

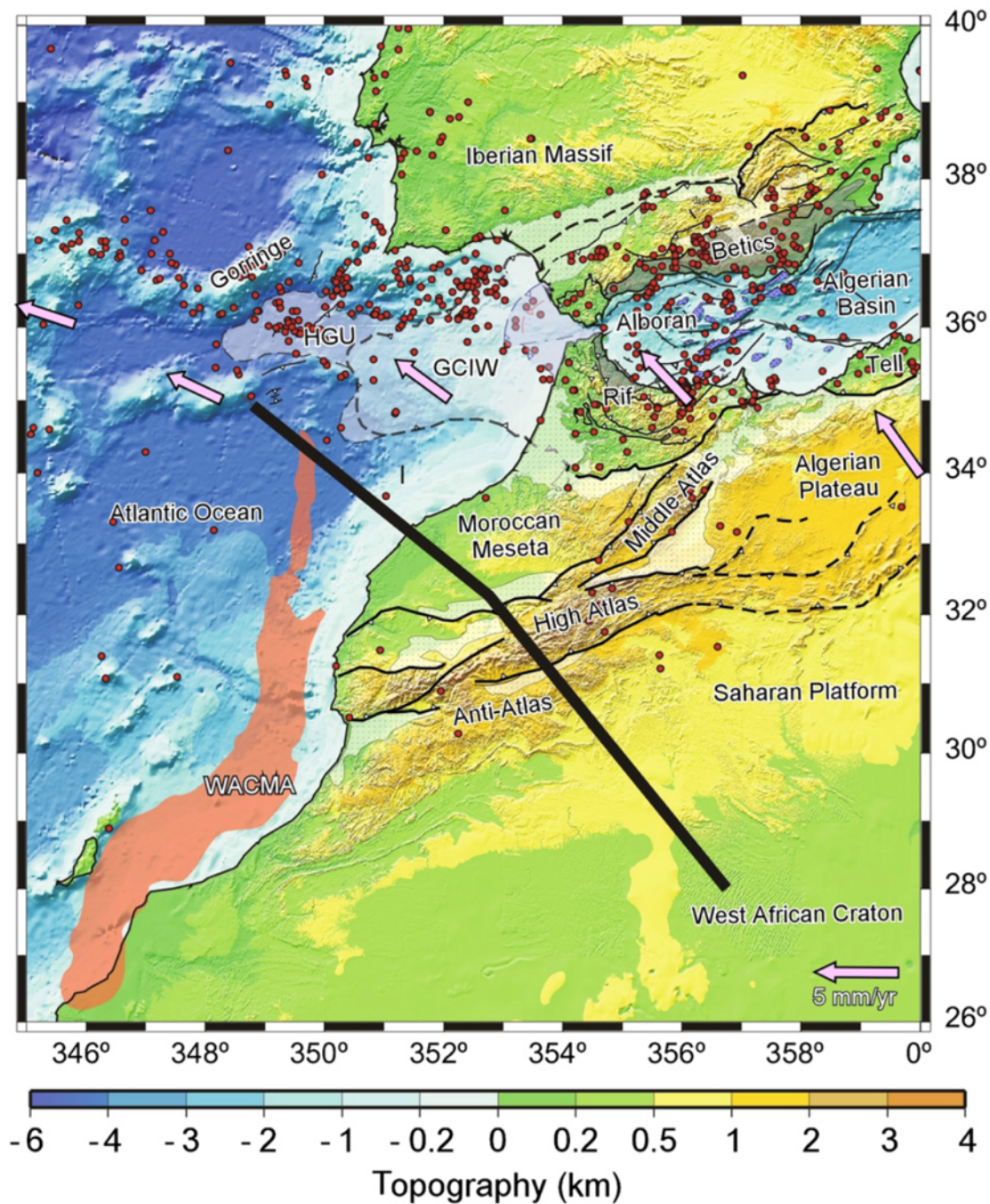
Coupled mantle dripping and lateral dragging controlling the lithosphere structure of the NW-Moroccan and the Atlas Mountains

