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The humus 'memory' – Are paleoenvironmental changes and past human activities archived in peat humic acids?

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For at least two centuries, ombrotrophic (i.e., rainwater-fed) peat bogs have been recognized as excellent archives of the past. Rennie (1807), for example, interpreted stratigraphic changes in Scottish bogs not only in terms of natural changes in paleoclimate, but was also able to identify environmental changes induced by humans. The use of bogs as archives of climate change in the early XX^{th} century was accelerated by studies of fossil plant remains, and by systematic investigations of pollen grains pioneered by von Post in Sweden. In Denmark, Glob outlined the remarkably well-preserved remains of bog bodies. In Britain, Godwin provided an introduction to the use of bogs as archives of human history, vegetation change, and Holocene climate, with a more recent survey provided by Charman.

Anyway, although hundreds of studies have been carried out in the last decades using ombrotrophic cores, scientific literature is still rather controversial about the role of bogs as reliable records, as several authors argued that all "climatic, vegetational and human activity-related information" could be affected by/during humification processes.

In the present communication, the authors will summarize data collected in the last 8 years analyzing two peat cores collected in 1991 and 2005 from Etang de la Gruère (Jura Mountains, Switzerland), i.e., the longest continuous record of atmospheric depositions in continental Europe, where 6.5 m of peat has accumulated in the past ca. 15,000 years.

Using several physico-chemical and spectroscopic approaches [e.g., elemental analysis (CHNS-O) and atomic ratios, Ft-IR, molecular fluorescence, UV-Vis, DSC, alkaline CuO oxidation (for phenolic constituents), stable isotopic ratios (for δ^{13}C, δ^{18}O, and δ^{15}N), XRF (for major and trace elements), LB γ-spectrometry (for ^{137}Cs and ^{241}Am)], the authors will try to answer to the following questions: 1) are ombrotrophic bogs reliable archives of dusts and trace elements deposition? 2) are ombrotrophic bogs reliable archives of organic pollutants deposition? 3) are ombrotrophic bogs reliable archives of paleoclimatic and paleovegetational changes?