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Unraveling post-Messinian evolution of the Aegean with tectonic integrations (Part I - Detailed map of key sites & Part II - Hellenic Arc active faults map)

T51A-2885

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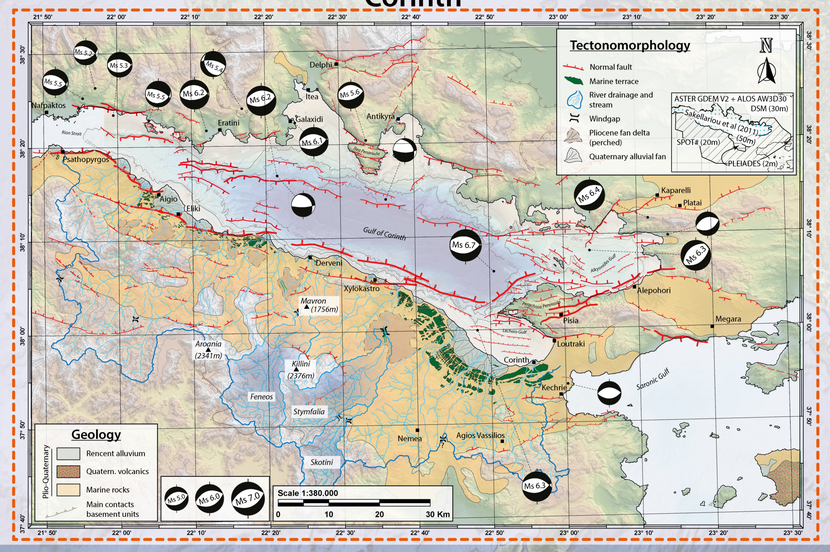
T51A-2885

Corinth

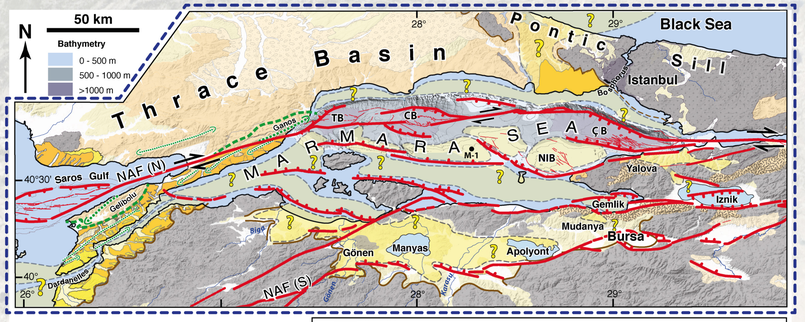


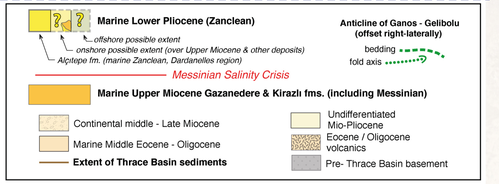
Introduction

The geodynamic drivers responsive for the extension mechanisms presently seen in the Aegean Sea and the Hellenic Arc have been promoting scientific debate for decades. Back-arc crustal extension driven by rollback of the underthrusting African slab controls the slow north-south extension active since several tens of million years in the Aegean Sea. Younger fast east-west extension along step faults trending N-S in the Hellenic Arc seem unrelated to subduction processes; these normal faults are not strictly perpendicular to the subduction interface along strike, but instead open radially away from its southernmost tip

Our project strives to unravel the geodynamic drivers behind the apparently disagreeing extension modes in post-Messinian times by producing tectonic integrations at the scale of the Aegean. We produce integrations at two «zoom levels» (regional, 10^3-10^4 km; tectonic, $>10^5$ km) that respect the particularities and complexity of the information of the studies at the local sacale ($<10^3$ km)