Sergio Zlotnik
sergio.zlotnik@upc.edu

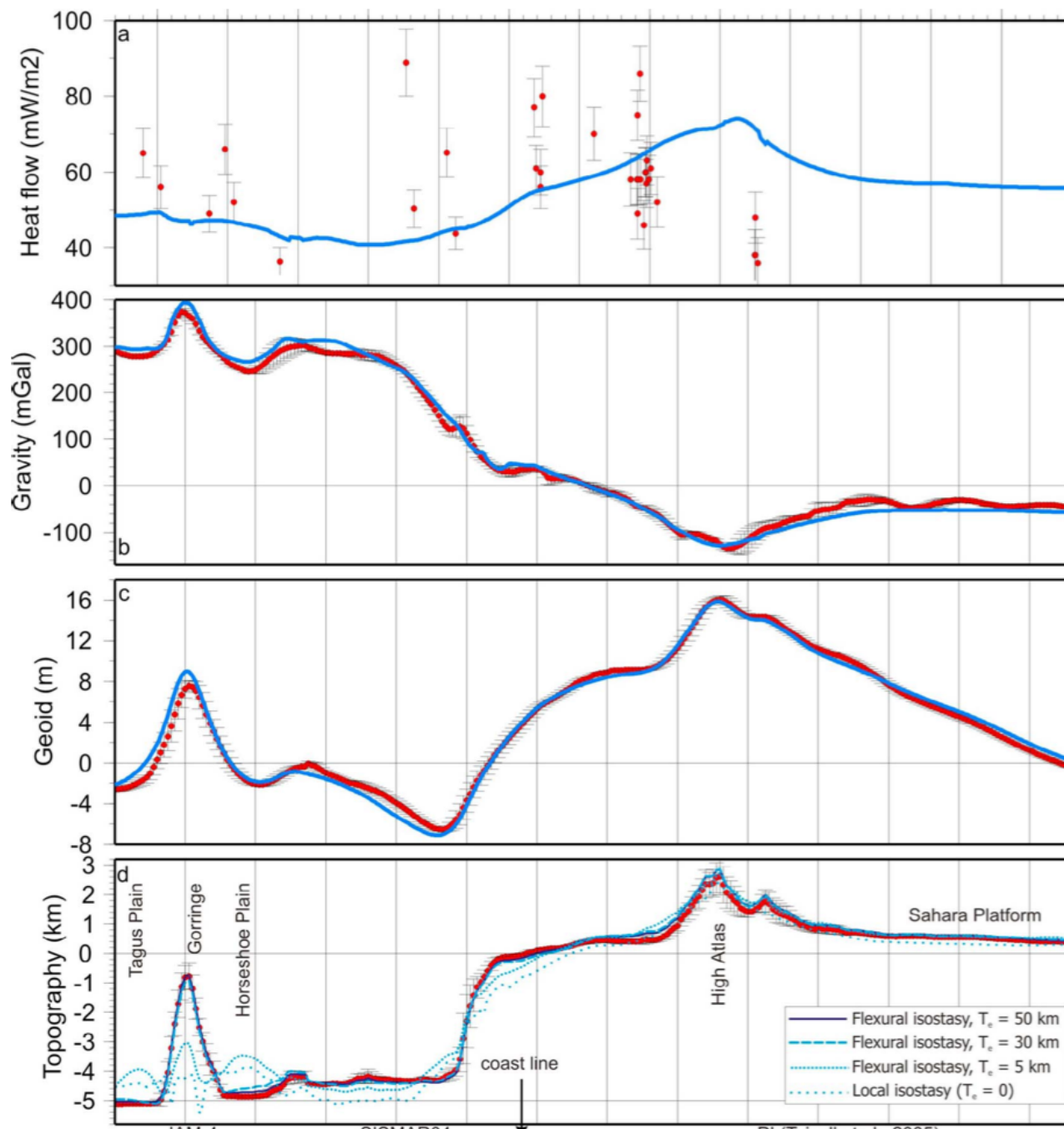


Ivone Jimenez-Munt, Manel Fernandez, ICTJA

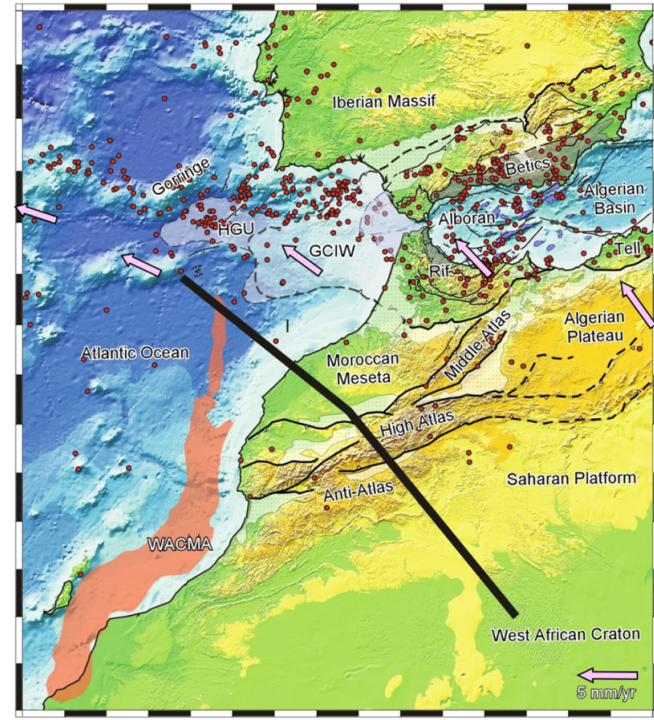
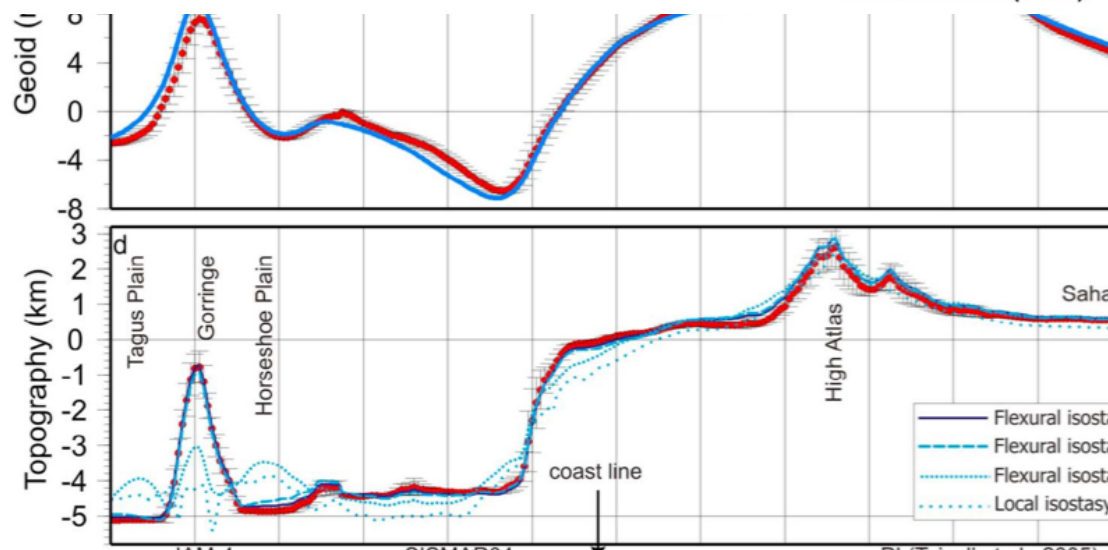
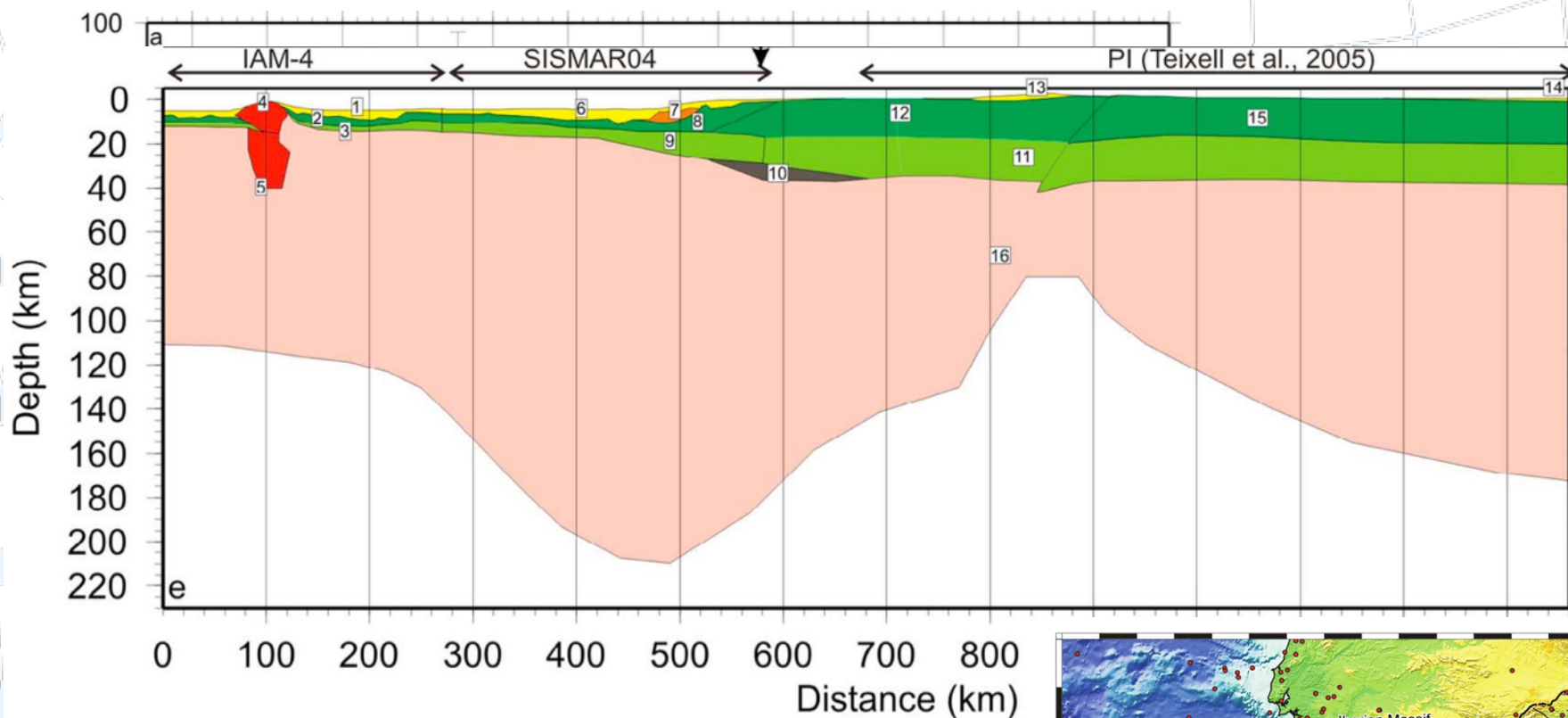
Laboratori de Càlcul Numèric (LaCàN)
Universitat Politècnica de Catalunya - BarcelonaTech (Spain)
<http://www.lacan.upc.edu/>



