Cretaceous times. Supra-subduction zone ophiolites exposed along the Yarlung Zangbo Suture Zone (YZSZ) between Himalayan (Indian) and Tibetan (Eurasiatic) terranes demonstrate that a long-lasting intra-oceanic subduction zone, close to Lhasa or far outboard, must have played a significant role in accommodating closure of the >7500 km wide Neotethyan Ocean. These ophiolites are the best-preserved, yet still highly incomplete record of the vast Neotethys. However, their study can provide key constraints on the plate kinematic history of the Neotethyan subduction systems, in particular their early stages.

Paleomagnetic analyses of the upper crustal sequence (pillow basalt and sheeted dykes, sills) of ophiolites have been successfully applied in the past to reconstruct the initial geometry of the spreading system associated to the ophiolite formation. Furthermore, oceanic detachment faults, structures widely occurring in modern magma-poor (slow-spreading) mid-ocean ridges, have been recently recognized also in ophiolites (i.e. Mirdita ophiolite of Albania), and (if present) their study may provide unique insights into the geodynamics of the associated spreading system.

The YZSZ ophiolites form a 2500 km long belt mainly composed of dismembered ultramafic massifs locally covered by a crustal sequence and oceanic sediments, underlying a regionally continuous clastic Xigaze sedimentary basin interpreted as the Tibetan forearc. Our study focused along a $\sim$250 km transect within the eastern sector of the YZSZ between the Sangsang and Xigatze ophiolite. More than 500 cores were paleomagnetically sampled at 22 localities within sheeted dykes/sills, pillow lavas, mantle peridotites and mantle-hosted gabbros. Paleomagnetic sampling was coupled with a structural geological analysis in the field. The geochemistry of the crustal units, and its geodynamic setting inferred from that (back-arc vs. forearc) was constrained through specific geochemical analyses.

Since the YZSZ ophiolite likely suffered of multiple stages of vertical axis rotation and tilt associated to (i) the Mesozoic ocean spreading and subduction dynamics, (ii) the Eocene thrusting of the ophiolites over the Greater Indian continental margin, and (iii) the subsequent continent-continent collision, we adopted a Net Tectonic Rotation (NTR) approach for our kinematic analysis based on paleomagnetic data. This technique, already tested in other ophiolitic belts, describes the total deformation through inclined axes that can then be decomposed into simple vertical and horizontal axis components of rotation.

Relying on the calculated rotation and paleo-spreading direction pattern, and the possible occurrence of oceanic detachment faults, we propose a tectonic evolutionary model characterized by the interplay between subduction-related back-arc spreading generating magmatic ocean floor, and detachment faulting associated to trench-parallel stretching upon saloon-door back arc basin opening.