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Strike-slip faulting in the western prolongation of the North Anatolian Fault: the Lichades – Oreoi Channel – Skiathos Basin lineament

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The North Anatolian Fault (NAF) is one of the major active structures in the Eastern Mediterranean. Its right-lateral strike-slip fault initiated in eastern Turkey 13 Ma ago. The NAF westward propagation during Neogene and Quaternary times delineates the plate boundary between Eurasia and Anatolia-Aegean. The western termination of NAF is currently located in the North Aegean Trough (NAT) where NAF displays a NE-SW direction. In the NAT, the NAF termination is located near to the Sporades Islands. In the western prolongation of this termination, there is a wide domain characterised by distributed deformation. This major extensional area is mainly constituted by the Corinth rift and the North Evia domain, our study area. The whole zone experience a relative high seismicity with strike-slip focal mechanisms, especially right-lateral displacements along NE-SW-striking faults, which are mainly located between the North Evia domain and the Southern Thessaly.

Our study is mostly based on new very-high-resolution seismic reflection profiles (Sparker) acquired during the WATER surveys (Western Aegean Tectonic Evolution and Reactivations) in July-August 2017 and 2021, onboard the R/V "Téthys II". We also analysed several seismicity catalogues in order to connect the recent structures from seismic lines to active tectonics over the region. The interpretations from these datasets emphasize the evolution of the deformation of the North Evia domain, in particular, along the NE-SW striking lineament "Lichades Area – Oreoi Channel – Skiathos Basin" (L-O-S).

The deformation in the Lichades Area is dominated by numerous active normal faults striking W-E or WNW-ESE and showing metric-scale offsets (up to 5 m.) within the Holocene sequence. One of the largest sub-active to active fault is striking NE-SW, parallel to the Oreoi

Channel, and thus strongly oblique to the main rift deformation. The Oreoi Channel is a marine straight linking the Lichades Area and the Skiathos Basin. The seismic profiles highlight normal faults of different ages with a NE-SW direction. In the south-east, the Oreoi Channel is delineated by the Oreoi Fault, a mainly onshore normal fault which is dipping towards north-west. The Skiathos Basin is a newly discovered structure from our seismic dataset that is separated from the Skopelos Basin by a NE-SW striking acoustic ridge. The Skiathos Basin presents two main depocenters individualized by areas of rising acoustic basement. Some normal faults, oriented NE-SW and W-E, have been identified in the basin. Finally, many earthquakes focal mechanisms located in the Skiathos Basin and the Oreoi Channel indicate strike-slip faulting, with a right-lateral motion along the NE-SW direction.

This detailed structural analysis together with the synthesis of seismic activity allow to propose a tectonic map with new insights on the recent deformation of the key-area "L-O-S" in the south-western prolongation of NAF. The Skiathos basin development shows indications of transtensive deformation. The Oreoi Channel is controlled by NE-SW-striking faults with a right-lateral component and the Lichades Area displays several fault with oblique direction and pure extension. We propose that the L-O-S tectonic system prolongs the NAF system and may progressively evolve as the future plate boundary.