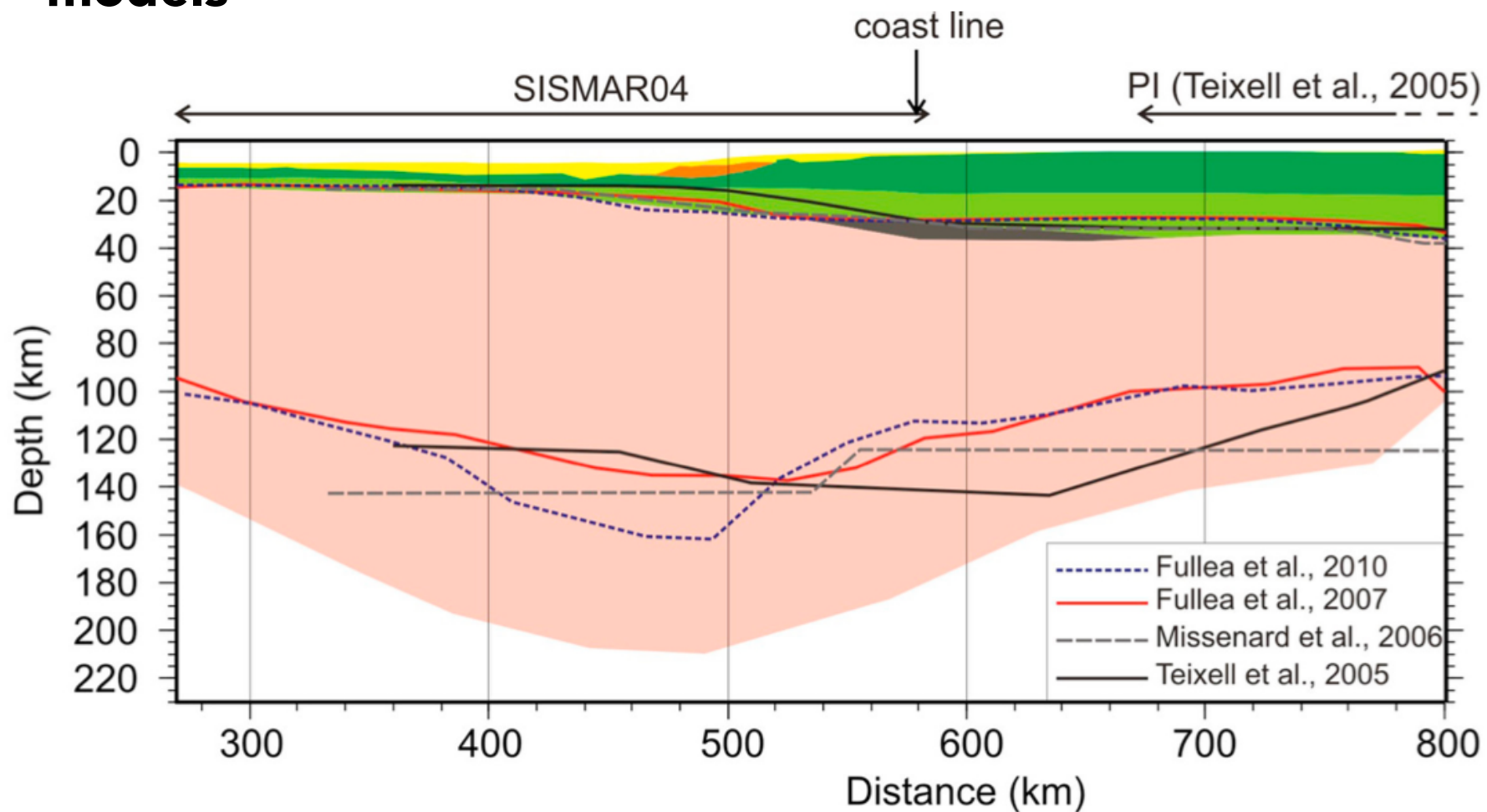
Jiménez-Munt et al. JGR,
2011



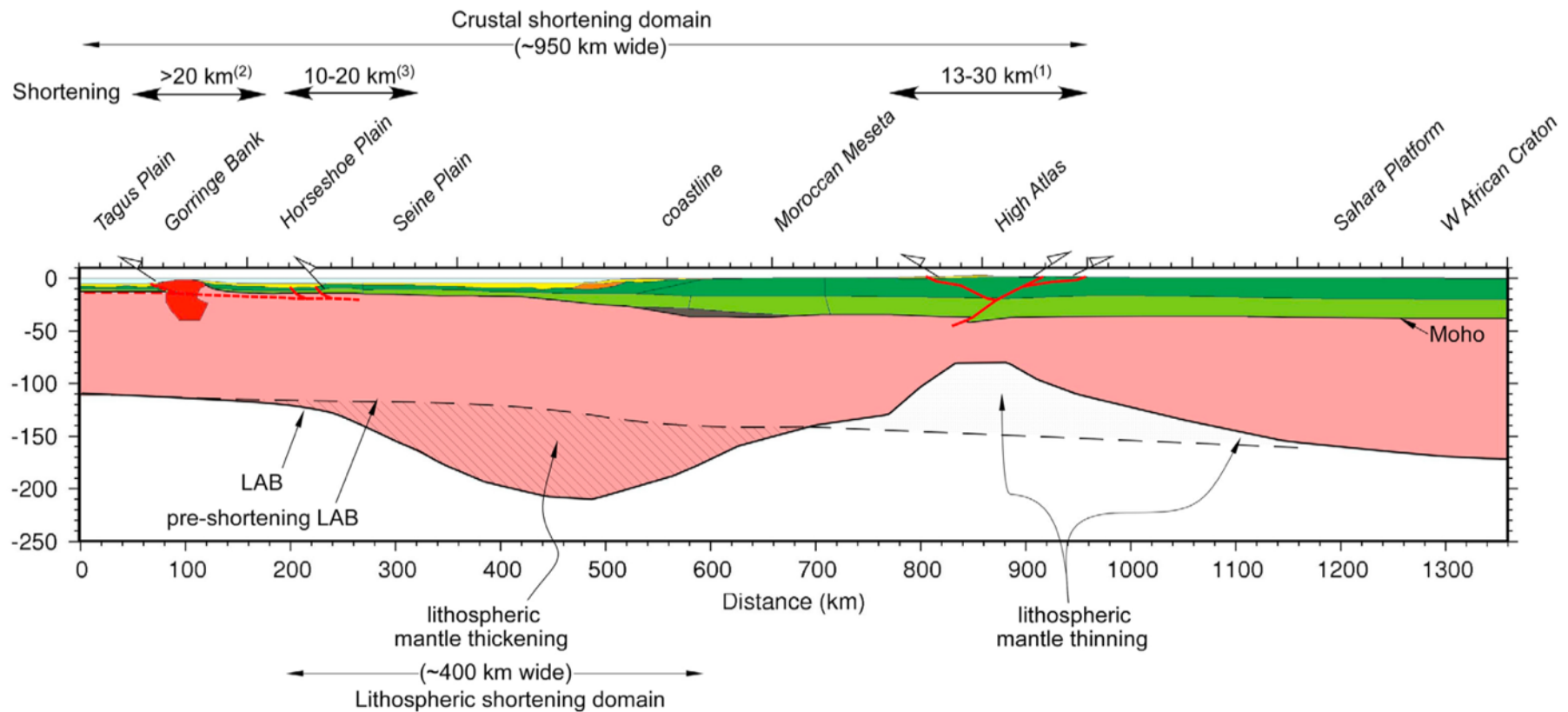
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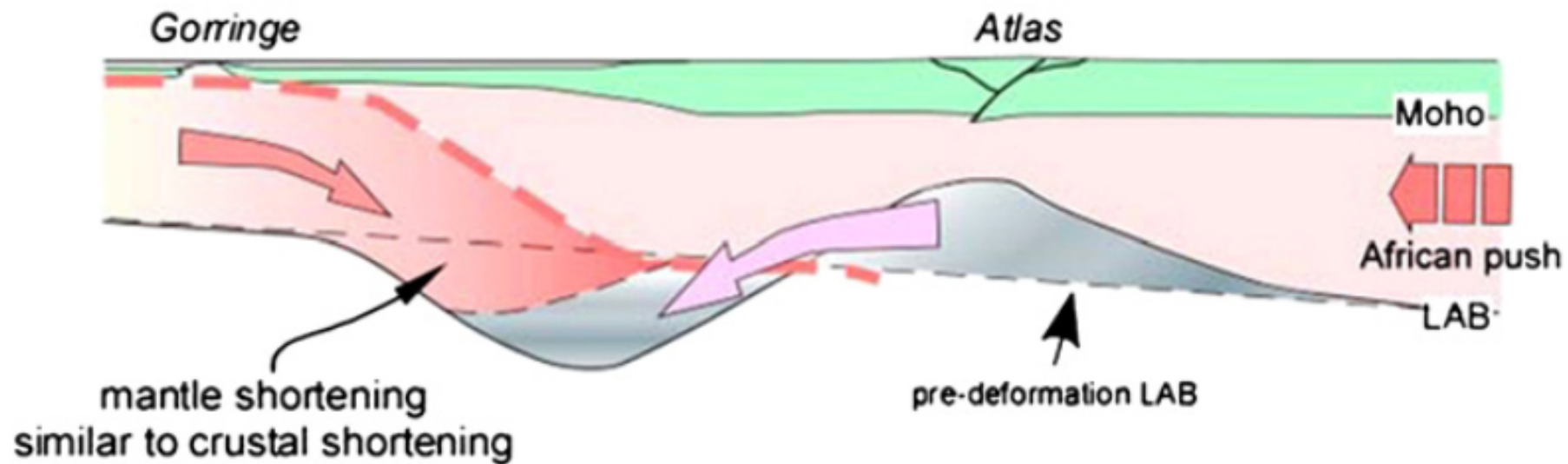
