# Weathering intensity related to climate change over the last 50 ka: evidence from Lynch's Crater, NE-QLD, Australia

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The peat deposits of Lynch's Crater in NE-QLD, Australia, represent a high-resolution archive of the past 50 ka that provides a unique opportunity to study the affects of weathering related to climate change. Utilising trace, major and rare earth elements (REE) and Pb isotopes, changes of both chemical and physical weathering conditions are observed. The archive presents a unique, continious geochemical record of environmental change in Australia and the Southern Hemisphere.

The peat was deposited in an extinct volcanic crater within the basaltic field of the Atherton Tablelands. Rock signatures of both basaltic and schist components are identified. Lead isotopes and principal component analyses (PCA) of trace, major and REE's identified the crater wall as the primary source of the peat's inorganic constituents. High temperatures and precipitation mainly influence the weathering in the region. Most of the record shows low inorganic ash yield (<7%). However, 4 layers high in ash yield (>30%) show events with high elemental concentrations and abundant sponge spicules and mark rapid transitions from peat to lake environments. Increased precipitation resulted in increasing physical weathering of catchment soils and fostered growth of sponges and diatoms in the crater. The timing coincides with Heinrich Events and hence indicate a southern migration of the Intertropical Convergence Zone.

The low ash yield sections (<7%) received inorganic material exclusively by the atmosphere and changes in both flux and source are observed. From 50-40 ka BP, low inorganics (<7%) and elemental concentrations coincide with rainforest vegetation in and around the crater, limiting exposure of catchment soils to erosion. Between 40-10 ka, high concentrations of lithogenic elements indicate increasing atmospheric dust flux. Between ~30-40 ka another source can be distinguished, dissimilar to the local rock signature. Arsenic and V become inportant and high Eu/Eu*PAAS is observed, indicating a long-range atmospheric dust source. During the Holocene, low inorganics and elemental concentrations are observed coinciding with wet conditions.

The study also considers the affects of chemical weathering in relation to Eh-Ph conditions in the peat mire. Post-depositional remobilisation of elements such as Ca, Mg, Fe and Mn occurs and provides insights into past environmental conditions of the peat ecosystem.