Forearc-dipping normal faulting in Central-Western Peloponnesus, Greece

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Forearc-dipping, orogen-parallel low-angle extensional faults have been described in various orogens, including the Apennines, Italy and, recently, southern-central Crete, Greece. Such a fault system is also present in the central-western Peloponnesus, in the south-western Aegean Arc. It comprises low- and high-angle normal faults which control the western border of Mt Mainalon. The Alpine nappe sequence of the studied area includes the metamorphic rocks of the Phyllites-Quartzites Unit (PQ), overlain by the carbonates and flysch of the Gavrovo - Tripolis Unit, which also overlies the Ionian Unit to the west. The uppermost nappe is the Pindos Unit, which is a sequence of Mesosoic pelagic limestones and clastics, topped by a Paleocene flysch.

Most of the extensional structures were previously thought of as the original thrust contact between the Pindos and Tripolis Units. However, our geological mapping and the cross-cutting relationships among these structures indicate that these are SW-dipping faults – their dip, in other words, is towards the arc- and they downthrow the original Pindos thrust by a few tens or hundreds of meters each. Some of these faults sole into the underlying thick Tripolis flysch, but most of them reach deeper, affecting the contact between the flysch and the carbonate platform. In SW Mainalon we mapped low-angle normal faults that juxtapose the metamorphic rocks of the PQ Unit against the non-metamorphic sequence of the Tripolis Unit. High-angle normal faults found further to the west have truncated or even sole to the low-angle ones. The whole extensional fault architecture has resulted in the Pindos thrust stepping down from altitudes higher than 1000 m in Mainalon, to negative heights in North Messinia and southern Ilia; and the gradual disappearance of the Phyllite-Quartzite metamorphics of Mainalon towards the west.

In the north-west, these faults are truncated by NE to NNE-striking, NW-dipping faults, which transfer the whole fault system towards the north, where it forms the eastern boundary of the Pyrgos graben. On the other hand, the south-eastern members of this fault system are truncated by E-W to ENE-WSW faults, which relay fault activity to the eastern boundary of the Megalopolis basin. All these extensional structures form the eastern boundary of the Megalopolis-Lycaion-Minthi-Tetrazion (MeLyMiTe) and the Pyrgos tectonic depressions, which in turn are separated by the E-W Lapithas horst, at the western end of which the Ionian Unit crops out. The northern and southern boundaries of these tectonic depressions are controlled by oblique-normal faults, perpendicular to the eastern boundary. The throw of these faults increases towards the west and the interplay of all these faults has led to the composite deformation pattern of the MeLyMiTe, which displays extension on its flanks and compression in its centre.

The combination of these extensional faults (which may reach down to the Ionian decollement) with the low-angle floor thrusts of the Pindos, Tripolis and Ionian Units leads to additional ENE-WSW shortening, normal to the Hellenic Arc, west of the Peloponnesus.

The origin of color in minerals and gems

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We explore the cause of color in the mineral world from the smallest (isolated ions) to the largest (a full crystal). Many mineral colors originate in absorption but occasionally