



Carbon fluxes in high-altitude prairies: results from the Critical Zone Observatory at Nivolet

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In 2017 we established the first Earth Critical Zone Observatory in Italy, at the high-altitude Nivolet plain in the Gran Paradiso National Park, between about 2500 and 2700 meters amsl (CZO@Nivolet). The Observatory is currently equipped with an eddy-covariance tower for CO₂ and H₂O fluxes; a portable accumulation chamber to measure H₂O, CO₂, CH₄ and H₂S fluxes; a double raingauge for rainfall isotopic studies; soil moisture and hydro-metric gauges. Regular samplings of the physical and chemical properties of soil as well as surface and groundwater are performed. The in-situ instruments are complemented by analyses in a suite of geochemical and isotopic laboratories at CNR IGG in Pisa and by analysis of high-resolution satellite images. While the CZO@Nivolet has multiple goals and the instrument pool is continuously upgraded, a specific question we have considered during the first year of activity is whether and how the geological setting and the geological substratum of soils affect carbon fluxes in a mountain prairie above the tree line. To this end, we have identified four plots, each having an average area of about 200 square meters, characterized by different geological substratum: (1) soil on gneiss (the dominant rock type of the Gran Paradiso massif), (2) soil on carbonate rocks, (3) soil over glacial deposits (common to most alpine areas), and (4) alluvial soil near the main stream of the Nivolet plain (Dora del Nivolet). In each plot, we performed on average 30 randomly-positioned flux measurements with the accumulation chamber method, approximately every two weeks from June to October 2017 and measuring both the sum of photosynthesis and respiration (using a transparent chamber) and pure respiration (using an opaque chamber). The preliminary results of the statistical analyses indicate that the carbonate soils behave quite differently from the other three types. A full discussion of the findings and their implications will be given.