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Paleomagnetic constraints on early collisional deformation along the eastern margin of the Qiantang terrane (Tibetan plateau) at 50 and 37 Ma.

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Ongoing controversies on the timing and latitude of the India-Asia collision with associated formation of the Tibetan plateau have major implications on geodynamic, climatic and biotic models. Rock paleomagnetic inclinations and declinations enable in principle to quantify respectively paleolatitudes and tectonic rotations. However, shallow paleomagnetic inclinations observed for most of the Cenozoic rocks across the active belts of Central Asia have been controversially interpreted as resulting from non dipolar geomagnetic fields, inclination flattening in the sedimentary data or large scale continental deformation. In addition tectonic rotations from the Eastern margin of Tibet may result from extrusion or dextral shear associated with implication on the early collision.
We present new paleomagnetic results from two Cenozoic basins of the Eastern part of the Qiantang block characterized by two short-lived volcanic fields at 37-38Ma (Nangqian area) and 49-51Ma (Xialaxiu area).
In the Xialaxiu area, we sampled the volcanic field near the town of Xialaxiu and red beds filling the Sangalaxiu basin 10 to 20km farther north. Results from the red beds after tilt correction (D=328.3°, I=34.3°, α95=7.6°) confirm the result (D=322.0°, I=32.3°, α95=9.5°) previously obtained by Cogne et al., (1999) but the age and nature of the characteristic magnetization are uncertain. The mean direction calculated from 21 sites in volcanic rocks provides a more reliable paleofield (D=11.9°, I=41.6°, α95=8.0°). Comparison with the expected direction for stable Eurasia suggest no rotation but significant post 50 Ma shortening north of the Qiantang block in agreement with results from the Lhasa terrane at the same age (56-47 Ma) (van Hinsbergen et al., 2012).
In the Nangqian basin, paleomagnetic sites have been collected in red beds sediments, sills and dikes intruding the red bed sequence and in extrusive volcanic rocks mainly found on top of the sedimentary sequence. A well-defined secondary component of magnetization with normal polarity was recovered in the red beds in the temperature range $\sim$150-600°C. All sites in magmatic rocks, except one have also a normal polarity. The remagnetizations in the red beds appear to be related to the volcanic event and confirm previous field interpretations (Spurlin et al., 2005) indicating that volcanic activity occurred at the end of a phase of deformation in the syntectonic Nangqian basin. The mean paleomagnetic inclination in volcanic rocks and in the remagnetized red beds indicate less than 5° of shallowing in agreement with estimated shortening north of the Qiantang block and do not support the hypothesis of a large inclination anomaly at 37Ma.
In summary, observed paleomagnetic inclinations are consistent with 1000 km of post 50 Ma shortening north of Qiangtang but declination are inconsistent with models of deformation implying a large component of extrusion or dextral shear despite most structures are NW-SE oriented along the eastern edge of the Qiantang block.
Cogné et al., Geophys. J. Int., 192, 2103; Cogné et al., J. Geophys. Res., 104,B8, 1999; Spurlin et al. Geol. Soc. Am. Bull., 117, 2005; Van Hinsbergen et al., Proc. Nat. Acad. Sci., 109, 2012.