brGDGT and pollen-based Holocene temperature reconstruction from the Olgi Lake in the Tarvagatai Mountains (north-central Mongolia)

Hermann Behling¹, Chéïma Barhoumi¹, Cindy De Jonge², and Julia Unkelbach¹
¹Albrecht-von-Haller Institute for Plant Sciences, University of Göttingen, Göttingen, Germany
²ETH Zürich, Geological Institute, Earth Sciences, Switzerland

Understanding the complex mechanisms that govern the short and long-term development of Holocene ecosystems requires the multi-proxy study of lake sediment or peat archives, for example. Factors such as climate variability can thus be determined, but also other factors influencing these ecosystems such as vegetation, disturbances (fires, storms, insect pests), as well as human impact. The objective of this presentation is to show new reconstructed Holocene (9500 ka – present) temperatures in the North-central region of Mongolia, in the Tarvagatai mountains, using two independent methods: transfer functions from pollen grains and from brGDGTs ratios. We aim to compare the results of these climatic reconstructions with each other, but also to analyze them with regard to the reconstruction of vegetation, fire dynamics and environmental changes, carried out by Unkelbach et al. in 2021. The temperatures obtained from the analysis of brGDGTs (calculated from the calibration of De Jonge et al., 2014) show a warm start to the Holocene (4.1 - 5°C), between 9500 and 8600 cal. yr BP. After an abrupt decrease in temperatures of 3°C to 8500 cal. yr BP, temperature remain stable until the mid-Holocene, to 5500 cal. yr BP, where a warm period of 1000 years is observed. From 4500 to 500 cal. yr BP, a gradual and continuous decrease in temperatures (down to -2.7°C) took place. This agrees with the climatic indications given by the vegetation and the results obtained by the WAPLS transfer function from pollen grains.