



Climatic reconstruction of the last 770 ka, explosive volcanism and post-eruptive evolution of the Argentinean maar Laguna Potrok Aike – a proposed ICDP deep drilling project

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In the southern hemisphere long, continuous and high resolution series of terrestrial paleoclimatic data are scarce and only slowly emerging. Such records are a key to a better evaluation of climatic teleconnections and inter-hemispheric differences. In recent studies it emerged that for a proper understanding of the global climate system the Southern Oceans play a key role. The most extreme oceanic character globally is encountered from 40-60°S where Patagonia and a few islands are juxtaposed to 98% of ocean. This region close to the Andean volcanic chain is subject to shifts in polar and mid-latitude pressure fields and precipitation regimes. It also is affected by the El Niño Southern Oscillation (ENSO) and the Antarctic Oscillation (AAO). Patagonia thus can potentially provide unique terrestrial records of variations in (1) climate, (2) hydrology and (3) deposition of aeolian dust. Such records may act as a cornerstone for paleodata-model comparisons. Additionally, links can be established to ice cores from Antarctica and to marine records from the Southern Oceans where dust and tephra of Patagonian provenance have been detected.

An international team of scientists has been attracted to coordinate the “Potrok Aike Maar Lake Sediment Archive Drilling Project” (PASADO) in the framework of the “International Scientific Deep Drilling Program” (ICDP). The main objective of PASADO is to develop an environmental, climatic and volcanological science network focusing on (A) quantitative climate reconstruction in combination with proxy-model intercomparison and (B) investigation of the phreatomagmatic formation of and early sedimentation in a young maar-diatreme structure.

Within PASADO it is proposed to recover long sediment cores from Laguna Potrok Aike, a 770,000 year old maar lake in the dry steppe of southern Patagonia (52°S, 70°W), Argentina. Seismic surveys demonstrate that at least 400 m of pelagic sediments were deposited in the lake centre underlain by an unknown thickness of volcanoclastic breccias. Based on this seismic data, three drilling sites were selected: (1) from the deepest part of the lake to obtain a continuous and high-resolution record of climatic and environmental changes and to unveil the phreatomagmatic history including more precise age constraints for the maar-diatreme formation from the volcanoclastic sediments below, (2) from a subaquatic lake level terrace at 35 m water depth to constrain the range of lake level variations and (3) from an angle hole passing through lacustrine sediments and the crater wall into the molasse-type basement rocks to study the impact of explosive volcanism, post-eruptive structural evolution and early processes of sedimentation in a mid-Pleistocene maar.