



Cenozoic tectonics of the External Hellenides

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The External Hellenides are characterized by a concave-to-the-foreland parabolic curvature that can be followed along the active Hellenic Arc. In cross-section they show a double-vergent geometry which was established during three main deformation phases. The first phase began at the early Eocene and marks the northward subduction of the Apulia margin beneath the Pelagonian crust in geometric continuity with the preceding subduction of the Pindos Ocean. During this phase, foreland-directed 'in-sequence' thrusting of the inner structural units took place. In this context, oceanic rocks were emplaced over the Pindos unit while the latter was overthrust onto the Gavrovo-Tripolitza unit. The along strike structural variations in the resultant Pindos nappe with dense array of imbricate thrusts in central Greece and detachment folds in Kythira and Crete are interpreted to reflect lateral variations in the thickness of the Mesozoic sequence as well as along strike changes in the rigidity of the Apulia crust. Such changes may explain localized backthrusting in NW Greece. Strong localization of deformation along an intracontinental weak Mesozoic zone separating the Ionian/Plattenkalk from Gavrovo-Tripolitza unit characterizes the second phase which began at the early Oligocene. The inversion of this rift zone to a crustal-scale thrust occurred almost synchronously throughout the Hellenides. However, the displacement on this thrust increases considerably from the central Greece to the south Peloponnese and Crete where the inversion of the zone led to intracontinental subduction and high-pressure metamorphism of the Phyllite-Quartzite unit. The region of maximum displacement on this thrust coincides with the crest of the parabolic curvature of the belt. The third phase at the early to middle Miocene was associated with uplift and doming of the windows in the Peloponnese and Crete. In these areas, regional out-of-sequence thrusting, backthrusting, folding of pre-existing thrust faults and gravity slidings took place. Forward thrusting took place in the outermost portions of the Hellenides. The absence of significant backward movements in continental Greece is maybe attributed to a previously established along strike crustal anisotropy.