Sill-Dominated Clastic Intrusions Sourced from Adjacent Deep-Water Submarine Channels: Geometry and Emplacement Models (Isaac Formation, Neoproterozoic Windermere Supergroup, Southern Canadian Cordillera)

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Recently outcrop and seismic examples of postdepositionally mobilized sediment (injections) have become increasingly recognized, and commonly occur as bedding-discordant dikes. In strata of the Neoproterozoic Windermere Supergroup, however, injections are dominated by coarse-grain, bedding-concordant sills (<2.5 m thick) that typically intrude thin-bedded turbidites. Sills are most common at the bases of coarse-grained channel fills where they form sharply-bounded, fingerlike projections that taper and eventually pinch out over horizontal scales of several meters to 50 meters. Almost invariably the intrusion fill consists of poorly-sorted, very coarse sandstone with dispersed granules. Generally grain size varies little along the length of the sill, but near its terminus fines rapidly. Mudstone clasts are common immediately adjacent to the channel-fill margin, but decrease rapidly in abundance and size laterally.

Intrusions are interpreted to be the result of short-lived, catastrophic fluidization of shallowly-buried channel-fill sediment. Initially pore-fluid pressures in the sand/gravel channel deposits were probably elevated by the influx of fluid expelled from adjacent, compacting, mud-rich, thin-bedded turbidites. Later, pore pressures became significantly elevated, in some cases by the instantaneous loading of overlying debris-flow deposits. Sand and granules most probably intruded adjacent strata as a network of coalescing elements that in many places completely surrounded and isolated "clasts" of thin-bedded strata (in-situ brecciation). Further away from their sediment source (i.e. channel fill) intrusions preferentially intruded along sand-rich layers in the thin-bedded turbidites, and then thinned rapidly and terminated. Although dikes are uncommon, these sill-dominated intrusion complexes may connect adjacent channel-fill deposits and enhance channel reservoir connectivity.

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