THE CENTRAL ANATOLIAN PLATEAU: NEW INSIGHTS FROM THERMAL-FLEXURAL MODELLING

BARTOL, Jeroen, GOVERS, Rob, and WORTEL, M.J. Rinus, Department of Earth Sciences, Utrecht University, P.O. Box 80021, Utrecht, 3508 TA, Netherlands, bartol@geo.uu.nl

In the Middle to Late Miocene several seemingly unrelated events occurred nearly simultaneously in central Anatolian, Turkey: (1) onset of widespread volcanic activity with a mantle signature (2) disruption of a late Oligocene-lower Miocene paleo-drainage system in the Western Taurus and (3) significant increase of erosion in the Bolkar mountains (south-east Turkey). The last two observations suggest a sudden uplift (>1000 meters) of the central Anatolian plateau by a mechanism which also triggered widespread volcanic activity. In the eastern Anatolian plateau, comparable events are attributed to delamination of the lithospheric mantle. Seismic wavespeeds are slow below the crust of the eastern and central Anatolian plateau. Results from tomography suggest that the (deeper) Bitlis slab was laterally continuous below the eastern and central Anatolian plateau. We therefore propose that the scenario developed for eastern Anatolian plateau also applies to central Anatolian plateau. In this scenario, delamination started in both east and central Anatolian along the Izmir–Ankara-Erzincan suture zone possibly induced by remnants of a northern Neotethys slab. As the lithospheric mantle (negative buoyancy) separates from the crust (positive buoyancy) it sank into the asthenosphere and was replaced by hot mantle material.

If true, delamination is expected to have had a thermal and isostatic imprint. Using a three-dimensional thermal and flexural model, we aim to quantify the possible imprints in the geological record of the central and eastern Anatolian plateau. With the lithospheric mantle being replaced by the hot asthenosphere partial melting of the crust could occur. The high temperature will also influence the rheology of the lithosphere and consequently the effective elastic thickness and flexural response. Our model takes the changes of the effective elastic thickness due to thermal perturbation into account and calculates the potential volume of crust that could melt.

Model results show that the present day elevation of both plateaus can be explained by delamination of the lithospheric mantle; 1500 meters of uplift is predicted for the central Anatolian plateau while an uplift of only 1000 meters is predicted for the eastern Anatolian plateau. This large difference in uplift is caused by variations in crustal thickness with a thick crust (eastern Anatolian plateau) resulting in a limited uplift while a thin crust (central Anatolian plateau) in a large uplift. The initial uplift is followed by a gradual thermal subsidence, which continues today, between 0.8-0.4 meter/kyr with the central Anatolian plateau having the highest subsidence rate. For the present day surface heatflow, our model predicts an average of 76 mW/m2 with a maximum of more than 80 mW/m2 predicted in the south. This is, to a very first order, in agreement with the observed surface heatflow. The average surface heatflow increases with time reaching a maximum of 84 mW/m2 , 30 Myr after delamination. Based on the model results, we expect to see a clear crustal signature within the erupted volcanic products in eastern Anatolian were our model predicts significant crustal melting. In central Anatolia, crustal melting is substantially less and consequently we expect to see less or even no influence

of the crust in the erupted volcanic products.

Abstract ID#: 175327
Password: 180188
Meeting: Tectonic Crossroads: Evolving Orogens of Eurasia-Africa-Arabia
Session Type: Discipline
Title: THE CENTRAL ANATOLIAN PLATEAU: NEW INSIGHTS FROM THERMAL-FLEXURAL MODELLING
Key Words: Anatolian plateau, Delamination, Plateau, Miocene, Thermal modelling
Presentation Format: Oral
Discipline Categories: Geodynamics

First Author

Student Presenting
Jeroen Bartol
(Graduate student)
Department of Earth Sciences, Utrecht University
P.O. Box 80021
Utrecht, 3508 TA
Netherlands
Office Phone: +31 30 2533048
Email: bartol@geo.uu.nl
Confirmation Email: bartol@geo.uu.nl

Second Author

Rob Govers
Department of Earth Sciences, Utrecht University
P.O. Box 80021
Utrecht, 3508 TA
Netherlands
Office Phone: 0031302534985
Email: govers@geo.uu.nl
Confirmation Email: govers@geo.uu.nl

Third Author

M.J. Rinus Wortel
Department of Earth Sciences, Utrecht University
P.O. Box 80021
Utrecht, 3508 TA
Netherlands
Office Phone: +31-30-2535074
Fax Number: +31-30-2535030
Email: wortel@geo.uu.nl

Confirmation Email: wortel@geo.uu.nl