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Lithospheric Response of the Anatolian Plateau in the Realm of the Black Sea and the Eastern Mediterranean

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The Eastern Mediterranean and the Middle East make up the southern boundary of the Tethys Ocean for the last 200 Ma by the disintegration of the Pangaea and closure of the Tethys Ocean. It covers the structures: Hellenic and Cyprus arcs; Eastern Anatolian Fault Zone; Bitlis Suture Zone and Zagros Mountains. The northern boundary of the Tethys Ocean is made up the Black Sea and the Caspian Sea, and it extends up to Po valley towards the west (Pontides, Caucasus). Between these two zones the Alp-Himalayan orogenic belt is situated where the Balkan, Anatolia and the Iran plateaus are placed as the remnants of the lost Ocean of the Tethys. The active tectonics of the eastern Mediterranean is the consequences of the convergence between the Africa, Arabian plates in the south and the Eurasian plate in the north. These plates act as converging jaws of vise forming a crustal mosaic in between. The active crustal deformation pattern reveals two N-S trending maximum compression or crustal shortening syntaxes': (i) the eastern Black Sea and the Arabian plate, (ii) the western Black Sea and the Isparta Angle.
The transition in young mountain belts, from ocean crust through the agglomeration of arc systems with long histories of oceanic closures, to a continental hinterland is well exemplified by the plate margin in the eastern Mediterranean. The boundary between the African plate and the Aegean/Anatolian microplate is in the process of transition from subduction to collision along the Cyprus Arc. Since the Black Sea has oceanic lithosphere, it is actually a separate plate. However it can be considered as a block, because the Black Sea is a trapped oceanic basin that cannot move freely within the Eurasian Plate. Lying towards the northern margin of orogenic belts related to the closure of the Tethys Ocean, it is generally considered to be a result of back-arc extension associated with the northward subduction of the Tethyan plate to the south. Interface oceanic lithosphere at the leading edge of the northward moving African Plate in the eastern Mediterranean Sea and the deforming Aegean-Anatolian Plate continental lithosphere forms the northward dipping Hellenic and Cyprean subduction zones in the south. Since there is a velocity differential between the northward motion of African and Arabian Plates (10 mm/yr and 18 mm/yr, respectively), this difference is accommodated along the sinistral strike-slip Dead Sea Fault that forms the plate boundary between the African and the Arabian Plates.
Continental crust forms from structurally thickened remnants of oceanic crust and overlying sediments, which are then invaded by arc magmatism. Understanding this process is a first order problem of lithospheric dynamics. The transition in young mountain belts, from ocean crust through the agglomeration of arc systems with long histories of oceanic closures, to a continental hinterland is well exemplified by the plate margin in the eastern Mediterranean. Mountains are subject to erosion, which can disturb isostatic compensation. If the eroded mountains are no longer high enough to justify their deep root-zones, the topography is isostatically overcompensated.

Similarly, the buoyancy forces that result from overcompensation of mountainous topography cause vertical uplift. The Eastern Mediterranean Basin, having 100 milligal gravity values lower than other isostatically compensated oceans, it is in general overcompensated. Normally the Eastern Mediterranean Basin should rise under its present isostatic condition. It is known, however, that the Eastern Mediterranean Basin with its thick sediment-filled basins is actually sinking. Anatolia, having 100 milligals gravity values higher than other isostatically compensated zones of the world, is in general undercompensated. Normal isostatic conditions require that Anatolia should sink. It is known, however, that Anatolia, with the exception of local grabens, is rising. While the Black Sea, having 100-milligal lower gravity value than other isostatically compensated oceans, it is in general overcompensated and The Black Sea basin with very thick sedimentary cover (more than 12-14 km thick) is actually sinking.