Geophysical Research Abstracts, Vol. 7, 08549, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08549

Microbial degradation of peat: evidence from organic petrograhy, cryo-SEM images and stable isotopes of carbon and nitrogen

P. Steinmann (1), Li Huang (2), S. Huon (3), and F. Laggoun-Défarge (2)

(1) Institut de Géologie, Université de Neuchâtel, Rue Emile-Argand 11, CH-2007 Neuchâtel, Switzerland, (2) ISTO, Université d'Orléans, UMR 6113 du CNRS, BP 6759, Bt de Géosciences, 45067 Orléans cedex 2, France, (3) UMR 7618 (UPMC-INRA-CNRS) BIOMCO, Université Pierre & Marie Curie (UPMC), Case 120, 4 place Jussieu, Paris Cedex 05, 75252, France

Peat bogs are valuable environmental archives in many respects. The type of peat and its degree of degradation, for example, bear information on climate change and changes of nutrient supply. This research aims at a detailed assessment of the degree of peat decomposition in view of a reconstruction of paleo methane emissions from peatlands. The study site is Etang de la Gruère (Jura Mountains, Switzerland), an ombrotrophic bog which accumulated more than 6 m of peat over the last ca. 14500 yrs. Starting from the botttom, the studied peat section consists of a relatively little decomposed fen peat (6.5 to 4 m), a well decomposed bog peat (4 to 2 m), and less decomposed bog peat towards the top.

Here we combine detailed (3 cm resolution) stable isotope analyses (C and N) with cryo-SEM imaging and classical organic petrography. Stable isotopes are useful for tracing the origin of the organic matter as well as on type and extent of degradation reactions. Comparing these data with the results from microscopy allows for a more quantitative understanding of the peat degradation.

Preliminary isotope analyses (at 25 cm resolution) show the following picture:

The δ^{13}C values of bulk peat are in a narrow range (-25 to -26 ‰) from the top of the profile to a depth of ca. 5 m and than decrease towards the bottom (lowest value -28 ‰). Such low values might be due to changes in the assemblage of peat-forming plants or to the presence of biomass of methanotrophic microbes. The δ^{15}N is steadily

increasing from -3 ‰ at the top to 0 ‰ at the bottom, with the exception of high values (up to 6.5 ‰) between 325 cm and 400 cm depth. The lower values at the top are possibly related to more acidic conditions in the upper, ombrotrophic part of the profile, compared to the older minerotrophic peat. The zone with high δ^{15}N may have been degraded under more oxic condition, which lead to nitrogen loss. The C/N ratio would in this case not be indicative for the degree of decomposition of this layer.