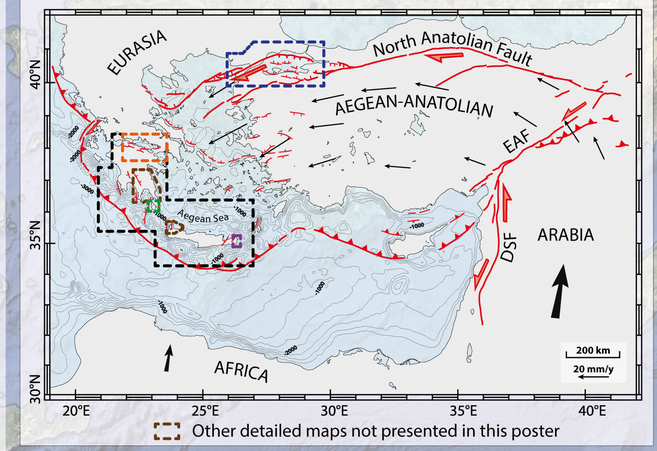
Marmara

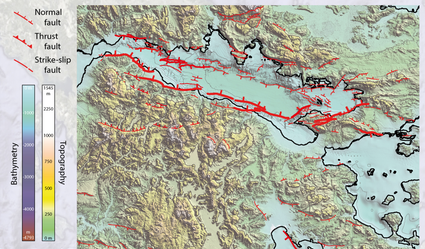




Based on Karakaş thesis (2013); Armijo et al. (in prep)

Aegean & Hellenic Arc

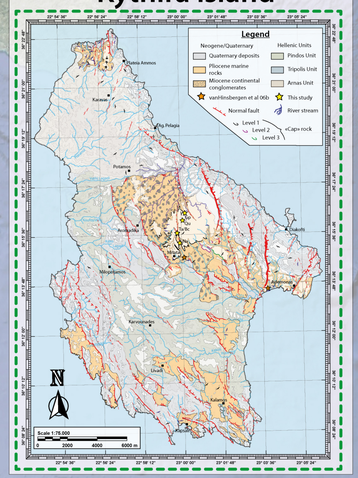




Neotectonic maps

We present a map of active faults of the Hellenic Arc derived from onland DEMs at 30 m horizontal resolution (ASTER GDEM V2 and ALOS AW3D30 DSM) and bathymetry at 1/8 arc horizontal resolution (EMODnet DEM), and inclusive of our mapping at key sites (using 2m-resolution DEMs and fieldwork) as well as observations by other studies

Kythira Island



Corinth

The post-Messinian basin is broad, roughly E-W oriented, and has normal faults oriented N105E, most now inactive

Present basin (since <1Ma) is an asymmetrical half-graben bounded by steep normal faults cross-cutting at N90E and uplifting with tectonic-scale slip rates the former basin in their footwalls

Kythira

Main post-Messinian basin is a half-graben with faults on the SW margin and onlaps in its NE one

Two sets of active normal faults: NW-SE trendin faults in SW and centre that reactivate Hellenic structures. N-S to NW-SE trending faults, transecting all other older structures, including the previous set of normal faults

Hellenic Arc

Overall N-S normal faults dominate the active tectonics in the Peloponnese and Crete

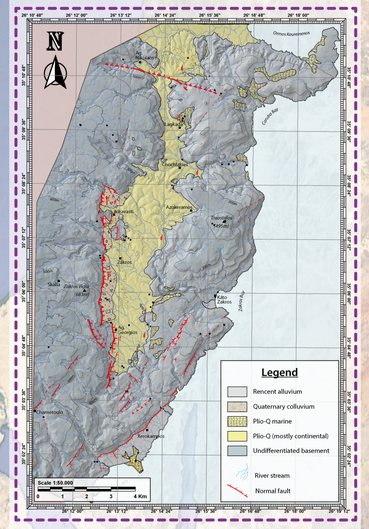
In detail, normal fault systems in the west Hellenic Arc have a N-S orientation in the south, pass to a NNW-SSE strike towards the NW and trend NW-SE in the central Peloponnese; i.e., they change from oblique (yet not perpendicular, ~75˚) to subduction to subparallel in more northward locations. Changes are gradual as the systems interact at different scales

The eastern side of the Hellenic Arc mirrors these trends from central Crete to Rhodes

Marmara

The post-Messinian basin is a E-W trending pull-apart formed in relation to the North Anatoian Fault creating a large rhomb-shaped trough, filled with sediments of Pliocene to Quaternary age. Faults and infill become younger towards more internal areas of the basin

East Crete



East Crete

The main post-Messinian basin is a N-S striking half graben with marine-to-continental infill bounded to the W by an E-dipping normal fault and onlapping against basement to the E

Other active fault systems of smaller relevancy trend NE-SW in the SE and ENE-WSW in the N

Interesting?

Then check as well G.I.N.O. de Gelder et al. poster T51A-2894

Acknowledgements

High resolution (0.5 m) DEMs were obtained using Tristereo Pleiades images and MicMac software (www.logiciels.ign.fr/?Micmac)*.
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* Rosu, A. M., Pierrot-Deseilligny, M., delorme, A., Binet, R., & Klinger, Y. (2015). Measurement of ground displacement from optical satellite image correlation using the free open-source software MicMac. ISPRS Journal of Photogrammetry and Remote Sensing, 100, 48-59.