Margin lithosphere significantly thicker than previous models



Decoupling between crust and mantle



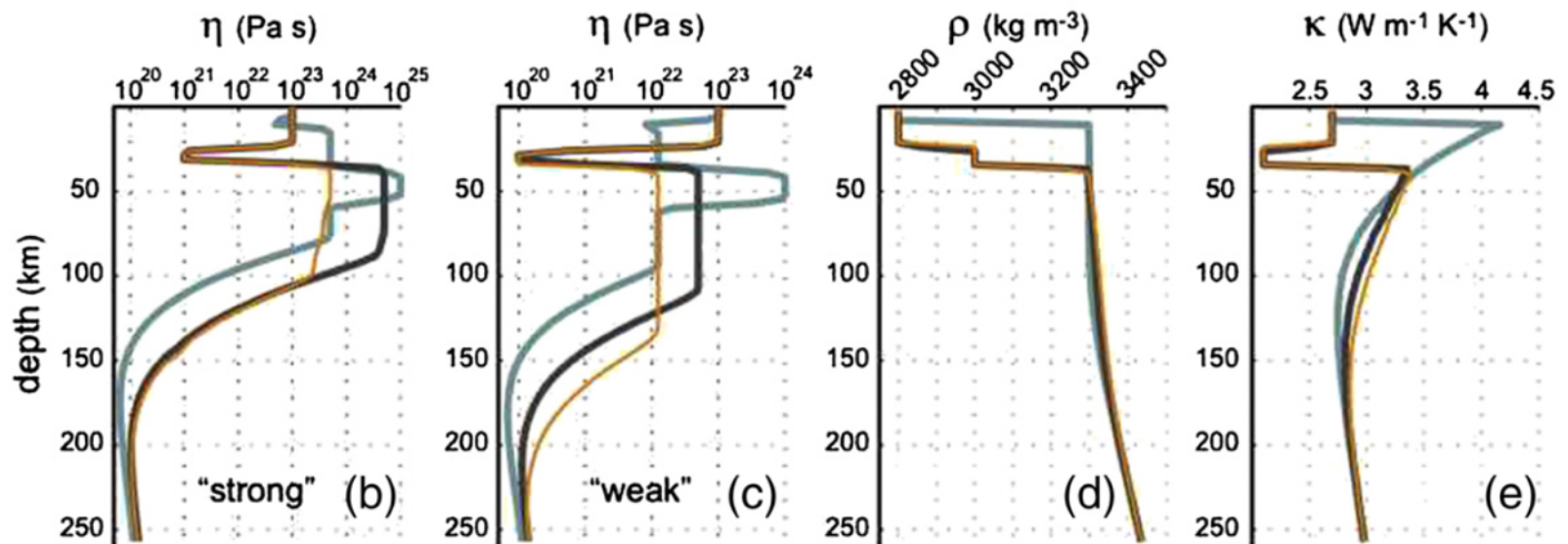
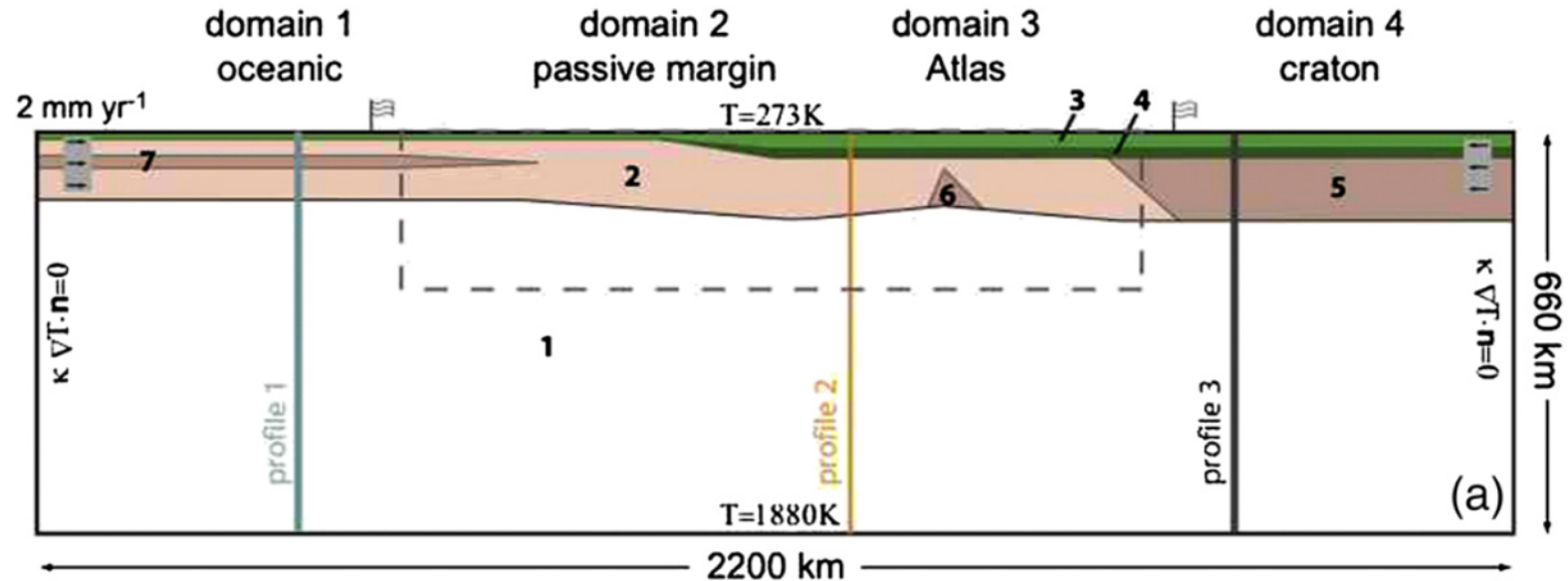
Jimenez-Munt proposes a drip&drag mechanism



