

Mass-transport-dominated sedimentation in a foreland basin, Hidaka Trough

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Mass transport is an important process of sediment redistribution from shallow to deep sea basins. It is vital to understand this process for disaster prevention and protection of economic interests in coastal and offshore areas. We describe mass-transport-dominated sedimentation in an active foreland basin, the Hidaka Trough, which developed from collision between the northeastern Japan arc and the Kuril arc. The basin is deformed by east–west compression associated with large, frequent earthquakes. The trough is filled with thick sediments, ranging from coal-bearing Cretaceous terrestrial strata to modern diatomaceous hemipelagic mud and volcanic ash. Bottom-simulating reflectors and the distribution of mud volcanoes, pockmarks, and acoustic wipe-out zones on the seismic records suggest the presence of subsurface gases in the sediments. The basin features stacked mass transport deposits (MTDs), but no channel–levee systems have developed. The MTDs are relatively thin and are derived from three sides of the basin margin. Initiation of submarine slope failure in this area may be controlled by multiple factors that increase driving forces and decrease resistance of the slopes. The driving forces include oversteepening of the margin slope as a result of thrusting and folding, and additional downslope gravitational acceleration caused by cyclic shaking during earthquakes. Decreased resistance in the slopes may be caused by the accumulation of excess pore water pressure driven by a high sedimentation rate, gas hydrate dissociation accompanying changes in sea level or temperature, and liquefaction in coarse-grained beds during earthquakes.

Keywords: Mass transport, submarine landslide, foreland basin, active margin, gas hydrate