LATE ARCHEAN CARBONATE FACIES MODEL

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Late Archean carbonate platforms are rare. However, similar facies distributions in five 2.8-2.5 Ga carbonates can be used to develop a working facies model for Late Archean carbonates. The main distinguishing feature of Late Archean carbonates is an abundance of calcite and (pseudomorphed) aragonite coatings on depositional surfaces. These precipitates are centimeters to meters thick; coat ripples, channels, and other bedding surfaces; form the bulk of the rock in meters of section; form the internal texture of precipitated stromatolites; and fill voids in microbial structures. The working facies model emphasizes these precipitated elements. 1) Intertidal to supratidal facies contain abundant precipitated stromatolites; centimeter-scale aragonite botryoids and calcite coatings; platy breccias, commonly coated with stromatolitic laminae and cements; oolitic grainstones; rare micrite beds; and tepee structures and desiccation cracks. 2) Shallow subtidal and reefal facies are composed predominantly of precipitated stromatolites. Various columnar stromatolites are common in shallower water; giant elongate stromatolites are common in deeper water. Decimeter-scale aragonite fans are locally abundant, sometimes forming the bulk of shallow subtidal facies. Centimeter- to decimeter-thick calcite coatings on depositional surfaces are common. 3) Lagoonal facies are composed of cement-rich microbially laminated sediment, interbedded with isopachously laminated domes that precipitated on bedding surfaces. 4) Deep subtidal facies consist of fenestrate microbialites with abundant calcite cements. In some units, aragonite was also abundant. There is no evidence of micrite settling from the water column. 5) Facies deposited below the depth of abundant calcite and aragonite precipitation contain carbonate turbidites, shale, and banded iron-formation.