

Biogenic Sorting in Wave Dominated Shorelines in the Western Canada Sedimentary Basin

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When analyzing the permeability characteristics of reservoir rocks, heavily bioturbated horizons are generally considered to be of poor reservoir quality because of the disruption of primary bedding and the resultant chaotic bedding pattern.

The Cretaceous of the Western Interior Sedimentary Basin contains numerous sequences of high-energy wave dominated strata. Within these sequences, there is frequent occurrence of the trace fossil *Macaronichnus* in sediments interpreted to represent a forshore to uppershoreface depositional environment. This trace fossil typically occurs in great abundance, with complete bioturbation of thick and laterally extensive rock units.

The *Macaronichnus* tracemaker preferentially ingests clean quartz and feldspar grains resulting in a biological sorting of sediment into small quartz rich lenses with micaceous and heavy mineral linings. Biological sorting of grains in this manner is on a scale large enough to significantly influence the permeability of a reservoir unit. Depending on diagenesis and degree of burrowing, the presence of *Macaronichnus* may enhanced or decrease the expected permeability in a given sedimentary unit. Examples occur in formations from the Aptian to Campanian including the Bluesky, Spirit River, Cardium, and Horseshoe Canyon. Based on comparison of horizontal and vertical permeability in bioturbated and non-bioturbated horizons, a predictive relationship between horizontal and vertical permeability and degree of bioturbation can be established.