ELS2014 –The Earth Living Skin: Soil, Life and Climate Changes
EGU – SSS Conference
Bari | Italy | 22 – 25 September 2014
ELS2014-131-2

Comparing humification indices along ombrotrophic peat profiles

Claudio Zaccone (1,2), Cesar Plaza (3), Claudio Ciavatta (4), Teodoro M. Miano (5), and William Shotyk (1)

(1) Dept. of Renewable Resources, University of Alberta, Edmonton, Canada (zaccone@ualberta.ca), (2) Dept. of the Sciences of Agriculture, Food and Environment, University of Foggia, Italy (claudio.zaccone@unifg.it), (3) Spanish National Research Council, Madrid, Spain, (4) Dept. of Agricultural Sciences, University of Bologna, Bologna, Italy, (5) Dept. of Soil, Plant and Food Sciences, University of Bari "Aldo Moro", Bari, Italy

Structural changes of organic matter occurring in peat during humification have been generally evaluated by indirect measurements of the degree of humification.

Besides traditional and (more or less) objective and reproducible methods, such as the von Post scale or the visual estimation of the relative proportions of fiber structures, several other methods have been published and a wide variety of geochemical, spectroscopic and molecular techniques used in humification studies, often providing contrasting results.

To answer fundamental questions about humification, and to be able to compare data, it is very important to determine what is the best humification index able to quantify the humification degree and the evolution of peat humification along vertical deep profiles. The possibility to better understand the extent to which bogs may serve as reliable geochemical archives is of paramount importance, especially considering that ombrotrophic cores from bogs have been and are often used to reconstruct environmental changes over time (decades to millennia).

Nine bogs from four continents (America, 3; Asia, 1; Europe, 4; Oceania, 1), showing different features including climatic conditions, botanical composition and age of formation, have been selected for this study. Four-to-five peat samples from each core have been randomly collected at different depths (n = 38), and each of them tested using several physical, chemical, spectroscopic and thermal approaches in order to identify the simplest, most valid and cost-effective method to be applied in geochemical and paleoenvironmental studies.

Preliminary data show that, surprisingly, the C/N ratio seems to be uncorrelated with most (if not all) humification indices, and the same is true also density and E_4/E_6 ratio. The signature of stable isotopes is promising, but it can be used only when peat is quite homogeneous in terms of botanical composition. On the opposite, the remaining chemical (H/C, O/C, C_{HA}/C_{FA}, C_{HA}/TEC), spectroscopic (alkyl-to-O-alkyl C ratio, alkyl-to-O/N-alkyl C ratio, aromatic/olefinic-to-O/N-alkyl C ratio, $SUVA_{254}$, ε_{280}, ε_{540}, HIX) and thermal (Exo1, Exo2, Exo2/Exo1) indices, instead, are quite consistent among each other.