Geophysical Research Abstracts
Vol. 16, EGU2014-4934, 2014
EGU General Assembly 2014

Effect of soil temperature on cellulose, lignin, C and δ13C of coarse woody debris in different decay stages along a northern and a southern elevation transect in Val di Sole (Eastern Alps, Italy)

Marta Petrillo, Paolo Cherubini, Giacomo Sartori, Samuel Abiven, Judith Ascher, and Markus Egli
Department of Geography, University of Zurich, Zurich, Switzerland, marta.petrillo@geo.uzh.ch

Coarse woody debris (CWD) is considered an important pool of stored organic carbon, with relatively slow decomposition dynamics, but data from alpine forest environments are often lacking. We analysed main organic chemical compounds of Picea abies and Larix decidua CWD at different decomposition stages in a forest ecosystem of the European Alps (Val di Sole and Val di Rabbi – Trentino, Italy). The overall aim was to decipher chemical processes during decomposition using 5 decay classes (increasing decay stage with increasing number) and to unravel the role of climate on wood decay. Cellulose, lignin, water content, carbon and δ13C of 177 samples were thus related to climatic and thermal conditions using a climosequence approach. Deadwood samples were collected at 8 sites located along two altitudinal transects, one north-facing, one south-facing. The four different elevations ranged from 1200 to 2000 m asl.
The water content increased significantly from decay class 2 to decay class 5. Cellulose decreased steadily and significantly (from 30% to 8%). In contrast, the lignin content increased with higher decay classes (from 25% to 40%). A significant negative correlation was found between lignin and cellulose. In general, elevation did not show a statistically significant effect on these variables. Exposition, on the contrary, distinctly affected the lignin content with higher values for the south-facing sites. The carbon content and δ13C (average values 46% and –25‰ respectively) did not vary considerably among the decay classes. Furthermore, δ13C values showed to be significantly influenced by both elevation and exposure.
The 5 decay-class system proved to be nicely apt to describe differences in deadwood properties during decomposition. The hypothesis that climatic conditions affect deadwood chemical properties could partially be proved. This may be explained by different microbial populations with different thermal conditions, nutrient availability, soil humidity, etc. Exposure and thus thermal and hydrologic conditions already seemed to influence the chemical composition of the living trees: this could be seen in the significantly different lignin composition between north and south-facing sites. With increasing decay stage, the differences, however, tended to diminish.