PEATFLAMES - Tipping-points in boreal and permafrost peatland ecosystems of W Siberia under the global climate crisis and increasing fire risk

The PEATFLAMES project will lead to a better understanding of the long-term development of W Siberian boreal and permafrost-related peatlands as well as associated taiga and tundra fires, droughts and peat carbon accumulation data. Our efforts will improve the understanding of carbon dynamics of Siberia ecosystems in the last two millennia. The project will explore causal relationships between climate change, carbon accumulation, fire and past water table changes in W Siberia. The study sites are situated in the north-south climatic transect, i.e. on the transition between permafrost, tundra and boreal forest zone; we thus expect their different sensitivity to the past climatic changes. PEATFLAMES will determine factors controlling the fire-drought regimes and, specifically, will target human and climate forcing. Vegetation and testate amoebae (protists) – key ecological groups of indicators in peatlands – will be used to track the hydrological response of peatlands to the past disturbances. We will apply unique wide-scale palaeoecological techniques in the not well-studied region to test hypotheses connected with peatland ecosystems response to the recent climate crisis in various spatial and temporal scales.

The specific objectives of the PEATFLAMES are to:
1) Assess of the impact of warming, droughts and fires on the resilience of peatland ecosystems and permafrost of W Siberia,
2) Reconstruct fires and droughts in the last 2000 years to assess their severity in the context of the climate crisis,
3) Explore and define peatland ecosystems' tipping-points concerning past climate changes to provide data about ecosystem baselines.
4) Combine high-resolution palaecological reconstructions with the remote sensing data.

Our approach will provide an exceptional opportunity to operate in various temporal and spatial scales to build a synthesis of ecosystem response to current global climate crisis and fires with the relation to the past ecological baselines reaching the last 2000 years. Appropriate understanding of modern peatland functioning is a prerequisite for palaeoclimatic interpretation and global scale modelling. Our investigations are critical to providing information about the non-degraded state conditions for the ongoing disturbances. The wide-scale analysis of climatic north-south gradient enables detailed comparisons of ecosystem functioning in different biogeographic settings of W Siberia. The project will open up new horizons for global climate change science linking various disciplines, e.g. geology, chemistry, ecology, biology and geography. It will also be an opportunity for the enthusiastic young researchers to learn from more experienced scientists for more effective career development and will enable the integration of research teams from Europe (Poland and Norway) also with researchers from Russian Universities. The integration of different datasets will lead to novel reconstructions of the fires and carbon accumulation and its drivers during the last 2000 years in W Siberia. This is a key to understand one of the largest carbon sinks in the world and its connections with the climate. Such a study has never been created for Siberian peatlands.