Petrogenesis and Geochemistry of Eocene Dolostones from Jamaica

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Replacement dolomite is widespread in the Cenozoic carbonates of Jamaica, with dolomitization affecting platform limestones of Eocene and Miocene age, and fringing reefs of Pliocene age. The Eocene dolostones are the largest volumetrically and are characterised by sucrosic dolomite with euhedral to subhedral interlocking crystals and the loss of most small-scale primary sedimentary fabrics. Preserved large-scale fabrics include large vugs after larger foraminifers, fenestral fabrics, and intraclasts.

Two units of dolomitization occur in the Eocene. The older Late Eocene Troy Formation has a thickness of 20 to 200 m, shows 95-99% dolomitization, and extends over some 4, 000 km^2 of the platform. In contrast, the younger Late Eocene Claremont Formation only shows dolomitization in a part of the southern half of the platform, an area of about 50-100 km^2. Although primary fabrics are largely lacking, undolomitized parts of the two formations consist of lime mudstones and wackestones, suggesting that dolomitization preferentially affected fine-grained carbonates. The underlying (Yellow Limestone), interbedded (Swanswick Formation) and overlying (Somerset Formation) packstones and grainstones are generally not dolomitized, although the boundaries between dolostones and limestones are gradational over a few to tens of meters. Petrographic analyses show idiotopic to xenotopic crystals with polymodal grain sizes, cloudy ferroan cores and limpid rims.

No evaporite deposits are associated with these platform successions. We envisage sea water as the only viable source of magnesium. Stable oxygen isotopes are moderately depleted (-1.46‰), suggesting dolomitization at elevated temperatures (depth), whereas stable carbon isotopic values are close to those of sea water (0.91‰). Strontium isotopes of dolomites are consistent with Oligocene seawater (Troy dolostones averaging 0.7078) and Miocene seawater (Claremont dolostones averaging 0.7083).

Our model implies dolomitization was as a result of burial and seawater fluid flow driven by sea-level lowstands in the Oligocene and Miocene.