Geophysical Research Abstracts
Vol. 12, EGU2010-2320-5, 2010
EGU General Assembly 2010

PASADO - ICDP Deep Drilling at Laguna Potrok Aike (Argentina): A 50 ka Record of Increasing Environmental Dynamics

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Laguna Potrok Aike, located in the South-Patagonian province of Santa Cruz (52°58'S, 70°23'W), was formed by a volcanic (maar) eruption in the late Quaternary Pali Aike Volcanic Field several hundred thousand years ago. This archive holds a unique record of paleoclimatic and paleoecological variability from a region sensitive to variations in southern hemispheric wind and pressure systems, which provide a significant cornerstone for the understanding of the entire global climate system. Moreover, Laguna Potrok Aike is close to many active volcanoes allowing a better understanding of the history of volcanism in the Pali Aike Volcanic Field as well as in the Andean mountain chain, the latter located in a distance of less than 150 km to the west. Finally, Patagonia is the source region of eolian dust blown from the South American continent into the South Atlantic and onto the Antarctic ice sheet. The currently ongoing global climate change, the thread of volcanic hazards as well as of regional dust storms are of increasing socio-economic relevance and thus challenging scientific themes that are tackled for southernmost South America with an interdisciplinary research approach in the framework of the ICDP-funded "Potrok Aike Maar Lake Sediment Archive Drilling Project" (PASADO).
Using the GLAD800 drilling platform seven holes were drilled in the southern spring of 2008. A total of 510 m of lacustrine sediments were recovered by an international scientific team from the central 100 m deep basin with an excellent core recovery rate of 94.4%. The reference profile with a composite depth of 106 m consists of undisturbed laminated and sand-layered lacustrine silts with an increasing number of coarse gravel layers, turbidites and homogenites with depth. Below 80 m composite depth two mass-movement deposits (10 m and 5 m in thickness) are recorded. These deposits show tilted and distorted layers as well as nodules of fine-grained sediments and randomly distributed gravel. Such features either indicate an increased seismicity that cannot be completely excluded for this late Quaternary backarc volcanic field or they are the result of hydrologically induced lake level variations and hence relate to changes in hydrological conditions within the catchment area. Intercalated throughout the record are 24 macroscopically visible volcanic ash layers that document the regional volcanic history and open the possibility to establish an independent time control through tephrochronology supported by Ar/Ar dating. Moreover, these isochrones potentially act as links to marine sediment records from the South Atlantic and to Antarctic ice cores. Preliminary extrapolation of the mean sedimentation rate of 1.1 mm/a determined for the upper 16 ka indicates that a continuous and high quality record may go back in time to approximately 50 ka. A comparable time frame is supported by first radiocarbon dates obtained from aquatic mosses.