Lake Sedimentation by River Sediment Discharge

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In lakes within a snow- or glacier-covered drainage basin, river sediment discharge by spring snowmelt or summer glacier-melt activates their sedimentation. If the sediment yielded in the drainage basin is fine-grained like silt and clay, sediment-laden underflows, induced by river sediment discharge, could then occur easily in the lakes because of no thermal stratification or weak, if any. The author ever observed sediment-laden underflows in glacial lakes of Canada, New Zealand and Nepal, and a reservoir and a volcanic caldera lake of Hokkaido, Japan, and found out that sedimentation by the underflows is dominant in the lakes. For example, in Peyto Lake in Canada, the contributions of delta progradation, sediment-laden underflows, and suspension overflows (or suspension interflows) are 32 %, 61 % and 7 % of the whole sedimentation, respectively. Hydrodynamics and sediment sorting of sediment-laden underflows will also be discussed by using observational results and applying a physical model.

Key words: lake sedimentation, river sediment discharge, sediment-laden underflows, sediment sorting
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Measurements of boundary layer parameters and sediment transport over intertidal mudflats, Jiangsu, China

The intertidal mudflats are of very important by representing an important habitat for wildlife and a potential land resource for reclamation, and protecting coastline from erosion. However, they have been relatively poorly researched in comparison with sandy beaches and saltmarshes since it is difficult for accurate measurement over the intertidal mudflats. The bad weather, easily subsidence, complex interaction between the physical, sedimentary, biological and chemical processes are responsible for the difficult fieldwork. Nevertheless, the boundary layer parameters (i.e., roughness length, shear velocity and drag coefficient), playing an important role on sediment transport, would help to understand some of these processes.

A velocity-SSC (suspended sediment concentration) monitor system (ASMS) was constructed by Nanjing Hydraulic Research Institute, China. The instrument has 5 velocity-turbidity sensors for current velocity (±2 cm s⁻¹) and SSC measurements. Experiments are carried out over the intertidal mudflats along the Jiangsu coast, by using this instrument and a water-depth meter. The velocity-turbidity sensors have distances of 10, 36.8, 60.5, 100 and 160 from seabed. All the data are recorded by a PC with an interval of 20 s. During the measurements, water samples are also collected for the purpose of calibration. Furthermore, a ZSX-3 direct-reading current meter is mounted on a pole out of the observation platform, with a distance of 36.8 from the seabed, in order to give an assessment of the current sensors. We also collected 36 sediment samples in the study area.

It shows that the velocity sensor is highly agreement with the direct-reading current meter. Then an internal consistency analysis is used to establish realistic logarithmic velocity profile, in the calculation of boundary layer parameters over the intertidal mudflats. By in situ measurements, SSCs of 5 water layers are estimated. Therefore, the suspended sediment transport during a tidal cycle is calculated. Finally, the estimated results are compared with the actual condition. The results indicate that the model is able to determine the net bedload transport directions.

Key words: boundary layer parameters, sediment transport, intertidal mudflats, China

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First results of hydroacoustic and sedimentological investigations on two NW-Spitsbergen lakes.

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During the 1999 field campaign one part of the Spitsbergen research group (SPE '99) investigated two lakes in NW-Spitsbergen (Andreeiland) using a 3.5 kHz subbottom profiler and gravity and piston coring devices. The aim of this project was to get new informations on the deglaciation history, the isostatic and eustatic sealevel changes and the sediment flux from the catchment area into the lakes.

Both lakes are situated near the fjords shoreline with a height of approximately 1m (Vogtvadnet) and 5m (Varfluensjoen) above today's sea level. 37 seismic profiles (3.5 kHz subbottom profiler) have been carried out for bathymetrical mapping as well as for mapping the sediment body of the two lakes. Both lakes are devided into two resp. three subbasins with a maximum waterdepth of 35m in the Varfluensjoen and 25m in the Vogtvadnet. Sediment thickness reaches up to 10m in the Varfluensjoen and up to 25m in the Vogtvadnet. According to the seismic profiles three sedimentological units with the same acoustic characteristics can be distinguished. A hard reflector which prevents any further acoustic penetration is the basal unit (1.). The unit above (2.) is acoustically transparent without any internal reflectors. The uppermost unit (3.) shows a lot of horizontal reflectors, indicating well layered sediments.

17 cores, taken from different sites of the lake basins in order to correlate the acoustically identified units with the sedimentological results, show the following characteristical sedimentological units corresponding with the above mentioned acoustical units:

1. The basal sediment consists of heavily compacted sand and gravel without sorting. This unit is thought to be the basal moraine.
2. The overlying unit consists of fine grained red silt and clay with some dropestones. Mollusces in living position as well as the microfossils are indicating marine conditions for this sediment.
3. The unit on top of all cores shows fine laminated silts and clays without any macrofossils. This unit is thought to be built during limnic (Varfluensjoen) or brakish (Vogtvadnet) conditions.

The first radiocarbon dates show that the deglaciation started in the lake basins around 11 ky B.P. or even earlier. The lake basins got part of the fjord system and had marine conditions until 10 ky B.P. in the Varfluensjoen and until 8 ky B.P. for the Vogtvadnet. Then the basins were separated from the fjordsystem and freshwater conditions established in the Varfluensjoen, whereas in the Vogtvadnet brakish conditions are visible until today. Further readvances of the glaciers in the catchment area into the lake basins, for example during the YD, are not detected in the sedimentary records of these two lakes.
Changes in Geomorphic Systems and Lake Sedimentation
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Changes in geomorphic systems are closely related to physical conditions of the earth's surface environment, such as topographical, vegetational and hydrological conditions. They are corresponding to tectono- and climato-environment in the studied areas. In a catchment-lake system, a typical geomorphic system, erosion, transportation and sedimentation processes are often observable. That is, in the heavy rainfall periods, a larger amount of sediment is often produced, transported, deposited and retransported in the catchment area and deposited in the downstream lake. Then, the lake bottom sediments may receive some information on the conditions in the catchment areas. Lake and reservoir have been used as natural sediment traps to reconstruct modern environment as well as paleoenvironment. To correlate observable modern catchment processes with lake sedimentation will provide a great insight for postdicting relationships between past processes and sedimentation.

Key words: catchment-lake system, erosional process, sedimentation
Environmental Significances of Magnetic Susceptibility Recorded by Lake Sediments from Different Climatic Regions in China

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Magnetic susceptibility of lacustrine sediments from different climatic regions in China was analyzed. The study areas include Erhai Lake in Southwest China, Nansihu Lake in Shandong Province, Daihai Lake and Jiuyanhai Lake in Inner Mongolia. The results of magnetic susceptibility from different climatic region indicate that the absolute values of magnetic susceptibility have close relationship with climates and magnetic materials, such as Erhai Lake and Daihai Lake with high magnetic susceptibility. The relative changes of magnetic susceptibility from the lacustrine sediment cores in different climatic regions were controlled by human activities during the historical period. The farming caused accelerate soil erosion especially the surface soils, which contribute to the increase of magnetic susceptibility.

Key Words: lacustrine sediments, magnetic susceptibility, Climate, human activities