Flexure in the Corinth rift: reconciling marine terraces, rivers, offshore data and fault modeling
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1. Introduction
The Corinth rift (Greece) is an exceptional area to study the large-scale mechanics of a young rift system due to its extremely high extension rates and fault slip rates. Middle-Late Pliocene activity of large normal faults has created a mostly asymmetric E-W trending rift, mainly driven by N-dipping faults that shape the southern margin of the Corinth Gulf in an arc-shaped pattern. We improve the onshore record of faulted uplift by analyzing the most extensive sequence of marine terraces in the SE margin, combine the offshore seismic record of faulted uplift with subsidence, and present simple numerical models to fit the observations.

2. Onshore flexure
We developed 2m-resolution digital surface models from Pleiades satellite imagery using MicMac software (Roux et al. 2015, http://micmac.iml.fr) to define with high accuracy the shoreline angles of the terraces using the graphical Matlab interface Terrametric (Jara-Muñoz et al. 2016, www.terrametric.com). The detailed record of flexure provided by this analysis is in good agreement with the nearly inverted river geometry of the major systems along the south coast, indicating that flexure occurs on the scale of the whole rift.

3. Cross-section
The 100kyr climate cycles that shaped the most extensive terrace levels are, by glacial-interglacial variation with the Ionian strait, also responsible for the marine-landustate transition observed for the offshore stratigraphy. We depth-converted the multi-channel seismic section L35 (Taylor et al. 2011) and combine this with the onshore record to obtain a full profile of the Xylkadas/Atalanti fault geometry and its associated deformation pattern. The model of a symmetric geometry with an uplift/subsidence (u/s) ratio of 10:9:1:15 after sediment compaction, and an average cumulative slip rate of 5-7 mm/yr. In the deeper section, microcracks are mainly concentrated in a broad region below the main faults, and the moho is thinned below the main fault system or ~10km to the south.

4. Fault modeling
We use the full cross-section as constraint for 2D mechanical models (Pyhtry, a finite element code for quasistatic viscoelastic simulations, to model 45°-60° planar normal faulting in an elastic upper crust overlying a viscous lower crust and mantle to reproduce the derived terrace uplift pattern. The models reproduce the observed geometry best by either reducing the elastic modulus of the upper crust by a factor of 10 or by using a non-linear viscous rheology for the lower crust (power laws), in which the latter is in better agreement with the observed u/s ratio and interpreted moho geometry.

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References

Profiles of four major river systems along the southern margin of the Corinth Gulf

5. Conclusions
1) The terrace sequence in the SE Gulf of Corinth provides a detailed record of fast flexure and the nearly inverted river profiles suggest it happens at the scale of the rift.
2) Similar climate-driven strain markers within the offshore section indicate a symmetric deformation pattern and u/s ratios of 10:9:1:15.
3) Our best fitting numerical models contain an elastic upper crust overlying a viscous lower crust with pervasive viscosity.

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