The Central and Northern Peloponnese low-angle normal faults: Late-Miocene unroofing of the Aegean forearc in the upper plate of the Western Hellenic subduction zone

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Résumé

Located in Southern Greece, the Peloponnese peninsula constitutes the upper plate of the Western Hellenic subduction zone, within the Southern Hellenides alpine belt. Its structure primarily results from the westward stacking of orogenic nappes between Eocene and Miocene times. Following the closure of the Pindos Ocean, the subduction of the Pre-Apulian margin provoked the high-pressure, low-temperature metamorphism of the Phyllite-Quartzite nappe during the Late Oligocene and Early Miocene.
We examine a series of low-angle normal faults (LANFs) throughout Central and Northern Peloponnese, which played a significant role in the syn-orogenic exhumation of the HP units during the Miocene evolution of the Aegean forearc. Although they mostly reactivated the syn-orogenic Cretan detachment, their 3D radial kinematics above the north-western termination of the HP exhumation zone indicate a decoupling of the upper crustal and mid-crustal kinematic regimes.

The LANFs contributed to the thinning of the Southern Hellenides nappe stack, with observed displacements reaching up to 8 km. They are commonly found at the periphery of HP metamorphic domes and appear to be closely related to the latter stages of the exhumation of the metamorphic units, with Zircon-Helium low-temperature thermochronology revealing cooling ages ranging from 9 Ma to 3.5 Ma. Additionally, inverse temperature-time modeling indicates a regional cooling event between 8 Ma and 3.5 Ma.

This cooling event implies that the Central and Northern Peloponnese underwent tectonic uplift in the Late Miocene, likely due to the deep stacking of crustal layers within the supra-subduction prism. During this stage, the activity of the LANFs facilitated the ultimate late-orogenic exhumation of the high-pressure units.
Finally, Plio-Pleistocene NW-SE and E-W high-angle normal faults intersected the LANFs in the Central and Northern Peloponnese, marking the transition to an extensional tectonic regime in the Southern Hellenides.

Mots-Clés: Low, angle normal fault, forearc extension, underplating, Hellenic subduction

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