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Characterization of Soil Organic Matter along an elevation gradient at Stelvio Pass (Italian Alps).

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Climate Change (CC) has evident impacts on the biotic and abiotic components of ecosystems.

Soil is the third largest reservoir of carbon, next to the lithosphere and the oceans, and stores approximately 1500 Gt in the top1 m depth. Even small changes in soil C stocks could have a vast impact on atmospheric CO_2 concentration. Elevated surface temperature can substantially affect global C budgets and produce positive or negative feedbacks to climate change. Therefore, understanding the response of soil organic carbon (SOC) stocks to warming is of critical importance to evaluate the feedbacks between terrestrial C cycle and climate change.

In comparison to other ecosystems, the areas at high altitudes and latitudes are the most vulnerable. In permafrost areas of the Northern Hemisphere the CC has already determined an increase in greenhouse gas emissions, shrub vegetation and variation in the composition of microbial communities. While numerous studies have been performed in Arctic, much less numerous are available for high altitude areas. These areas are a quarter of the emerged lands and have suffered strong impacts from the CC. Mountain permafrost makes up 14% of global permafrost, stores large quantities of organic carbon (SOC), and can release large quantities of CO_2 due to climate change. However, permafrost contribution to the IPCC global budget has not yet been correctly quantified, in particular for ecosystems of prairie and shrubland, which alone could incorporate over 80Pg of C between soil and biomass. In the last decades, the plant component has undergone migration of species to higher altitudes, expansion of shrubs, variations in floristic composition and dominance, variations in area distribution. The expansion of the shrubs accelerates the regression of alpine meadows and snow valleys.

The sampling activities have been carried out in July and September, from September 2017 to July 2019 in an area near Stelvio Pass (2,758 m a.s.l.) (Italian Central-Eastern Alps) along an altitude gradient. Two sampling sites located at 2600 m a.s.l. and 2200 m a.s.l. in altitude, corresponding to about 3° C difference in the average annual air temperature were chosen. At the 2600 m site, warming experiments using open-top chambers (OTCs) to investigate how climate warming affects SOC were performed.

In order to characterize the SOM (Soil Organic Matter), Total carbon (TC), Organic carbon (OC), Total Nitrogen (TN) and Dissolved Organic Carbon (DOC) were determined in soils. TC and TN were determined in biomass. In both soils and biomass were analyzed to quantify the distribution of stable isotopes of C and N, $\delta^{13}C$ and $\delta^{15}N$.