Geophysical Research Abstracts, Vol. 8, 03805, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03805

Solid earth response to complete dessication of the Mediterranean as predicted from a 3D regional isostasy model

R. Govers, P.Th. Meijer, and W. Krijgsman
Faculty of Earth Sciences, Utrecht University, Netherlands

The reconstruction of Mediterranean canyon and margin profiles in the during the Messinian sea level drop has been the topic of many studies. Isostasy is an important component in these reconstructions. We use flexure models to quantitatively predict possible signatures of the Late Messinian removal of the Mediterranean water load. The typical time scale of dessication events is probably on the order of 3000-8000 years, which is similar to the time scale for lithospheric flexure to develop fully. We focus on the resulting uplift/subsidence, basement tilting and stresses. Near basin margins, plate bending effects are most pronounced which is why flexure is particularly important for a relatively narrow basin like the Mediterranean. The highly irregular shape of the Mediterranean basin calls for a three-dimensional model. The results can be understood best if we simplify the unloading history. We show that marginal uplift of 100s of meters and subsidence up to 50 m of the continent may be expected, as well as stress changes on the order of a few kPa and basement tilting up to 1 degrees. However, even if we ignore the existing variability of lithospheric properties, uplift patterns are highly variable. Prominent signatures of Late Messinian dessication in onshore geology are predicted in northern Algeria, western Corsica and Sardinia, the Nile Delta and Northern Syria. Uplift of the Gulf of Lions margin is substantially less than previously predicted on the basis of 2D models. The famous Messinian localities on Sicily are probably difficult to interpret because of the complexity of the flexural pattern and due to the nearby presence of an active plate boundary. We illustrate that two-dimensional models do not correctly predict regional isostatic features.