Geophysical Research Abstracts
Vol. 13, EGU2011-4989, 2011
EGU General Assembly 2011

Contemporary sedimentary processes and suspended sediment transfer in the small Sætrevatnet sub-catchment in Bødalen, western Norway

Susan Liermann (1,2), Achim A. Beylich (1,2), and Aurelien van Welden (1)

(1) Geological Survey of Norway (NGU), Trondheim, Norway (susan.liermann@ngu.no), (2) Norwegian University of Science and Technology (NTNU), Department of Geography, Trondheim, Norway

Lacustrine archives enable to detect changes in the sedimentary regime and provide information on landscape response to variability in hydrological and climatological regimes within a catchment. Laminated sediments from Sætrevatnet lake are analyzed in association with hydrological and meteorological monitoring data with the goal (i) to calculate the efficiency of the lake as a trap (role of the lake as temporary storage area within the sediment routing system), ii) to estimate the time to complete silting up of the lake Sætrevatnet, (iii) to idendify and characterize the sediment sources and the related geomorphic processes, (iv) to analyze the temporal variability of the different sedimentary and geomorphic processes, (v) to discuss the relations and linkage(s) between the possible lamination thickness and associated meteorological variables.

Lake sediments were retrieved from a boat using a modified Livingston piston-corer in August 2009 and from ice using gravety and freeze core systems in February 2010. Suspended sediment transport into and out of the lake Sætrevatnet was continuously monitored at two stationary hydrological stations which recorded discharge, electrical conductivity. Optical turbidity was also monitored since August 2009. In addition, a defined grid of wooden sticks was installed on the delta in order to calculate the current accumulation rates at the inlet of the lake.

First sediment analysis point out a domination of quartz and mica minerals, followed by feldspar, which clearly reflects the surrounding bedrock geology (granitic orthogneiss). Besides the elementary composition, the grains shape is mostly angular; all observed samples tend to show a low degree of sorting, which should be confirmed by upcoming laser-granulometry based grain size analysis. As expected, these results show a short transport of freshly eroded material into the lake. All analyzed samples are dominated by silty to sandy particles, with an increasing amount of sand in the proximal cores. No clay particles were identified in any analyzed sample (cores, grab-samples, material from the sediment trap), which indicate that the lake is a bypass area for the finer material. All gravity and freeze cores show complex laminations with a high content of organic macrorests. Laminations are tentatively related to the high variability of the hydrological regime and the sediment distribution into the lake.
Chronological framework is defined by radionuclides. Whereas 210Pb activity profile could not be used to reconstruct the sediment-age relation, the 137Cs activity of freeze core CF9 points out a defined peak at 39.5 cm, which is related to the artificial radionuclide fallout caused by the Chernobyl accident and implies an average sediment accumulation rate of 1.62 cm per year. Delta accumulation rate obtained from the monitoring grid between May and October 2009 and 2010 confirms a high sedimentation rate but with much higher values of 4 cm (May - October 2009) and 3.5 cm (Mai – October 2010). The highest accumulation rate is associated with the major inflow, which is also reflected in an increasing silting up of the lake. The discrepancy of the 2009/2010 values and the 24yr record suggest either an increase of sedimentation rate at the coring place and/or a strong remobilization of material within the Sætravatnet valley system and Bødalseter lake.

Current work is focused on the annual characteristics of the laminations which would be interpreted in relationship to meteorological data. In addition, classic paleolimnological investigations will be made such as ITRAX geochemistry, laser sizing, TOC and TIC content as well as morphoscopy of the particles using SEM. The obtained results should enable to characterize the erosion dynamics as well as the forcing and limiting factors on sediment transfer from the bedrock to the final sink through the lake.