Geophysical Research Abstracts
Vol. 18, EGU2016-12835, 2016
EGU General Assembly 2016

N-C isotopic investigation of a zeolite-amended agricultural field

Giacomo Ferretti, Claudio Natali, Barbara Faccini, Dario Di Giuseppe, Gianluca Bianchini, and Massimo Coltorti
University Of Ferrara, Physics and Earth Sciences, Ferrara, Italy (frrgcm@unife.it)

In this study, a C and N isotopic investigation in the soil-plant system of the ZeoLIFE project experimental field have been carried out. Since many years, natural and NH4-enriched zeolites have been used as soil amendant in agricultural context in order to reduce N losses, increase NUE (Nitrogen Use Efficiency) and crop yield. Nevertheless up to now there are no studies that, using the stable isotopes approach, highlighted the interaction between zeolites and plants in agricultural systems. The main aims of this study is to verify if natural zeolites amendment can enhance chemical fertilization efficiency and if N transfer from NH4-enriched zeolites to plants really occurs. Plants grown following traditional cultivation methods (with no zeolite addition) and plants grown on soils amended with natural and NH4-enriched zeolites (the latter obtained after mixing with pig-slurry with a very high [U+F064]15N) were compared for two cultivation cycles (maize and wheat). As widely known, plants grown under conventional farming systems (use of chemical fertilizers as urea) and plants grown under organic farming can be discriminated by the isotopic signatures of plant tissues. For both years the main results of the study reveals that plants grown on plots amended with natural zeolites generally have their nitrogen isotopic signature more similar to that of the chemical fertilizers employed during the cultivation with respect to the plants cultivated in the non-amended plot. This suggests an enhanced N uptake by the plant from this specific N source with respect to the non-amended plot. On the other hand, plants grown on NH4-enriched zeolites registered a higher [U+F064]15N, approaching the pig-slurry isotopic signature, confirming that this material can constitute an N pool for plants at least for two cultivation cycles. The distinct agricultural practices seem to be reflected in the plant physiology as recorded by the carbon discrimination factor ([U+F044]13C) which generally increases in plots amended with natural zeolites indicating better water/nutrient conditions. At similar N availability it seems that plant prefer to use natural N from pig slurry instead of using that coming from chemical fertilizers.