Geophysical Research Abstracts
Vol. 15, EGU2013-1801, 2013
EGU General Assembly 2013

Physical properties of recently exposed basal sediments of the Steingletscher, Berner Oberland, Switzerland

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Basal lodgement till is a glacial sediment which has been emplaced under pressure at the base of a temperate glacier in a compressive flow regime. With the melting of the glacier ice, basal lodgement till is not only exposed, but also altered: melt water and temperature variations change the properties of basal lodgement till during its formation.

We have compared the physical properties of frozen, subglacial till to those of weakly altered basal lodgement till at the top of the sediment sequence, which equals the surface of deglaciated terrain. The aim is to describe the process how sub-glacial, ice-rich basal till evolves into dense lodgement till with optimal water content during the melting of the ice. We have chosen the Steingletscher in the Gadmen valley because of its rapid downmelt over the past few years and because unique sediment sequences are exposed.

The following methods have been chosen to investigate the exposed sections: undisturbed samples of sub-glacial and surface exposed basal lodgement till have been collected in the field. Lab analysis has been focussed on water content, bulk density, plasticity and grain size distribution. Profiles of surface exposed basal lodgement till have been logged including measurements of orientation and shape of clasts. A map of the the Steingletscher area is being made with emphasis on glacier morphology and sedimentology.

First results show that surface exposed basal lodgement till has an average water content of 7 % whereas sub-glacial basal till shows changes with depth: average water and ice content directly under the ice is about 50 % and decreases to about 20 % vertically downwards. The bulk density on the other hand increases from top to down. The bulk density of surface exposed basal lodgement till shows no clear dependence on depth. However it is similar to the one of the lower samples of sub-glacial basal lodgement till.

It seems that the melting of the glacier strongly affects the upper parts of the sub-glacial till. The dominating process is dehydration whereas the change in bulk density is an indication that also compaction occurs. The lower parts of the sub-glacial till show smaller changes in comparison with exposed basal lodgement till at the surface.