

EARTH - Anthropocene

Rare earth elements, isotopes and anthropogenic particulates long range transport in Northern Hemisphere – implications for defining Anthropocene

Human activities have a great influence on all spheres of the Earth, changing global trace element cycles, quality of soils, water, air and biodiversity. The distinct anthropogenically induced changes have led to the proposal of a new geological epoch—the Anthropocene. However, new chronomarkers, which are persistent over time, are required to define the inception of the new geological period. The aim of this project is to determine the global patterns of deposition of geochemical and mineralogical proxies (inorganic particulates of anthropogenic origin, fossil fuel biomarkers, rare earth elements (REE), and Nd and Sr isotopes) in different peatlands of the Northern Hemisphere (NH) (Iceland, Spitsbergen, Estonia, Russia, China, and Alaska). Their application to define the new period will be assessed.

Anthropogenic particulates, as products of coal combustion, are significant indicators of industrial activity. They are carriers of fossil fuel biomarkers, also indicative for coal use. Our project will show the global pattern of dissemination of the markers. At present, their distribution is known from only few sites.

Lithophile REE are important tracers of climatic changes. However recent investigations proved that elevated dust emission and higher REE accumulation rate in Siberian peatland was due to the aboveground nuclear weapon tests in 1962. We want to check if emission of dust enriched in REE, which originated from weapon tests can be observed globally. The influence of industrial activity on REE emission and deposition in peat will be also determined.

Isotopes are the most sophisticated and valuable tracers of dust. We will use Pb, Nd, Sr isotopic signature to assess the sources of dust deposited in the investigated peatlands. Pb stable isotopes are known markers of anthropogenic activity in the last 150 years, however pattern of recent deposition of Nd and Sr isotopes is less known. Research in Florida and Siberia indicated that a dramatic shift in their radiogenicity was probably caused by human. We will broaden this topic.

Our research is globally innovative and will make an important contribution to understand patterns of dust deposition in selected peatlands of Northern Hemisphere as well to assess the boundary of Anthropocene.