Despite being far from major civilization centres the Arctic environment is heavily influenced by human activities. One of substances that polute the Arctic are heavy metals, including radioactive elements, distributed globally through the atmospheric circulation. A better understanding of levels and factors influencing spreading of radionuclides between different compartments of the Arctic environment is necessary because these ecosystems are vulnerable to any environmental disturbances. This knowledge is still limited due to poor accessibility and difficult work conditions in the Arctic. An important component of the Arctic environment are glaciers, which, for example, on the Svalbard archipelago cover 60% of its surface area. A characteristic feature of polar glaciers are cryoconites – accumulations of dust deposited on glacier surfaces. Being darker than ice the cryoconites melt down into glacier ice creating cryoconite holes filled with water in summer. Cryoconite constitute a basis for various organisms whose properties and importance for biogeochemical cycling in the Arctic environment are subject to intensive research. Only recently their ability to accumulate radionuclide has been recognized. This ability is related to the highly adsorbing extracellular polymeric substances and other substances excreted by cyanobacteria – the most common living components of cryoconites. The role of these substances is to bind toxic elements outside cyanobacteria cells. The cryoconite aggregates held together by these substances can survive even tens of years on glacier surfaces acquiring during that time airborne radionuclides up to very high levels. These radionuclides were released into the atmosphere by nuclear weapons testing (which culminated in years 1963-4), nuclear accidents (Chernobyl, Fukushima), emissions from spent nuclear fuel processing plants or from less known disasters of nuclear powered satellites. Among these radionuclides are: Pu isotopes, Cs-134,137, Am-241 and Sr-90. Besides these radionuclides released into the atmosphere by man cryoconites accumulate naturally occurring 210Pb and 210Po. Radionuclide concentrations observed in cryoconites reach very high values, comparable to those known from sites of nuclear accidents. Therefore, the cryoconites are important component of the radiation environment of the Arctic. Until they remain on glacier surfaces cryoconites do not constitute a threat to fragile Arctic ecosystems but the well documented retreat of Arctic glaciers results in deposition of cryoconites on glacier forefields. The enriched in radionuclides cryoconite material can be mobilized by wind and surface runoff of water or assimilated by plants colonizing the uncovered areas. The retreat of glacier may thus lead to spreading of these radionuclides in the terrestrial and marine ecosystems. The project aims at determination of radionuclide levels in cryoconites collected from selected glaciers on Spitsbergen and Greenland and at identification of their variations along the glaciers. The cryoconites collected from the frontal parts of glaciers should contain more radionuclides. The presumed relationship between chemical composition (mineral vs organic components) and the ability of cryoconites to accumulate radionuclides will be verified. Additionally, it will be checked if invertebrate organisms are absent from cryoconites with highest radionuclide levels due to exposition to high doses of ionizing radiation. Project results will increase the knowledge on the completely unknown aspect of cryoconite occurrence in the environment which is their ability to concentrate radionucklides. This knowledge is important to fully understand the fate of these substances in the environment in the conditions of current climate change.