EGU25-12332, updated on 16 May 2025
https://doi.org/10.5194/egusphere-egu25-12332
EGU General Assembly 2025

Spatial extent of deep slab slicing events: Insights from the Phyllite-Quartzite paleo-accretionary complex (SE-Peloponnese and Kythira, Greece)

Maïlys Bouhot[1], Armel Menant[1], Clément Ganino[1], Samuel Angiboust[2], Onno Oncken[3], Damien Deldicque[4], Laurent Jolivet[5], and Nikolaos Skarpelis[6]

[1]Université Côte d'Azur, CNRS, Observatoire de la Côte d'Azur, Géoazur, Nice, France (mailys.bouhot@geoazur.unice.fr, armel.menant@geoazur.unice.fr, clement.ganino@univ-cotedazur.fr)

[2]École normale supérieure de Lyon, ENS, IUF, Lyon, France (samuel.angiboust@ens-lyon.fr)

[3]GFZ Helmholtz Centre Potsdam, German Research Centre for Geosciences, Potsdam, Germany (oncken@gfz-potsdam.de)

[4]Laboratoire de Géologie, École Normale Supérieure PSL, LGENS-ECCETERRA, Paris, France (deldicque@biotite.ens.fr)

[5]Sorbonne Université, UMR 7193 CNRS-UPMC, Institut des Sciences de la Terre de Paris, Paris, France (laurent.jolivet@sorbonne-universite.fr)

[6]Faculty of Geology and Geoenvironment, University of Athens, Athens, Greece (skarpelis@geol.uoa.gr)

The massive transfer of material at depth significantly influences the long-term morphology of active subduction zones. However, the process of basal accretion (or tectonic underplating), when active, remains challenging to observe directly, due to the low resolution of geophysical imaging at high depth and the lack of spatial and temporal constraints on its tectonic and topographic signature in fore-arc domains. To tackle this issue, we aim at constraining the size of accreted tectonic slices that were stacked at high pressure/low temperature (HP/LT) conditions to build an accretionary complex.

To provide such constraints, we carried out a multidisciplinary study on the now-exhumed Phyllite Quartzite paleo-accretionary complex dated to the Oligo-Miocene, which crops out discontinuously along the active Hellenic subduction zone (Greece). This natural laboratory represents a key site for studying deep accretion processes as it remains in a fore-arc position and has not undergone a strong overprinting by later tectonic events.

A petro-structural study was therefore undertaken to identify the different sub-units of the Phyllite Quartzite complex. Detailed mapping of Kythira and southeastern Peloponnese, combined with structural measurements, petrological observations, Raman spectroscopy of carbonaceous material, and thermobarometric modeling, revealed several tectono-metamorphic sub-units forming this nappe stack. These units are distinguished by their petrological characteristics, the orientation of finite deformation markers, and their pressure-temperature history.

The results highlight two HP/LT sub-units in southeastern Peloponnese, which are also likely present on the island of Kythira, where one or two additional sub-units have been identified. These sub-units exhibit a distinct metamorphic evolution characterized by an increasing peak

temperature from the base to the top of the HP/LT nappe stack. These observations suggest that the Phyllite-Quartzite paleo-accretionary complex was formed through a minimum of three successive episodes of basal accretion in this area. To better constrain the geometry of these units, spatial correlations with the neighboring regions where the nappe stack crops out are proposed, providing a minimum estimate of the size of the HP/LT units. The slices are estimated to measure tens of kilometers by hundreds of kilometers in the trench-perpendicular and trench-parallel directions, respectively. This study thus represents a first key step for constraining the characteristic size and the dynamics of tectonic underplating, which may still be active along the Hellenic margin and is observed in many active subduction zones worldwide.