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Petrographic and geochemical characteristics of dolomitization in the Late Jurassic-Early Cretaceous platform carbonates, Başoba Yayla (Eastern Pontides, NE Turkey)

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The Late Jurassic-Early Cretaceous Berdiga Formation with a wide distribution in E-W direction in the eastern Pontides (NE Turkey) is composed of platform carbonates. The formation with distinct lithofacies properties in both lateral and vertical directions was deposited on carbonate shelf changing from supratidal to platform margin reef and was buried until the end of Late Cretaceous. One of the typical exposures of formation is found around the Başoba Yayla area (Trabzon, NE Turkey) in northern zone of the eastern Pontides where the formation has a limited distribution. In this area, platform carbonates are 250 m in thickness and from bottom to top composed of dolomite, grainstone-packstone and skeleton wackestone. The 120-m thickened dolomite facies which comprises the lower part of formation contains four dolomite phases as replacement (Rd) and cement (Cd) types. Replacement dolomites (Rd) that are cut by low-amplitude stylolites are developed as 1) thin crystalline planar-s dolomite (Rd1), 2) thin-medium crystalline, texture-protective planar-s dolomite (Rd2) dolomite and 3) medium-coarse crystalline planar-s dolomite (Rd3). Coarse-very coarse crystalline dolomite cement (Cd) filling dissolution spaces and fractures in Rd1 dolomites are cogenetic with low-amplitude stylolites. Replacement dolomites are Ca-rich and non-stoichiometric ($Ca_{56-60}Mg_{40-44}$) and geochemically have two-population distribution and uniform dull red/non-luminescence appearance. The $\delta^{18}O$ compositions of replacement dolomites are from -15.3 to -4.2 ‰ VPDB, $\delta^{13}C$ values are 1.5–3.7 ‰ VPDB and $^{87}Sr/^{86}Sr$ ratios are 0.70675 to 0.70731. Sr, Na, Mn and Fe contents of these dolomites are 74–163 ppm, bdl–200 ppm, 94–553 ppm and 1400–3800 ppm, respectively. Petrographic and geochemical date yield that replacement dolomites (Rd) are formed before the chemical compression at shallow-moderate burial depths from Jurassic-Early Cretaceous seawater and/or seawater partly modified by rock-water interaction and recrystallized by hydrothermal waters of marine origin at enhanced temperatures and progressing burial depths. Like replacement dolomites, dolomite cement (Cd) are Ca-rich and non-stoichiometric ($Ca_{58-60}Mg_{40-42}$) and are represented by Sr (106-201), Na (<bdl ppm), Mn (154-435 ppm), Fe (1900-5200 ppm) and high homogenization temperatures (Th) that depict Rd3 dolomite. These findings coupled with the association of Cd dolomite with low-amplitude stylolites indicate that Cd dolomite were precipitated at nearly moderate burial depths by dolomitizing solutions (hydrothermal) which are similar to those which formed and/or crystallized Rd3 dolomite. In addition, the fact that Cd dolomite gradually changes to coarsely crystalline mosaic calcite and silica cement toward the center of pores might reveal that diagenetic fluids become oversaturated with respect to calcite and silica but undersaturated with respect to dolomite.