

Evidence of pedogenesis in Late Pleistocene volcanic ash deposits in Ecuador

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The results of investigations of the changes in chemical weathering between the Last Glacial Maximum (LGM, 21 kyr BP) and the Holocene (10kyr BP) which are based on marine inventory or alluvial deposits indicate either increased chemical weathering since the LGM due to exposure of finely ground material at glacial terminations [1], or decreased chemical weathering since the LGM under high runoff and physical erosion, accompanied by a reduction in soil residence time [2].

Changes in chemical weathering conditions may also be assessed by studying pedogenesis. Here, we combine physical, chemical and mineralogical analyses to investigate the pedogenesis of a late Pleistocene sequence of volcanic ash deposits and paleosols from Ecuador. Two volcanic ash layers are stratigraphic markers at 22kyr BP and 10kyr BP, with paleosols underneath. At 22 kyr BP, the paleosol contains beetle fossil nests and traces of earthworm's activity. At 10 kyr BP, the paleosol shows horizon differentiation and has a higher organic C and clay content than at 22kyr BP. These results i) provide evidence for pedogenesis at both 22 kyr BP and 10 kyr BP, and ii) suggest that pedogenesis was more advanced at 10 kyr BP than at 22 kyr BP. Global climate model outputs and local paleoenvironmental data point to wetter and warmer climatic conditions in Ecuador at 10 kyr than at 22 kyr; such conditions may have favoured chemical weathering and pedogenesis at 10kyr. Paleosols are complementary archives to investigate weathering conditions between the LGM and the Holocene.

[1] Vance et al (2009), *Nature* **458**, 493-496 [2] Dosseto et al (2015), *Geochem. Persp. Let.* **1**, 10-19.