Geophysical Research Abstracts
Vol. 16, EGU2014-12804-1, 2014
EGU General Assembly 2014
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A potential record of Late Holocene natural environmental changes in a cultural landscape

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The Late Holocene period is in most of Europe characterised by fast developing culture and agricultural techniques with associated changes in land-use, land-cover and landscape processes. Therefore, European Late Holocene natural environmental changes are often difficult to document. A core from Lake Ilsø, Denmark, was obtained to investigate environmental changes in the lake and its catchment during the Late Holocene. This record suggests an environment little disturbed by humans during the Iron Age.

Lake Ilsø, situated in the central Jutland, is a small (0.005km^2) and wind-protected lake in an east-west directed tunnel valley. The lake has an outlet, now channelised, and its topographical catchment area is 0.2km^2. The morphology and size of Lake Ilsø gives it the potential of recording local-scale hydrological, environmental and climatic changes.

Five radiocarbon dates on terrestrial material constitute an age-depth model of the 7m core, which was obtained in the central part of Lake Ilsø at maximum water depth (2.5m). The core covers the time interval from 2750 cal yr BP until the present. The core was analysed on an Itrax XRF-core scanner and sampled in 5cm increments for analysis of pollen and isotopes.

The XRF-counts of titanium are expected to reflect the amount of detrital material entering the lake and thereby a proxy of the erosion from the catchment. This interpretation is supported by a high correlation between titanium and potassium. The titanium counts indicate a significant and rapid increase in erosion at 1000 cal yr BP, which continues to be high towards the present. Prior to 1000 cal yr BP organic rich sediment was deposited in the lake with short intervals of minor detrital input. The sedimentation rate was approximately 2.3mm/yr, which increased slightly to approximately 2.9mm/yr after 1000 cal yr BP.

The marked change in the lake sediment is interpreted to be caused by human induced changes in the catchment during the early medieval period. The significant increase in catchment erosion could be due to forest clearance and intensified agriculture, e.g. the heavy wheeled plough was implemented in Denmark at this time.

The low detrital input before 1000 cal yr BP indicates low erosion in the catchment and preliminary pollen data does indicate dense beech forest cover during this period. This record can potentially provide a proxy of natural changes in the environment during the Iron Age in Denmark. Changes in hydrology, primary productivity, lake conditions or carbon source will be targeted through analysis of δ13C and δ15N of the organic fraction. Furthermore δ18O and δ13C of the carbonate fraction and of cellulose is expected to provide a climate signal.