55th SISV International Congress

Vegetation science and global changes: scenarios, challenges and innovation

L'Aquila

16 June 2022 – 17 June 2022

1st session: High-altitude vegetation in global change scenarios

Functional phytosociology: the challenge of traits up-scaling in vegetation science

Cerabolini B.E.L., Dalle Fratte M., Caccianiga M., Pierce S.

Long-term monitoring of vegetation dynamics and carbon dioxide exchange in alpine peatlands

Brancaleoni L.[1], Gerdol R.[1]

[1] Department of Environmental and Prevention Sciences - University of Ferrara Corso Ercole I D'Este, 32 I-44121 Ferrara, Italy

Peatlands are among the most threatened ecosystems in the world because they host a variety of microhabitats, plants and animals very sensitive to global change. In ombrotrophic mires, *Sphagnum* mosses are the main producers of organic matter that accumulate as peat. The competitive balance between *Sphagnum* mosses and vascular plants plays a major role in determing the capability of mires to act as carbon stores. For this reason, vegetation dynamic in peatlands has received great attention in the last decades. In 2002, we chose a mire in the Italian Dolomites (Passo S. Pellegrino, province of Trento, 1800 m), with the objective of evaluating the long-term dynamics of plant species and plant functional types. In 2003, the mire experienced an exceptional heatwave event. After 8 years we recorded an increase of vascular plants, especially graminoids and ericaceous dwarf-shrubs, at the expense of *Sphagnum* mosses. In order to detect the influence of changes in vegetation composition on carbon storage in the peat, we started another long term experiment to analyze the emission of carbon dioxide gas exchange from the peat. We use the elevation gradient as a proxy for temperature increase comparing two mires at different elevation (1300 m and 1800 m, respectively), mimicking an increase in mean annual temperature of about 3 °C. We determined ecosystem respiration and heterotrophic respiration in the growing seasons 2010-2017 with the closed chamber techinque using an infrared gas analyzer. Carbon dioxide emissions were always higher in the mire at low altitude with a higher input from vegetation than peat. Our results demonstrate that increased cover of vascular plants at the expense of *Sphagnum* mosses, triggered by climate warming, enhance carbon dioxide emission thus decreasing the capability of mires to store carbon in the peat.

References

1. Gerdol R. & Brancaleoni L. 2015. Slow recovery of mire vegetation from environmental perturbations caused by a heat wave and experimental fertilization. Wetlands 35: 769-782
2. Walker T.N., Garnett M.H., Ward S.E., Oakley S., Bardgett R.D. & Ostle N.J. 2016. Vascular plants promote ancient peatland carbon loss with climate warming. Global Change Biology 22: 1880-1889