Geophysical Research Abstracts
Vol. 21, EGU2019-4826, 2019
EGU General Assembly 2019

Linking clay mineralogical composition with glacial/interglacial cyclicity: an example from the ICDP drilling project Lake Junín, Peru.

Anja Schleicher (1), Simona Pierdominici (1), Jochem Kück (1), Donald Rodbell (2), and Mark Abbott (3)

(1) Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ, Germany (aschleic@gfz-potsdam.de), (2) Union College, Schenectady, NY 12308, USA, (3) Department of Geology and Planetary Science, University of Pittsburg, PA 15260-3332, USA

In the framework of the International Continental Scientific Drilling Program (ICDP), a drilling campaign was performed at Lake Junin in Peru during the summer of 2015. The main objective of the Lake Junín drilling project was to obtain high-resolution paleoclimate records from lacustrine sediments in order to reconstruct the history of the continental records covering the glacial-interglacial cycles. Lake Junín is located at 4000 m above sea level in the tropical Andes of Peru and is characterized by a thick sediment package deposited at a high rate (0.2 to 1.0 mm/year). It predates the maximum extent of glaciation and is in a geomorphic position to record the waxing and waning of glaciers in the nearby Cordillera, hence making the lake a key site for investigating the Quaternary climate evolution in the inner-tropics of the Southern Hemisphere. Drilling was performed at three drill sites, with 11 boreholes in total. Continuous coring reached a maximum depth of 110.08 m at site 1 (1D borehole).
Based on the element distribution of potassium (K) and thorium (Th) from spectrum gamma ray downhole logging data in two boreholes (1D and 3B), we have selected 45 samples from core run 1D and 23 samples from core run 3B at the LacCore repository in Minneapolis (USA), to compare and characterize the clay content in the lake sediments. The samples were selected based on massive, medium bedded, mottled, and thinly bedded silt. Qualitative and semi-quantitative mineralogical analyses on randomly oriented bulk rock powder samples were performed by X-ray diffraction (XRD), in order to identify the different bulk mineral phases that are present in the samples. Quartz, calcite, feldspar and clay minerals could be identified. The clay-size fraction (< 2 microns) was separated using a combination of wet-disaggregation, sedimentation and centrifugation techniques. Oriented samples were prepared and analyzed by XRD in air-dried and ethylene glycol state, to identify the individual clay mineralogy. Especially changes in interlayer size and intensity or half-width broadening in the individual clay peaks give information about changes in mineralogical properties. The main clay mineral phases showed illite, smectite, and kaolinite in different amounts. Interestingly, some specific samples showed no clay, but only calcite and quartz. Linking the abundance and the lack of the specific clay minerals in core samples with the downhole logging data (spectrum gamma ray and magnetic susceptibility), a relationship between the geological history of the lake and climate change processes can be recognized. Consequently, the different mineralogical composition of the sediments, especially the presence or absence of smectite in the clay bulk, reflects a glacial/interglacial climate cyclicity.