ELS2014 –The Earth Living Skin: Soil, Life and Climate Changes
EGU – SSS Conference
Bari | Italy | 22 – 25 September 2014
ELS2014-21-1

Soluble fraction of soil organic matter in Pine and Beech forests.

Maria Giordano (1), Armando Zarrelli (2), Amalia Virzo De Santo (1), Antonietta Fioretto (3), and Anna De Marco (1)

(1) Federico II di Napoli, Biologia, Italy (ademarco@unina.it), (2) Federico II di Napoli, Chimica, Italy, (3) Seconda Universitàdi Napoli, Caserta, Italy

Accumulation and turnover of soil carbon are important to understand the functioning of terrestrial ecosystems, their balance and forests role in the global carbon cycle. Forests cover 27% of Earth's surface, and represent the largest site of carbon storage in plant biomass and in soil. The entire pool of soil organic carbon can be divided into two fractions based on solubility in H_2O: the fraction of water soluble organic carbon (WSOC) and the fraction of insoluble organic carbon (WIOC).WSOC can be absorbed on mineral particles or dissolved in interstitial pores. Both of these pools can be transported by leaching water and constitute the dissolved organic carbon (DOC). WSOC represents only part of the total organic carbon in the soil. However, it is the most mobile and reactive fraction of organic carbon able to control soil physical, chemical and biological processes. In this study we assessed, along the whole soil profile (organic and mineral layers), total and soluble carbon in soils of three Stone pine forests across a chronosequence encompassing a 40y, a 70y and a 100y old forest within Vesuvius National Park, and two coeval 80 y old beech forests, located in Northern and Southern Italy, different for climatic and edaphic conditions. We also determined the chemical structure of soluble carbon in the different horizons by 1H NMR. In the cronosequence of Mount Vesuvius, the oldest forest showed a greater carbon accumulation in the organic layers and in the upper layer of mineral soil. This is in agreement with the higher litter production in this forest than in the younger ones. The youngest site showed the highest percent ratio of soluble to total carbon. In details, alkyls and alcohols are the most abundant components of soluble carbon. Aromatic compounds were more abundant in the deepest layers of the soil profile in all three forests. The two beech forests show significant differences in carbon amount accumulated along the soil profile. In both forests the concentration of soluble carbon is greater in the litter that in the mineral soil. Soluble carbon increases along the soil profile and shows higher values in the Northern beech forest compared to the Southern beech forest. The chemical composition of soluble carbon fraction, assessed by 1H NMR analysis, showed the presence of abundant carbohydrates and saturated compounds, especially in the organic layers with respect to the mineral soil, in both beech forests. Aromatic compounds are relatively more abundant in the first 5 cm of soil in the Northern beech forest and at greater depths in Southern beech forest. Southern beech forest soil accumulates greater C amount which appears to be less soluble and more recalcitrant.