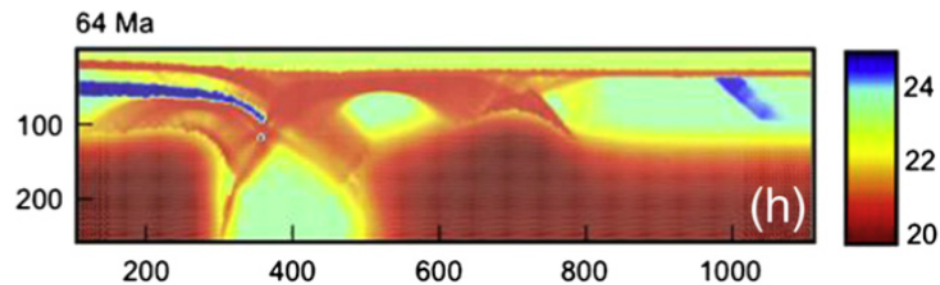
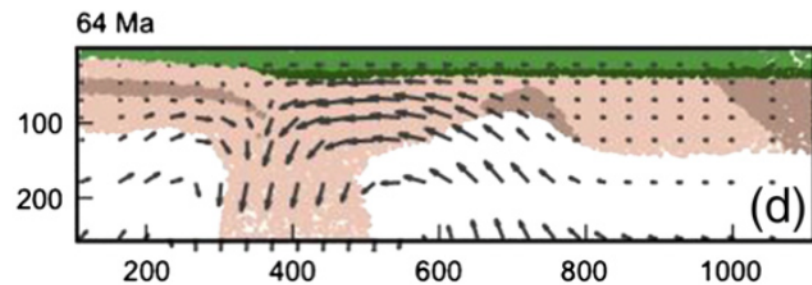
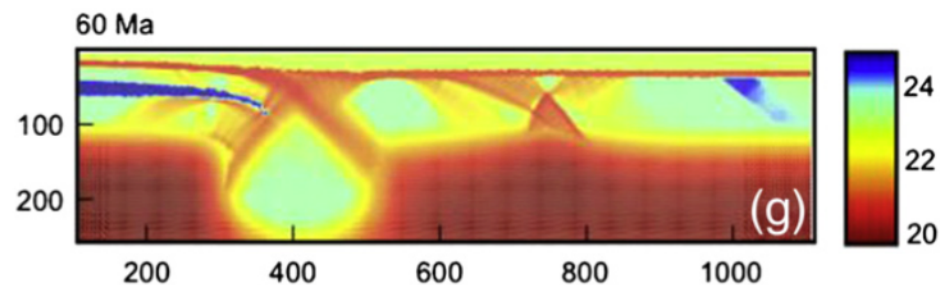
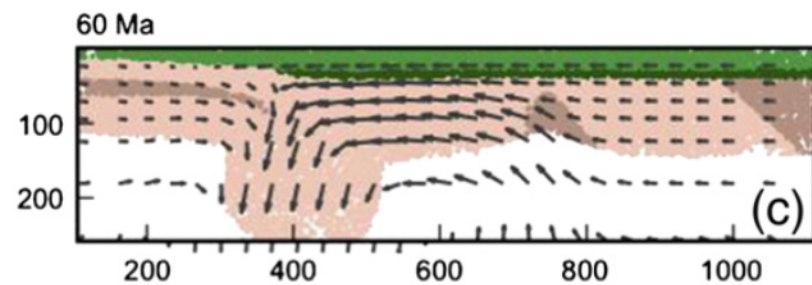
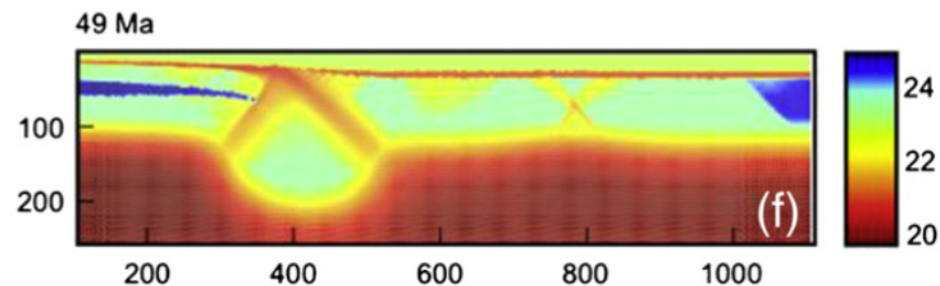
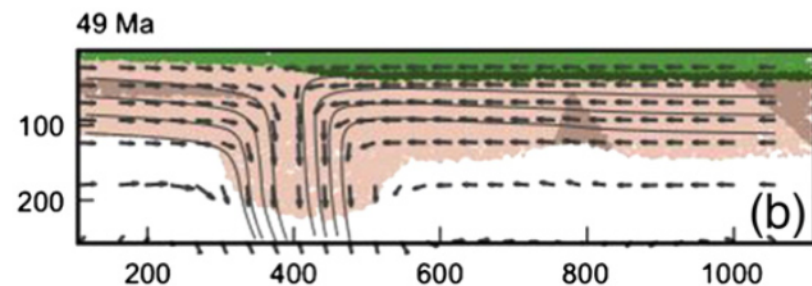
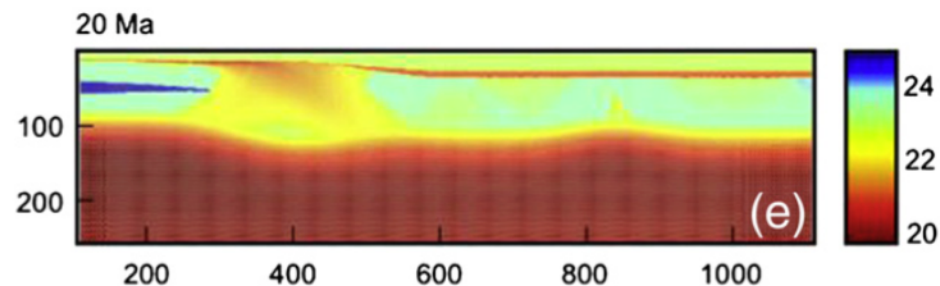
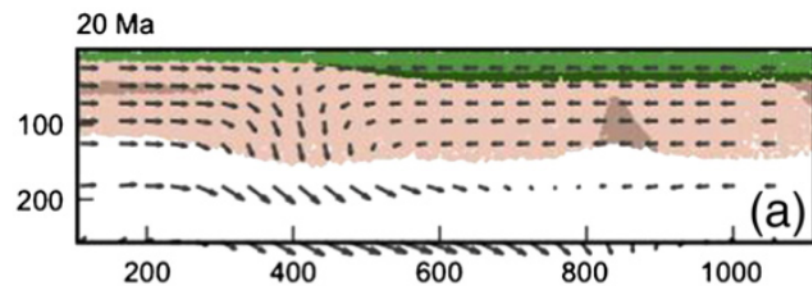
- Asymmetric process (different from std RT) concentrates deformation on one side
- Drag contributes to both, thickening of the margin and thinning at Atlas

