Geophysical Research Abstracts
Vol. 21, EGU2019-10916-1, 2019
EGU General Assembly 2019

The GRASP project –periglacial hydrology and biogeochemistry studies bridging the gap between the academic and industrial worlds

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Long term climate development – e.g. up to 100 000 years or more – is rarely an issue for societal questions and planning. However, the nuclear waste management industry needs to demonstrate safety for humans and the environment for time scales way beyond common standards. This demand, together with a general scientific interest in climate and landscape development, provides an opportunity for cooperation between industrial organisations and the scientific community. By using specific site analogues, the conceptual understanding of site behaviour and future climate development can be explored for long time scales.
Here we summarize and present methods used and data collected in the Greenland Analogue Surface Project (GRASP). GRASP is a catchment-scale field study of the periglacial area in the Kangerlussuaq region, West Greenland, focusing on hydrological and biogeochemical processes in the landscape. The site investigations were initiated in 2010 and have so far resulted in three separate data sets published in ESSD (Earth system and Science Data) focusing on i) meteorological data and hydrology, ii) biogeochemistry, and iii) geometries of sediments and the active layer, respectively. The three data sets, which are freely available via the PANGAEA data base, enable conceptual and coupled numerical modelling of hydrological and biogeochemical processes during present-day conditions.
The results of such modelling are discussed in terms of short and long term changes in properties and process rates due to possible changes in climate conditions.
Quantification and assumptions on future change are often based on model predictions. Such models require cross-disciplinary data of high quality; however, such data rarely exist. Biogeochemical processes in the landscape are highly influenced by the hydrology, which in turn is intimately related to permafrost processes. Thus, a multidisciplinary approach is needed when collecting data and setting up field experiments aiming at increasing the understanding of these processes. An important asset of the GRASP data is that all data are collected within the same, relatively small, catchment area. This implies that measurements are more easily linked to the right source area or process. Despite the small catchment area, it includes the major units of the periglacial hydrological system; a lake, a talik, a supra- and sub-permafrost aquifers, allowing biogeochemical processes in each of these units to be studied. The data from GRASP are used both with the aim to increase knowledge of present day periglacial hydrology and biogeochemistry, and also with the aim to predict hydrological and biogeochemical consequences due to future climate change.