Geophysical Research Abstracts
Vol. 12, EGU2010-7206, 2010
EGU General Assembly 2010

Depositional pathway tracing in glacial catchments using Optically Stimulated Luminescence dating

Georgina King, Ruth Robinson, and Adrian Finch
University of St Andrews, Geography & Geosciences, United Kingdom (gk84@st-andrews.ac.uk)

Optically stimulated luminescence (OSL) dating is a direct Quaternary dating method which is utilised to date sedimentary horizons and landforms, and to constrain rates of geomorphological processes in a wide variety of environmental settings. Within cold environments, material suitable for radiocarbon dating is often absent, and OSL has been increasingly used to date glacial deposits. However, one of the prerequisites of OSL, that quartz grains are fully exposed to sunlight prior to deposition, is not necessarily fulfilled in some glacial environments, resulting in partial bleaching of luminescence signals during transport. Typical equivalent doses (De) distributions for partially bleached samples are overdispersed and skewed, which causes reduced precision in age determinations and potential age overestimation. The application of age models has been used by luminescence practitioners to overcome this limitation, however it is hypothesized here that these De distributions contain valuable information about the sampled deposit's depositional history and source.

The degree of De overdispersion and the shape of the distribution are in part dependent on transport and depositional processes, and the initial overdispersion characteristics of the sediment source. Numerous depositional pathways operate with varying dominance within glacial catchments depending upon glacier behaviour, climate, bedrock type, catchment morphology, and sediment availability. Mobile sediment may be derived from, and transported within, paraglacial, subglacial, or supraglacial sources, and deposition may occur within ice-contact landforms or within a glaciofluvial environment. Valuable inferences about the transport and depositional pathways operating within an environment may be made if these different pathways have distinctive overdispersion characteristics. If tracing specific signatures is possible, it will provide a means through which the dominant sediment sources and depositional pathways within a catchment can be identified.

Analysis of the overdispersion characteristics of a range of modern samples taken from four glacial catchments within Jostedalen, Southern Norway using standard luminescence procedures and Principal Components analysis has been undertaken. Modern-recent subglacial, supraglacial, paraglacial and various glacifluvial samples were collected from the catchments of Bergsetbreen and Fåbergstølsbreen during June 2008. These catchments were selected as they are dominated by a glaciofluvial system, through which material derived from paraglacial, subglacial and supraglacial sources are transported. Furthermore samples have been taken from the Jostedola and thus range over 25km, enabling long-distance examination of overdispersion signature evolution. Initial results indicate that the overdispersion signatures of different depositional settings are distinct, as are the sediment source signals.