Is this process physically feasible?
(under reasonable geophysical assumptions)

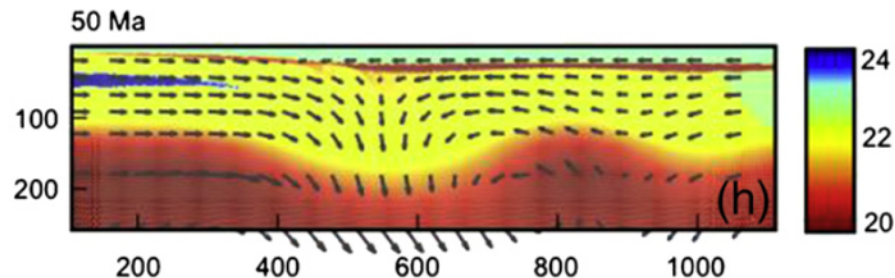
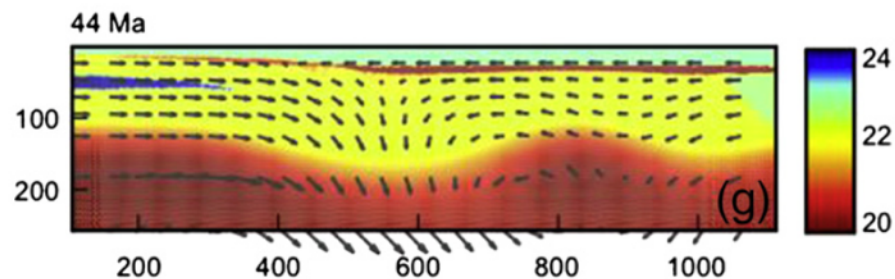
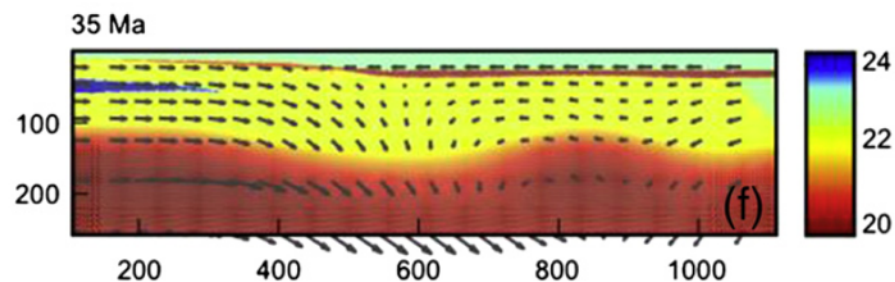
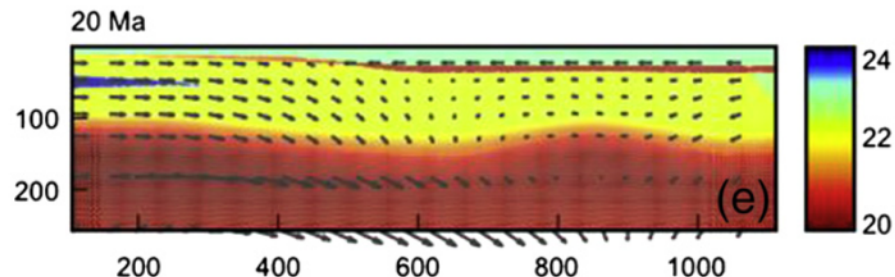
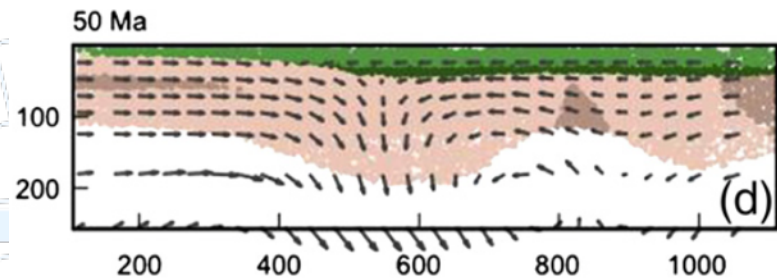
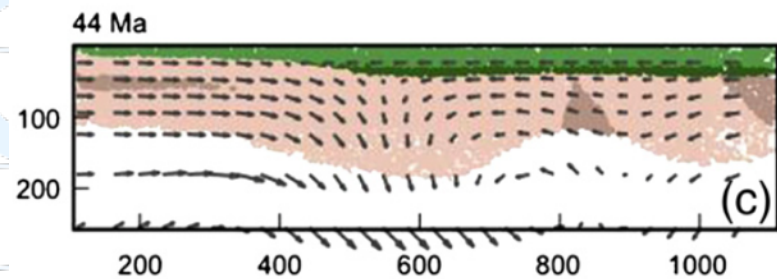
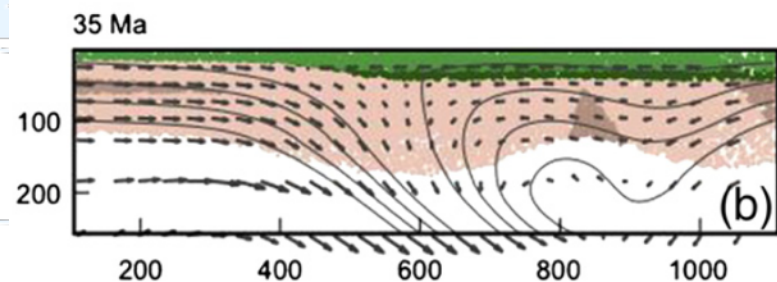
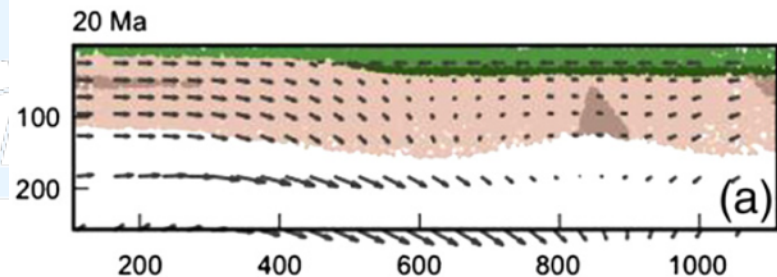
Numerical Experiment



