

A Glass Ramp: Shallow-Water Permian Spiculitic Chert Sedimentation, Sverdrup Basin, Arctic Canada

Laura M. Gates^{*}
ExxonMobil Canada Ltd., 237 Fourth Avenue S.W., Calgary, AB T2P 2J7
laura.m.gates@exxonmobil.com

Noel P. James
Queen's University, Kingston, ON

and

Benoit Beauchamp
Geological Survey of Canada, Calgary, AB

ABSTRACT

Thick, widespread spiculitic chert and subordinate carbonate of the Upper Permian (late Guadalupian to Lopingian) Degerböls and Lindstrom formations record deposition during a third-order, Late Paleozoic sea-level cycle in the Sverdrup Basin. The succession is interpreted to have accumulated as a ramp in a mid-latitude, relative low-energy setting that was periodically perturbed by storms, one of the few such occurrences of neritic spiculitic chert in the geological record.

Sediments comprise eight lithofacies that can be placed in inner ramp to basinal paleoenvironments. Inner-ramp facies include fossiliferous glauconite-rich carbonate grainstone, fossiliferous spiculitic chert, and light spiculitic chert. Although siliceous sponge spicules greatly outnumber all other fossils, Heterozoan Association calcareous biota commonly occur in nearshore environments. Burrow-mottled and dark spiculitic chert typify the middle ramp. Finely-laminated spiculitic siltstone and fissile shale occur in the outer ramp, slope and proximal basinal settings. Ankeritic siltstone spans middle ramp to basinal environments, characterizes sediments deposited subsequent to the biosiliceous cherts, and may record continuous deposition across the Permian-Triassic boundary. Episodic storms affected nearshore environments, and hummocky cross-stratification typifies spiculites on the middle ramp. During periods of slow accumulation, bioturbation is pervasive, with *Zoophycos* and *Planolites* common across the ramp profile. Ramp morphology evolved through the third-order sequence, with widespread fossiliferous grainstone, typical of Guadalupian time, reduced to patchy, isolated occurrences by Lopingian time.

This extensive chert occurrence is one of many accumulations of Late Permian age along the northwest margin of Pangea. The source of silica is interpreted to have been upwelled cold and nutrient-rich waters, with an abundant typical upwelling assemblage of authigenic minerals including glauconite, phosphate, and pyrite associated with the cherts.