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The North Cycladic Detachment System and associated mineralization, Mykonos, Greece: insights on the evolution of stress regime in the Aegean domain

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In the Aegean back-arc domain, some 30-35 Ma ago, the increasing rate of slab retreat led to the initiation of post-orogenic extension, largely accommodated by several large-scale structures such as the North Cycladic Detachment System (NCDS). Although the Aegean N-S extension is still active nowadays, particularly with the Evia and Corinth rifts, an E-W compressional regime developed 5-6 Ma ago with the propagation of the North Anatolian Fault and its extension within the Central Hellenic Shear Zone. On Mykonos island (Cyclades), the NE-SW back-arc extension is well expressed, particularly with two main shallow-dipping shear zones belonging to the NCDS: the Livada and Mykonos detachments associated with NW-SE banded barite and Fe-hydroxide vertical veins emplaced from 10-11 Ma. A structural study of detachments, veins and faults show an evolution of the kinematics of these tectonic structures. We show that (1) most of the displacement was first accommodated by the shallow-dipping Livada and Mykonos detachments with a N30°E direction of extension. Minor steep and shallow-dipping normal faults formed during this episode above and below the detachment and some of them were mineralized. (2) The normal faults and the veins were later reworked in a strike-slip regime with an E-W direction of compression and a persistent N-S to NE-SW extension. Alternating periods of extension with the same direction of the least principal stress are recorded during this stage. (3) The last stage is compressional with a minor reworking of shallow-dipping faults (locally including the detachment itself) with an E-W compression. We interpret this increase of the E-W compressional component during the activity of the detachments and the emplacement of ore deposits as a consequence of the initiation of the westward motion of Anatolia that we date at $\sim$10 Ma, some 5 Ma before the propagation of the North Anatolian Fault and the localization of the strain on the margins of the Aegean Sea.