Quantifying long-term changes in Danish climate and water resources

K.J. Brown (1), P. Rasmussen (1), H. Seppa (2), and H.J.B. Birks (3)

(1) Geological Survey of Denmark and Greenland, Dept. Quaternary Geology, Copenhagen, Denmark (kbr@geus.dk), (2) University of Helsinki, Dept. Geology, Helsinki, Finland, (3) University of Bergen, Dept. Biology, Bergen, Norway

Starting approximately 6,000 years ago, the introduction of agriculture in Denmark had a marked effect on the landscape as the natural virgin forest that characterised the country was cleared and replaced by farmland. Since then, continued human action has further modified the natural state of the Danish landscape and ecosystems. One result of this past human action is that it facilitated a decoupling between the landscape and climate in Denmark. Thus, while it remains possible to examine fossil records in Denmark to examine how the landscape has developed through time, it is extremely difficult to reconstruct how the climate has changed due to the human factor. Consequently, this investigation will employ an interdisciplinary approach that combines analysis of modern climate data with the development of climate transfer functions and geospatial analysis to quantitatively reconstruct how climate has varied through time in Denmark. The particular climate variables to be examined include mean annual temperature, July temperature, January temperature and mean annual precipitation. The data show that temperature and precipitation both increased during the early Holocene (ca. 11,500-7,500 cal BP), attained maximum values in the mid Holocene (ca. 4500-7500 cal BP) and decreased thereafter. Futhermore, the data also reveal a high degree of spatial variability in precipitation in Denmark. In combination with other variables such as Holocene insolation, these parameters are now being incorporated into a national hydrological model (the DK-model) to assess variations in surface water runoff and groundwater conditions through time for all of Denmark.