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Debris flows in Antarctica: where? when? why?

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Neogene debris flow deposits of the Wilkes Land and western Antarctic Peninsula continental margins, (Eastern and Western Antarctica respectively), have been compared in order to study the relationships between sedimentary processes and Antarctic Ice Sheet evolution.

In the Early-Late Miocene, the fluctuation of temperate, highly dynamic ice sheets over the continental shelf caused large supply of sediment to the Wilkes Land continental margin. The abundant glacial meltwater, particularly by the end of the ice sheet maximum expansions, eroded and transported large amounts of sediments to the shelf edge. This situation led to continental slope instability and triggering of huge gravity flows down the slope and emplacement of mega debris flow deposits on the continental rise (Donda et al., accepted).

In the Late Pliocene (about 3 Ma) the transition from polythermal to polar conditions of the Antarctic Peninsula ice sheet (Rebesco et al., in press) produced the landward shift of sediment depocenters, from the continental rise towards the continental slope at the mouth of ice streams. The relatively rapid loading of the pre-exisiting continental slope caused slope instability and the emplacement of a mega debris flow deposit on the continental rise (Diviacco et al., in press).

From the comparison of Wilkes Land and western Antarctic Peninsula margins emerges that mega debris flow deposits have been generated by submarine slides on the Antarctic margin that affected sediments deposited during periods of temperate and polythermal ice sheet conditions. This situation appears comparable to the one observed on the Norwegian continental margin where slope instability develops as a

consequence of rapid loading of inter-glacial high sedimentation rate (Solheim et al., 2005). Sedimentation of the steep glacigenic wedge that developed in response to the reduction of meltwater at the ice-base during fully polar cold-based ice sheet conditions, resulted in relatively less sorted and higher shear-strength sediments less prone to gravitational instability than the pre-existing sediments.

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