

Marine Pisoids Versus Pedogenic Vadoids: An Old Controversy Revisited Using New Core from the Mississippian Frobisher Formation in the Benson area, SE Saskatchewan

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Coated grains are ubiquitous in the interpreted shallow marine and paralic environments of the Mississippian in the Williston Basin. Historically and conventionally, most of these coated grain deposits have been interpreted as the result of in situ precipitation and continued growth of oolitic (including superficial oolitic) to pisolitic grains in an agitated shallow offshore marine shoal/bank, or less commonly, a high energy foreshore environment. In 1982, following a detailed examination of the Alida-Frobisher beds of the Mission Canyon Fm. from North Dakota, Lee Gerhard put forward the controversial thesis, that the coated grains he examined were the result of subaerial exposure, vadose diagenesis and pedogenesis. In brief, the coated grain deposits were best described as part of a caliche profile.

Examination of an exquisitely preserved core from the Huntoon to Halbrite beds of the Frobisher Formation from the Benson area of SE Saskatchewan, lends additional credence to the Gerhard model. Vadose and pedogenic fabrics prevail, whereas persuasive evidence of high-energy shoal environments is absent. This raises the larger question as to how extensive were Bahamian-type ooid-dominated shoals (so commonly portrayed in diagrammatic models), in the Mississippian of the Williston Basin? Notwithstanding the irregular trap geometries imposed by the subcrop, the lateral continuity of pisolitic reservoir facies, if developed in a predominantly subaerial regime of supratidal cays and evaporitic ponds (perhaps associated with subtle topographic highs), will be substantially less than the continuity of offshore high energy shoals. Mapping and risking of step-out exploration opportunities must account for this reality.

Pertinent to the petroleum industry, the genesis of the pore systems in these rocks, can also be related to the influence of subaerial exposure and associated processes.