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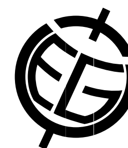

Measurement of dinitrogen fixation by Biological soil crust (BSC) from the Sahelian zone: an isotopic method.

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Amongst the described ecological roles of Biological Soil Crust, N fixation is of importance for soil fertility, especially in arid and semi-arid ecosystems with low inputs. In BSC, the quantification of N fixation fluxes using an indirect method is widespread, usually with the Acetylene Reduction Assay (ARA) which consists in measuring the nitrogenase activity through the process of acetylene reduction into ethylene. A converting factor, still discussed in the literature and greatly depending of the constitutive organisms of the BSC, is the tool used to convert the amount of reduced ethylene into quantitative fixed Nitrogen. The aim of this poster is to describe an isotopic direct method to quantify the atmospheric dinitrogen fixation fluxes in BSC, while minimizing the variability due to manipulations.

Nine different BSC from the Sahelian zone were selected and placed in an incubation room at 28˚C in dark and light conditions during three days, while moisture equivalent to pF=2 was regularly adjusted using the gravimetric method with needles and deionized water, in order to activate and reach a dynamic stability of their metabolisms. Subsequently, each crust was placed into a gas-tight glass vial for incubation with a reconstituted $^{15}N_2$ enriched atmosphere (31.61 % atom ^{15}N, while the proportion of each main gas present in the air was conserved, i.e. 78% N_2, 21% O_2 and 0.04% CO_2). Principal difficulties are to guarantee the airtighness of the system, to avoid crust desiccation and to keep the crust metabolically active under stable conditions for six hours. Several tests were performed to determine the optimum time for $^{15}N_2$ incubation. Three replicated control samples per crust were also stabilized for three days and then dried at 105˚C, without any incubation with $^{15}N_2$ enriched atmosphere.

Total N and ^{15}N were then measured in the grounded (80μm) and dried (105˚C) crust, using a Flash EA elemental analyzer (Eurovector, Milan, Italy) coupled to a DeltaPlus Advantage mass spectrometer (Finnigan Thermo Fisher Scientific, Bremen, Germany). N_2fixation fluxes were calculated from the difference between the amount of ^{15}N in incubated and in control samples. Mean values ranged from $1.32.10^{-3} \pm 1.02.10^{-4}$ to $8.47.10^{-2} \pm 2.63.10^{-3}$ mgN.m^{-2}.h^{-1}. Concerning the variability, differences observed between crusts and between replicates are probably related to the characteristic of each crust as well as to field sampling which integrates the important heterogeneity and sensitivity of the material.