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Hydrology and ecosystems in a periglacial catchment -Massbalance calculations on landscape level

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Knowledge about biotic and abiotic features and processes in ecosystems influenced by a periglacial climate is limited and long term effects on mass balances and transport processes when climate switches between temperate and permafrost conditions is not well understood . Furthermore, there is limited consensus on the hydrological response to long-term climate change during a glacial cycle and its influence on transport and accumulation (fluxes and pools) of matter within an ecosystem in a changing environment; thus, further studies are needed.
The main aim of the present work, which is a four-year project, is to increase the understanding of how ecosystem processes and features are affected by a periglacial climate. Hydrological and biogeochemical investigations in a lake catchment in Western Greenland has been performed and a conceptual model has been developed that can be used in assessments of periglacial conditions. The core hypothesis is that ecosystems in cold climate conditions compared to temperate ones show a different pattern in process rates and transport related features.
The hydrological investigations have focused on monitoring water flows and storage in the catchment in order to better understand when and how main hydrological events that influence the transport of matter in the ecosystem appear during the year. By monitoring soil temperature and soil water content, as well as ground- and surface water levels, the dynamics of the active layer and the interactions between groundwater and surface water have been analysed. The interactions between i) deep and shallow groundwater via taliks and ii) groundwater in the active layer and surface water in the lake are key aspects for transport and accumulation of matter in ecosystems in a periglacial climate.
Surface water, groundwater, soil and sediment sampling has been carried out to establish site-specific knowledge on major chemical pools and fluxes of elements in the terrestrial and aquatic ecosystems of the catchment. Samples were analysed using ICP-MS techniques as well as by stable isotope analysis. In combination with hydrological modelling, the chemical sampling was used to develop mass balance models for carbon at both ecosystem and catchment levels. The results are discussed and compared to relevant studies in other regions.