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Seafloor Morphology And Sediment Discharge Of The Storfjorden And Kveithola Palaeo-Ice Streams (NW Barents Sea) During The Last Deglaciation

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IPY Activity N. 367 focusing on Neogene ice streams and sedimentary processes on high- latitude continental margins (NICE-STREAMS) resulted in two coordinated cruises on the adjacent Storfjorden and Kveithola trough-mouth fans in the NW Barents Sea: SVAIS Cruise of BIO Hespérides, summer 2007, and EGLACOM Cruise of Cruise R/V OGS-Explora, summer 2008. The objectives were to acquire a high-resolution set of bathymetric, seismic and sediment core data in order to decipher the Neogene architectural development of the glacially-dominated NW Barents Sea continental margin in response to natural climate change.
The paleo-ice streams drained ice from southern Spitsbergen, Spitsbergen Bank, and Bear Island. The short distance from the ice source to the calving front produced a short residence time of ice, and therefore a rapid response to climatic changes.
In the outer trough of southern Storfjorden, lobate moraines superimpose and are cut by very large linear features attributed to mega-iceberg scours. In the adjacent Kveithola trough, a fresh morphology includes mega-scale glacial lineations overprinted by transverse grounding-zone wedges, diagnostic of episodic ice stream retreat. A 15 m thick glacimarine drape suggests an high post-deglaciation sedimentation rate. Preliminary interpretation suggests that the retreat of the Svalbard/Barents Sea Ice Sheet was highly dynamic and that grounded ice persisted on Spitsbergen Bank for some thousands years after the main Barents Sea deglaciation.The Storfjorden continental slope is divided into three wide lobes. Opposite the two northernmost lobes the slope is dominated by straight gullies in the upper part, and deposition of debris lobes on the mid and lower parts. In contrast, the southernmost lobe is characterized by widespread occurrence of submarine landslides. Sediment failure has accompanied the evolution of the southern Storfjorden and Kveithola margin throughout the Late Neogene, with very large mass transport deposits up to 200 m thick in the early phases of the development of the glacially influenced margin. Conversely, the central and northern parts of the Storfjorden margin have prograded without appreciable episodes of mass failure. Sedimentation has occurred through alternate layering of decimeter-thick glacial debris flows deposits, with laminated and acoustically transparent interglacial sediment drape. Gullies and paleo-gullies incise the glacial debris flows and are covered by the interglacial drape. They are formed early during each deglaciation phase, most likely by the erosive action of short-lived hyperpycnal flows generated by sediment-laden subglacial meltwater discharge. In sediment cores thick finely-laminated sedimentary beds on the upper continental slope of the southern part of the margin indicate preferential deposition by settlement of meltwater sediment plumes. High sedimentation rates of plumites may contribute to the slope instability and suggest that meltwater discharge was focused on the southern Storfjorden and Kveithola paleo-ice streams.