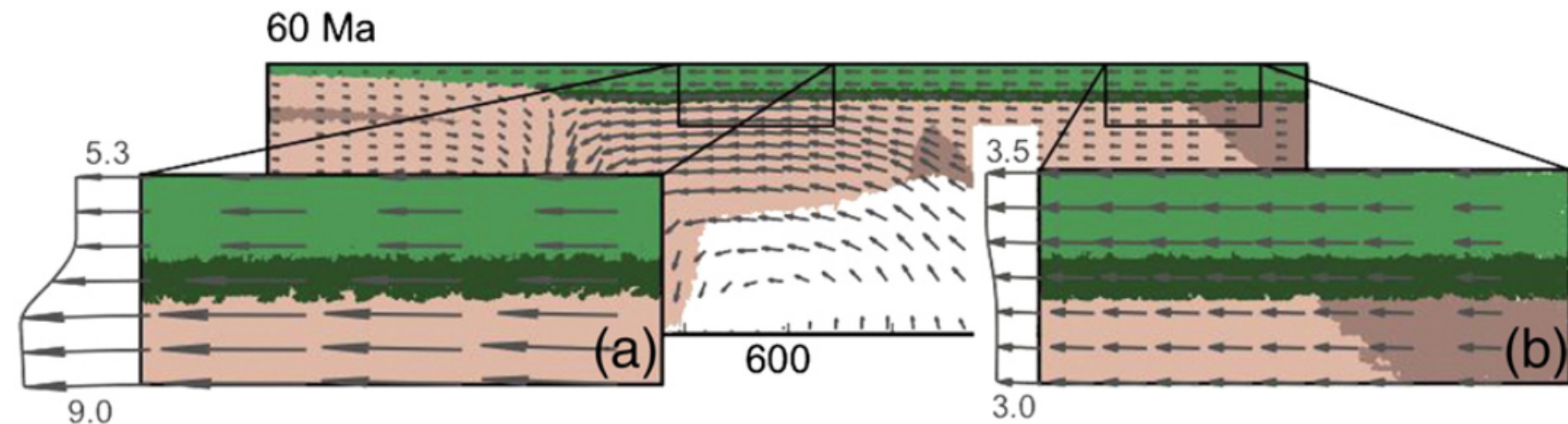
Results - Evolution of model with strong lithosphere



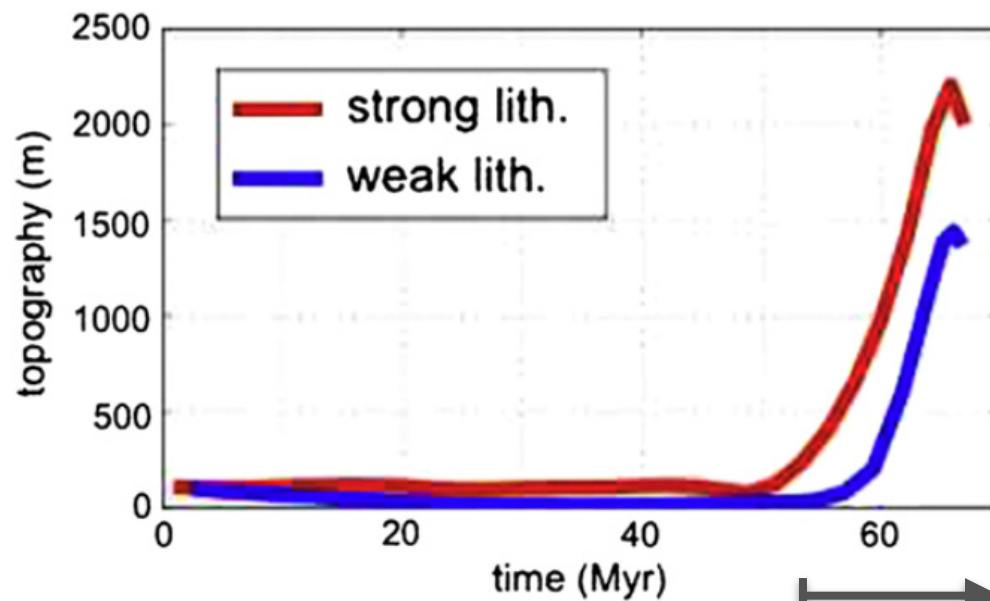
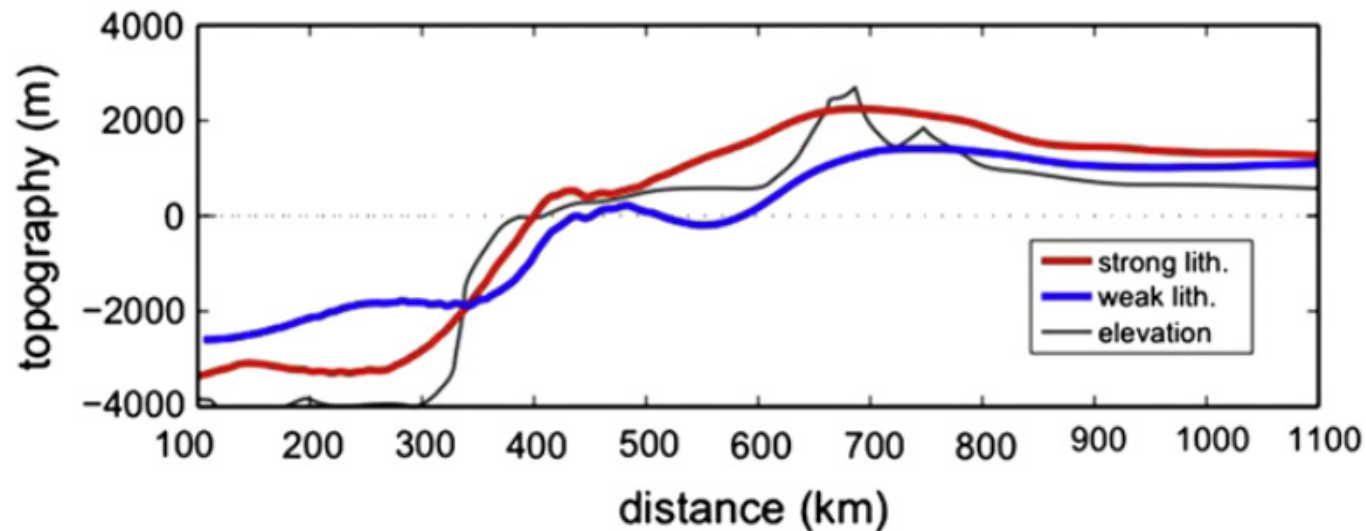
Results - Evolution of model with weak lithosphere



