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Regional Variations in Clay Mineralogy and Geochemistry of Mn-Rich Marine Clays from Maden-Hazar Basin in the Neotethys, (Eastern Turkey)

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Hazar-Maden Basin marine sediments were deposited along the eastern branch of the Neo-Tethys margin during the oceanic convergence stage between the Senonian and the Eocene ages. Sediments from volcanoclastic environments including pyroclastic tuffs and epiclastics were studied by optical microscopy, XRD, SEM and geochemical methods. This study concentrates on the marine clay mineral assemblages, importance of volcanism to marine sediments during convergence stage, and the relationship between paleo-environments and clay mineralogy-geochemistry in sections belonging to deeper and proximal arc volcanism (Mastar Section, Gehroz-Karadere Formations; Yukaribag Section, Karadere Formation), and platform marine (Sebken Section, Simaki Formation) settings. This study focuses on Upper Maastrichtian-Middle Eocene Hazar Group and Middle Eocene Maden Complex. Simaki Formation of Hazar Group consists of pinched out limestones with grey shales-sandstones at the base and alternated reddish shales-sandstones above. The Gehroz Formation of Hazar Group consists of gray shales, tiny sandstone layers, and limestones. Karadere Formation of Maden complex is represented by volcanosedimentary rocks and pyroclastics. These lithologies contain phyllosilicates (smectite, I-S, S-C, I-C, paligorskite, sepiolite, paragonite), quartz, feldspar, calcite, dolomite, opal-CT and hematite. Clayey rocks are dominated by smectite and I-S (interstratified illite/smectite). Smectitic I-S was created through the conversion of smectite transported to the synclinal basins from the open marine environment. The absence of kaolinite and the smectite-paligorskite-opal-CT association shows that the majority of the precursor smectite converted to smectitic I-S was derived from argillized marine volcanic rocks and island volcanism. Smectite is widely distributed in sediments, showing honeycomblike traits in the SEM, considered to authigenic origin. I-S crystals, typically result from the diagenetic conversion of smectitic precursors, and are elongated and flementous. Previous studies showed that the Hazar-Maden Basin was deposited during the oceanic convergent stage in different environments as open and shallow sea based on the geologic mapping and stratigraphic data. Geochemical results show the useful integration to detect different marine successions of the basin. Samples of Mastar and Yukaribag Sections have lower K2O/Al2O3, Th/Al, HFSE ratios than the Sebken Sections, but a higher Sr/Ca ratio, due to their volcanoclastic detritic contribution. Negative anomalies of chondirite normalized sample patterns are distinctive in the Sebken Section, because of continental detritics. Mn rich samples have a higher Ce anomaly and total REE, because, Fe-Mn flocs scavenge Ce_{IV} and REE from seawater. Mineral to element correlation analysis indicates the mineral assemblages (significant, $p<0.05$). Feldispar shows a negative correlation with CaO, indicating carbonate-silicate discrimination. Negative correlation of clay-SiO2 show silicate-clay phase discriminants. Quartz and feldispars show a similar correlation coefficient, except Cs, V, Y, Cu, Pb, Zn, Ni, which reveal a quartz-feldispar association.