Impact of Heinrich stadials on North-East Africa soils during the Late Quaternary

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During the late Quaternary, the climate in tropical Africa latitudes has oscillated between arid and humid periods in response to monsoon intensity fluctuation. Since 32 ka, these oscillations resulted in co-variations of weathering in the Nile Basin based on lithium and neodymium isotopes: high precipitation rates lead to more intensive rock leaching and physical erosion, thus limiting soil development and clay neoformation in NE Africa [1].

In this new study we analyze weathering proxies (including lithium isotopes [2]) and source proxy (neodymium isotopes) in the clay fractions extracted from the sediments deposited in the Nile Delta during the last 110 ka. Major and trace elements are analysed by ICP-OES, lithium and neodymium isotopes by MC-ICP-MS after specific chemical separations..

Preliminary results show that clay δ^7Li values increase systematically during the Heinrich stadials. Heinrich stadials are characterized by rapid (200 yrs) decrease in North Altantic sea surface temperature and consequently, slowdown in the North Atlantic thermo-haline circulation. These variations have been associated to significant aridification in West Africa [3]. K/Ti and Mg/Ti ratios also show systematic increase during the Heinrich stadials while Nd isotopes remain constant. Our first results therefore suggest that less intensive leaching and more neoformation was operating in the Nile Basin during these periods, consistent with rapid increase of aridification in this region.

[1] Bastian et al., 2017, Scientific Reports, 7, 44231
[2] Vigier et al., 2009, EPSL, 287, 434-441
[3] Collins et al., 2013, Climate of the Past, 9, 1181-1191