Geophysical Research Abstracts
Vol. 12, EGU2010-11235, 2010
EGU General Assembly 2010

Towards a novel look on low-frequency climate reconstructions

Christian Kamenik (1), Tomasz Goslar (2,3), Sheila Hicks (4), Lena Barnekow (5), and Antti Huusko (6)

(1) Oeschger Centre for Climate Change Research and Institute of Geography, University of Bern, Bern, Switzerland (christian.kamenik@giub.unibe.ch), (2) Faculty of Physics, A. Mickiewicz University, Poznań, Poland, (3) Poznań Radiocarbon Laboratory, Foundation of the A. Mickiewicz University, Poznań, Poland, (4) Institute of Geosciences, University of Oulu, Oulu, Finland , (5) Department of Geology, Lund University, Lund, Sweden, (6) Thule Institute, University of Oulu, Oulu, Finland

Information on low-frequency (millennial to sub-centennial) climate change is often derived from sedimentary archives, such as peat profiles or lake sediments. Usually, these archives have non-annual and varying time resolution. Their dating is mainly based on radionuclides, which provide probabilistic age-depth relationships with complex error structures. Dating uncertainties impede the interpretation of sediment-based climate reconstructions. They complicate the calculation of time-dependent rates. In most cases, they make any calibration in time impossible. Sediment-based climate proxies are therefore often presented as a single, best-guess time series without proper calibration and error estimation. Errors along time and dating errors that propagate into the calculation of time-dependent rates are neglected. Our objective is to overcome the aforementioned limitations by using a 'swarm' or 'ensemble' of reconstructions instead of a single best-guess. The novelty of our approach is to take into account age-depth uncertainties by permuting through a large number of potential age-depth relationships of the archive of interest. For each individual permutation we can then calculate rates, calibrate proxies in time, and reconstruct the climate-state variable of interest. From the resulting swarm of reconstructions, we can derive realistic estimates of even complex error structures. The likelihood of reconstructions is visualized by a grid of two-dimensional kernels that take into account probabilities along time and the climate-state variable of interest simultaneously. For comparison and regional synthesis, likelihoods can be scored against other independent climate time series.