



Project acronym: DEGREEZ

Project title: DEeper GRoundwater flow Effects on river Exports in Zackenberg

Project leader: Camille Bouchez, University of Rennes 1, France

Discipline: Earth Sciences & Environment: Water sciences/Hydrology

Station(s): Zackenberg Research Station (Greenland/Denmark)

Climate change is altering the high-latitude hydrology as a result of rapid changes in glaciers, snow cover and permafrost. Permafrost thaw enhances infiltration as well as the connectivity between surface waters and deeper groundwater pathways, therefore increasing the supra permafrost groundwater discharge into Arctic rivers. These changes in groundwater discharge could alter solute export from Arctic watersheds and could mediate carbon release to the atmosphere. However, different sources of groundwater could contribute to the increase of groundwater discharge, from recently infiltrated waters to melted permafrost waters, with unknown consequences on the transport and reactivity of mineral and organic solutes.

In this project, we aim to characterize the supra permafrost groundwater in the Zackenberg valley (Northeastern Greenland) by investigating its composition and estimating its residence time in the watershed. In addition, we aim to evaluate the groundwater export of both organic and mineral solutes. This will be achieved by collecting pore-water in the active layer, precipitation, Zackenberg river water and surface water bodies. Water flowing directly from the AP Olsen glacier and permafrost ice will also be collected. We will use a wide suite of tracers such as major ions, dissolved organic and inorganic carbon, carbon and water isotopes and noble gases to investigate the origin of groundwater sustaining river flows. As no such data exist in Greenland and are scarce in the Arctic, we aim to provide unique insights into subsurface flows in order to reduce the high uncertainties associated with the role of groundwater in the overall hydrological and biogeochemical cycles in the Arctic.