Quantity and type of logging residues following cut-to-length and full-tree salvage logging systems in damaged mountain forests

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**Abstract.** Extreme disturbance events, such as climate change-driven ones, have increased their frequency, upsetting the ordinary management of the forests, and impacting large forest areas with severe damages. As a consequence, when productive forests are hit, salvage logging operations represent the common way to recover part of the economic loose. However, salvage loggings can lead to negative impacts in term of soil erosion as well in terms of variation of soil carbon stock and nutrients. Commonly, in the European Alps, salvage logging operations in largely damaged forest area can be referred generally to two basic harvesting systems: i) Cut-to-Length (CTL) and ii) Full-Tree (FT) extraction systems.

The application of the two harvesting methods can have a different effect on the type and quantity of logging residues left on the forest ground, which in the short-medium term it can be reflected in terms of quantity and distribution of organic carbon and nutrients in the soil. The aim of this study is thus verify if there is a difference in terms of logging residue type and quantity according to the used harvesting system.

Logging residues were sampled in 2021 in three forest areas in the Province of Trento (NE Italy) windthrown in 2018 and harvested in 2019, 2020 and 2021. The logging residues were sampled and classified as fine wood debris (FWD) and coarse wood debris (CWD). A chemical analysis was also carried out on wood and soil samples to obtain the carbon and nutrients estimation.

Preliminary results show a higher amount in the areas harvested with the FT system, while a higher CWD in areas harvested with the CTL system. Significant difference with respect to the quantity of residues was found only for 2021 (p<0.05). The chemical analysis reveals a higher amount of organic carbon stored in the soil (up to 85 Mg C/ha) than in the residues (up to 29 Mg C/ha). For the major nutrients considered (N, Ca, Fe, K, Mg, Mn, P and S), their concentration decreases with the increment of the residues diameter, resulting higher in FWD. The results confirm the potential for CTL to be more depleting in terms of nutrients removal but not in terms of material recovered.1