Abstract for general public

Global warming affects contaminant transport and fate in the Arctic. Raising temperature result in glaciers melting and permafrost thawing. The loads of contaminants from primary sources (atmospheric circulation, marine currents and ice transport from distant locations) are nowadays well recognized and low. The gap in knowledge is related to contaminant loads from secondary sources eg. melting glaciers. Intensive glacier melting can enhance the delivery of contaminants accumulated in glacier ice over the last century. As a consequence, fjord ecosystems probably receive today higher loads of contaminants than before, and these may pose a threat to the ecosystem. Unfortunately, this problem is nowadays not well addressed in current research. One group of Arctic environment contaminants are heavy metals (eg. Hg, Cd, As, Pb, Zn and Cu). Some proportion of heavy metals in the environment is of natural origin but larger part (>90%) is a result of human activity. Hornsund fjord (Spitsbergen) was selected for the study based on the reports that it hosts tidewater glaciers with the highest melting rates in the island. The overall objective of this project is to assess fluxes of heavy metals discharged by freshwater (mainly meltwater from tidewater glaciers) to an Arctic fjord (Hornsund, Spitsbergen). We hypothesize that the discharge of heavy metals with glacial meltwater to marine ecosystem is the most important source of contaminants in fjord hosting tidewater glaciers. The Project objective will be implemented by modelling recent freshwater input to studied fjord, determining heavy metal concentrations in different elements of glacial compartment (snow, cryoconites, supraglacial streams), determining heavy metal concentrations in freshwater from non-glaciarized ecosystem part (land surface runoff), determining heavy metal concentrations in seawater, suspension and surface sediments at the glacier front, and finally calculating temporal fluxes and estimate loads of heavy metals to the fjord environment leading to assessing the risk for marine biota based on achieved heavy metal levels. Sampling will be conducted in 6 seasons (08.2021-10.2002) related to glacier melting rate. The study will be conducted using innovative, sophisticated and autonomous instruments – Remotely Operated Vehicule, remotely controlled platform, automatic multi-sediment trap and automatic riverine water sampler. Heavy metals will be measured in dissolved fraction (water samples) and attached to particles (suspended matter and sediments). The heavy metal concentration measurements will be performed on ICP-MS and AAS. Environmental properties: temperature, salinity, pH, redox potential, dissolved, particulate and black carbon concentrations will be measured. The sources of contaminants will be assessed using specific end-members method using stable metal isotopes. The dissemination activities will include publishing scientific articles in top indexed journals, publishing popular science articles, presenting lectures aimed at general public audience, presentations of the problems of global changes and their effects during the science festivals. The presentations on global changes and their consequences will be shown in primary and secondary schools in form of interesting lectures, workshops and shows. The data achieved within the project will be also presented in form of lectures for University students (e.g. University of Gdańsk, University of Silesia). The data achieved within the project will be will be gathered and offered to Arctic Monitoring databases (AMAP, SIOS, MOSJ etc.).