Results - Crust-Mantle decoupling



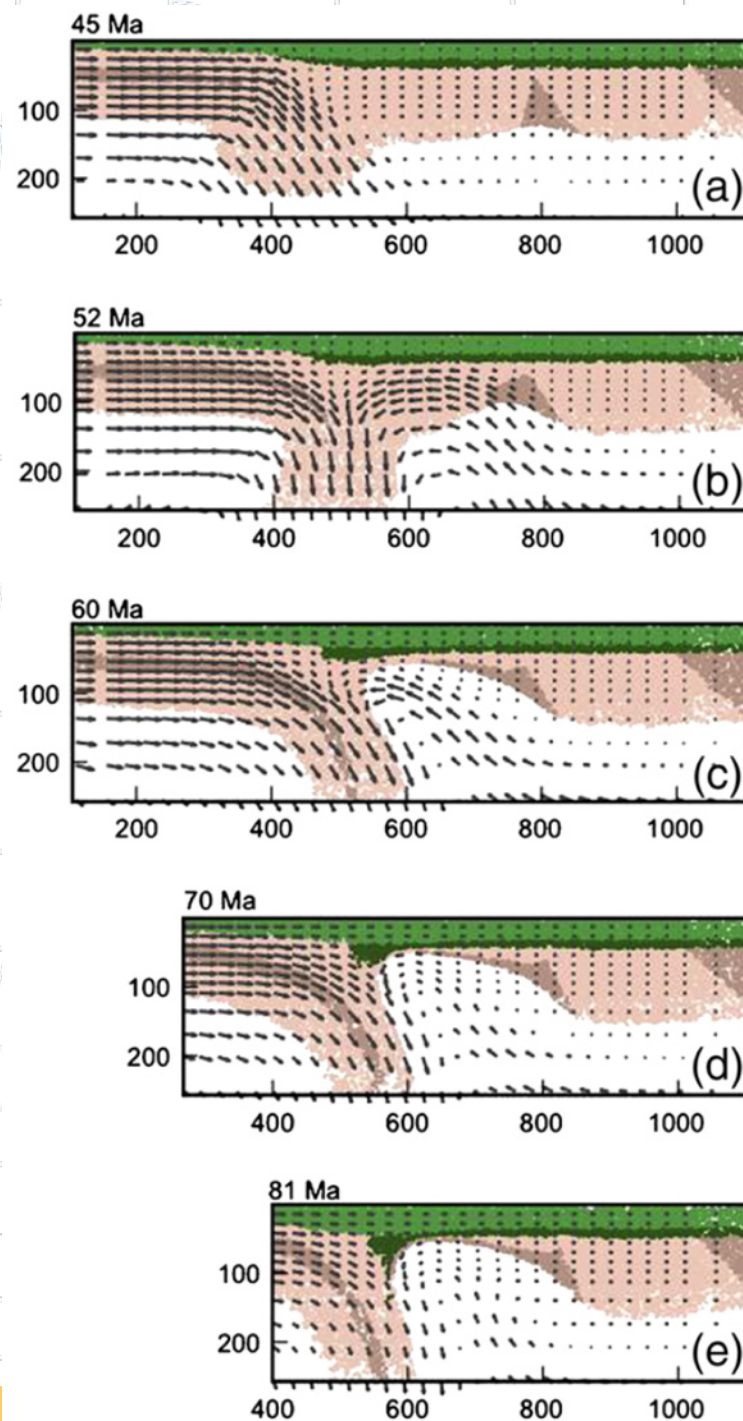
Results - Topography



uplift during last 8-15Ma
(Babault, 2008)

Results -

Speculative evolution: subduction initiation?



Conclusions

- A mechanism of asymmetric instability producing thickening beneath the margin and lateral mantle drag and thinning beneath the continental domain is **dynamically feasible** under plausible conditions.
- The asymmetry of the process depends on the existence of lateral strength variations in the lithosphere (e.g. a passive margin).
- This mechanism could account for present-day lithospheric structure across the NW-Moroccan margin and Atlas mountains.

Thank you!

Questions or comments?



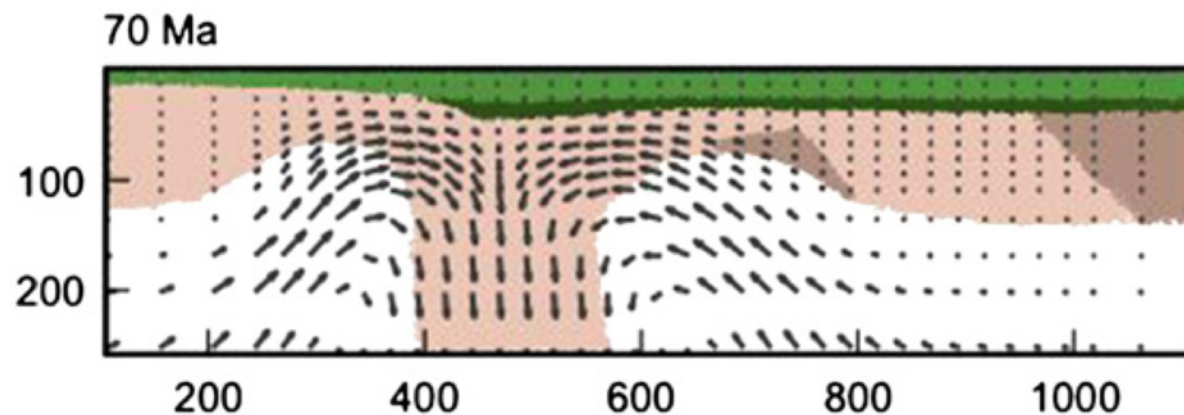
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S. Zlotnik, I. Jiménez-Munt, M. Fernández

Lithos, 189 (2014), 16–27

Results -

Symmetric evolution if no strength lithospheric contrast between ocean and continent



Results - Volcanism

Miocene to Pliocene alkaline volcanism in Atlas

(Missenard and Cadoux, 2012)

Decompression melts due to rapid ascent of mantle material produce a relatively large degree of melt (7 to 10%) in the late stage (last 15 My)

Results - Speculative evolution: delamination

