Geophysical Research Abstracts
Vol. 18, EGU2016-17404, 2016
EGU General Assembly 2016

Fate of organic carbon in paddy soils – results of Alisol and Andosol incubation with 13C marker

Pauline Winkler (1), Chiara Cerli (2), Sabine Fiedler (3), Susanne Woche (4), Sri Rahayu Utami (5), Reinhold Jahn (1), Karsten Kalbitz (6), and Klaus Kaiser (1)

(1) Soil Science, Martin Luther University Halle-Wittenberg, Germany, (2) Earth Surface Science, Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, The Netherlands, (3) Soil Science, Johannes Gutenberg University Mainz, Germany, (4) Soil Science, Leibniz University Hannover, Germany, (5) Faculty of Agriculture, Brawijaya University, Malang, Indonesia, (6) Soil Science & Site Ecology, TU Dresden, Germany

For a better understanding of organic carbon (OC) decomposition in paddy soils an incubation experiment was performed. Two soil types with contrasting mineralogy (Alisol and Andosol) were exposed to 8 anoxic–oxic cycles over 1 year. Soils received rice straw marked with 13C (228 ‰ at the beginning of each cycle. A second set of samples without straw addition was used as control. Headspaces of the incubation vessels were regularly analysed for CO_2 and CH4. In soil solutions, redox potential, pH, dissolved organic C (DOC), and Fe2+ were measured after each anoxic and each oxic phase. Soils were fractionated by density at the end of the experiment and the different fractions were isotopically analysed. Samples of genuine paddy soils that developed from the test soils were used as reference.
During anoxic cycles, soils receiving rice straw released large amounts of CO_2 and CH4, indicating strong microbial activity. Consequently, Eh values dropped and pH as well as Fe2+ concentrations increased. Concentrations of DOC were relatively small, indicating either strong consumption and/or strong retention of dissolved organic compounds. During oxic cycles, concentrations of dissolved Fe dropped in both soils while DOC concentrations remained constant in the Alisol and decreased in the Andosol. Density fractionation revealed increased contents of mineral associated OC for the Andosol incubated with straw addition as compared to the parent soil. No changes were found for the Alisol. However, the mineral-associated OC fraction of both soil types contained 13C of the added straw. Hence, fresh organic matter is incorporated while part of the older organic matter has been released or mineralized. The increase in the Andosol might be due to effective binding of fresh OC to minerals and/or stronger retention/preservation of older OC. Both could be explained by the more reactive mineralogy of the Andosol than of the Alisol. XPS analyses of the soils are currently performed and will give further insides into the binding mechanisms and compounds bound.