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Constraining the closure of the Neo-Tethys: a paleolatitude reconstruction of the Anatolide-Tauride and South Armenian Blocks

Maud Meijers and the Brigitte Smith, Marc Sosson, Yann Rolland, Cor G. Langereis, Mark J. Dekkers, Douwe J.J. van Hinsbergen, Nuretdin Kaymakci, Demir Altiner, Araig Gregoryan, Ara Avagyan, Carla Muller Team
Université de Nice Sophia Antipolis, GéoAzur, Nice, France (meijers@geoazur.unice.fr)

The Turkish Anatolide-Tauride Block (ATB) and the South Armenian Block (SAB) of Gondwanan origin rifted away from Africa in the Triassic-Jurassic, underwent late Cretaceous ophiolite obduction, and collided with the Eurasian margin in Paleocene to Eocene times. The position of both blocks between the moment of rifting and collision, and particularly during ophiolite obduction is not well constrained. Paleogeographic reconstructions vary on the width and nature of the remnant basin that was separating the ATB/SAB and the Eurasian margin until the final closure of the northern Neo-Tethys, from a narrow forearc basin to an ocean that was subducting below the Eurasian margin.

We aim at reconstructing the paleolatitudal evolution of the ATB and SAB with respect to the Gondwanan and Eurasian margins. Therefore we sampled Paleozoic to Eocene rocks, mostly limestones, for paleomagnetic analysis in both regions. Preliminary results give a maximum estimate for the width of the northern Neo-Tethys ocean at the position of the South Armenian Block.

Our data from Carboniferous to Eocene rocks in the Turkish central ATB show remarkably similar paleolatitudes. We suggest that all sampled rocks are remagnetized during the late Paleocene to Eocene folding and thrusting event, related to the collision of the ATB with Eurasia and a southward jumping of the subduction zone. We further tested the possibility of remagnetization using a novel end-member modeling approach on 174 acquired isothermal remanent magnetization (IRM) curves. Results of this modeling study confirm the remagnetized nature of the rocks (Meijers et al., 2011).

Data from Devonian to Triassic rocks from the South Armenian Block show too high latitudes for their age compared to Gondwana and are most likely also remagnetized. Upper Cretaceous (Santonian, ∼84 Ma) and younger rocks however, display latitudes that fall within the constraints given by the African and Eurasian apparent polar wander paths (Torsvik et al., 2008). Large (∼45-65°) clockwise rotations are in agreement with rotations that can be expected from regional tectonic reconstructions. Data from two sites in Santonian pink pelagic limestones that were deposited on top of the just obducted ophiolites, provide the latitude of ophiolite obduction (at ∼85 Ma) of ∼28°N±3°. Because the data are derived from limestones, they could be affected by inclination flattening caused by compaction, therefore providing too low latitudes. Correction of one of the two sites for inclination flattening (Tauxe and Kent, 2004) resulted in no significant correction.

The paleolatitude of ∼28°N±3° suggests that the distance between the Eurasian margin and the SAB in the Santonian is ∼600km and can be maximum ∼1100 km, taking the errors in the data and the apparent polar wander path into account. The convergence between Africa and Eurasia at the position of Armenia between 85 Ma and the start of the collision (∼60Ma) is ∼500km. Therefore, we consider it likely that the convergence between both plates is fully accommodated by subduction below the Eurasian margin in this time span. Any larger distance between the SAB and Eurasia in the Santonian would imply N-S extension 1) between the SAB and Eurasia or 2) in the overriding Eurasian margin to accommodate the difference.

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