Carbonate cement within strata of the Pennsylvanian Grande Anse Formation, southeast New Brunswick, Canada

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The Grande Anse Formation comprises a Lower Pennsylvanian sedimentary succession deposited in the western Cumberland Basin of the regional Maritimes Basin complex. The succession is interpreted to have formed within fluvial channel, floodplain, and non-channelized environments. Sandstone and conglomerate beds contain carbonate cements, the distribution and origin of which are being investigated using optical microscopy, scanning electron microscopy (ESM), X-ray fluorescence (XRF), and cathodoluminescence (CL). The overall diagenesis of the Grande Anse Formation is characterized by dissolution and alteration of framework grains, and by crystallization of iron oxides, kaolinite, pyrite, and several generations of silica and carbonate cements. Broadly, three types of carbonate cements are identified: calcite, dolomite, and siderite. These cements are more abundant in the coarser grained beds from the lower part of the formation, with clay minerals and greater compaction more common up-section.

Several different carbonates have been identified. The abundance of floating grains and non-ferroan poikilotopic calcite cements that fill large pores indicate early precipitation prior to significant compaction. In the lower part of the section these cements have generally prevented further diagenetic alterations and mechanical compaction, except for a later stage partial dissolution of unstable detrital grains. These cements most likely precipitated from vadose waters during eodiagenesis before the transformations of the clay minerals and release of iron and manganese that substitute for calcium in later stage carbonate. The later, high Mnand Fe-calcite cements fill fractures and secondary pores of leached k-feldspar. The Scanning Electron Microscope shows neocrystallization of high Mn- and Fe-calcite and variably Fe-rich dolomite in conglomerate and coarse sandstone units. In addition, chalcedonic silica and prismatic silica zoned by microcrystalline carbonate indicate an episode of chertification that may accompany dissolution of existing carbonate during late eodiagenesis and/or mesodiagenesis.

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