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Sedimentary sources within a glacierized catchment identified by magnetic signatures and grain size distribution

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Most studies reconstructing past climate changes based on glacier activity use sediment cores as their primary source for information. Such studies are usually founded on two assumptions; 1) sediment yields from the glacier completely dominate contributions from other sources (f. ex. paraglacial or fluvial), and 2) the internal variability characterizing the sediment yield from the glacier is of less importance compared to the magnitude of the deposition.

In an attempt to test these two assumptions we have focused on minerogenic contributions derived from the catchment by analyzing various sediment components for their physical grain size distribution, as well as for their rock magnetic characteristics. The site we selected for this task is a glacierized catchment located in northern Norway (69˚N), where a small temperate glacier have fed an adjacent lake for the last $\sim$ 4000 years. The catchment contains several sediment sources that may add to the total sediment budget as recorded in the lake, including a number of talus cones (i.e. colluvium), previously deposited morainic material, a delta and so forth. Presently, the sedimentladen glacial meltwater runs through both colluvial and glacigenic deposits before it enters the lake.

Samples were drilled from downstream bedrock exposures and collected from surface sediments dispersed throughout the glacierized catchment - both above and below the lake. A suite of piston and HTH cores were also raised from the lake and will be the main focus of this project (MAGNET). In addition to traditional field mapping, we analyzed the material for their physical grain size distribution (2mm to $<38\mu$, divided

over eight fractions), and also applied a range of bulk magnetic parameters assessing composition and 'grain size' of magnetic minerals.

Preliminary results show that catchment material upstream of the lake consists of coarse sand while medium sand dominates the downstream surface material, in contrast to the lake sediments that are entirely composed of material smaller than 63 μm. Thermomagnetic analysis (Curie-curves) suggests that bedrock is characterized by Fe_3O_4 (Magnetite) which often is 'overprinted' with a dominant paramagnetic component, and/or $Fe_{1-\delta}S$ (Pyrrhotite). Although 50% of the bedrock samples contain Pyrrhotite, this mineral has neither been identified in any of the grain-size fractions from the adjacent surface material bedrock nor in the lake. This either suggests that the collected catchment material is not derived from the present-day bedrock-surface, or that Pyrrhotite is rapidly weathered and decomposed into non-magnetic mineral phases.

Specific magnetization of catchment material from the delta above the lake is significantly higher than surface material from below the lake, implying that the lake may serve as a sink for the heavier magnetic minerals. Thermomagnetic analysis of $<38\mu$ grain size fractions from all the surface samples shows more or less developed maghemite-hematite inversions between 300-400˚C. This maghemite inversion feature is even more developed in the lake sediments. This observation indicates that partial low-temperature oxidation of magnetite to maghemite takes place quickly, and is enhanced when catchment material is deposited in the lake.

The preliminary results so far show that several of the sediment sources, other than the direct glacial output transported by meltwater, carry a unique signature that can be isolated and identified, but it remains to be established to what extent they contribute to the overall sediment budget of the lake.