Geophysical Research Abstracts, Vol. 7, 07919, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07919

The role of micro-facies variations in lake sediment research

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Lake sediments are unique continuous archives in human habitats to trace past environmental changes. A number of highly sophisticated proxies has been developed making use of various components of lacustrine deposits. Common to most of these approaches is that analyses are carried out on discrete (mostly 1-cm) samples. In contrast, lithological information is, if at all, mostly used only if obvious facies changes can be identified by naked eye. In consequence, a wealth of information that can be derived from variations in micro-facies including, for example, short-term sedimentation rate oscillations and their triggering mechanisms are not exploited. Improved techniques for thin section preparation of lake sediments today allows to study even long continuous records for small-scaled changes in depositional processes that sensitively reflect environmental changes. In this way it is possible to distinguish, for example, reworking of shallow water sediments, detrital fluxes from the catchment, authochthonous sedimentation during productive lake periods (biochemical calcite precipitation, diatom blooms), and early diagenetic mineral formation at sub-mm scale. Moreover, micro-facies data are a fundamental need to proove if fine laminations are of annual origin (varves). For varved sediments short-term oscillations then might be traced down to seasonal scale and quantified through measuring the thickness of seasonal sub-layers. In addition to providing an independent integrative proxy of environmental change, micro-facies analyses further aids interpretation of proxy data obtained from bulk samples through optical sample control. This presentation will demonstrate the potential of micro-facies analyses for several examples from varved sediments: (1) intra basin correlation, (2) identification of detrital layers and their seasonal interpretation (3) support for the selection of discrete bulk samples, (4) abrupt sedimentation rate changes and seasonal causes.