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Preliminary results constraining the kinematics of subduction and exhumation processes on Skopelos island, Northern Sporades (Aegean Domain)

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Extension in the Aegean region is a process driven by slab rollback since 45 Ma (e.g. Brun and Sokoutis, 2007; Brun et al. 2016). These and other studies dominantly focused on the northern Aegean/Rhodope or the Cycladic tectonic systems, yielding abundant kinematic, structural, petrologic and geochronological data to constrain their geodynamic evolution. This contrasts with the region of the Northern Sporades, which have not yet been thoroughly studied in the light of subduction-exhumation processes. In particular, a detailed kinematic analysis, the focus of this study, is missing that allows for establishing the relation between the deformation structures on the island, and the large-scale tectonic events in the Aegean domain.

The Northern Sporades consist of three major (area $\geq$ 50km2) islands (Skiathos, Skopelos, and Alonnisos) and a number of smaller islands. As the first phase of exploring the structural evolution of the Northern Sporades, this work reports the results of field work performed on the island of Skopelos, and aims to provide a preliminary model for the deformation history of the island.

Skopelos consists from bottom to top of three structural units, which are separated by thrust contacts (Jacobshagen and Wallbrecher, 1984; Matarangas, 1992; Jacobshagen and Matarangas, 2004): the Pelagonian, the Eohellenic, and the Palouki unit. The age of the formations constituting these units ranges from Paleozoic to Paleogene, and all formations have been metamorphosed under lower greenschist or possibly also blueschist facies conditions (Mposkos and Liati, 1991) and experienced polyphase deformation.

Based on our field kinematic and structural analysis we suggest the following deformation sequence on Skopelos island: D1 is characterized by tight to isoclinal folding (F1) and the formation of a penetrative foliation (S1), which is the axial plane cleavage to the F1 folds. S1 planes carry a NE-SW trending stretching lineation, along which top-SW shear has been inferred. The second phase of deformation (D2) is defined by top-NE to E shear using the already existing S1 foliation planes in many cases. D2 folding (F2) entails the formation of sheath folds with their axes being sub-parallel to the dominantly NE-SW trending stretching lineation in zones of high strain, upright folds with NE-SW trending axes as well as recumbent folds that affected the already tilted penetrative foliation. The D3 phase is semi-brittle to brittle and is defined by outcrop-to regional-scale fault (and fault-related fold) systems, which have shaped the geometry and elevation of islands and basins of the region until present days.

We interpret D1 to reflect prograde metamorphism and top-SW deformation during subduction of the Pelagonian continental block. In contrast, D2 records progressive and distributed top-NE to E extensional deformation and provides the main mechanism for exhuming the previously buried rocks. This phase of deformation was probably triggered by the southward retreat of the Hellenic trench. The emplacement of the Eohellenic and the Palouki units by thrusting (D3) is post-metamorphic and in our view related to the dextral displacement along the fault that borders the North Aegean Trough.