Geophysical Research Abstracts
Vol. 18, EGU2016-7727, 2016
EGU General Assembly 2016

Stabilization of microbial residues by co-precipitation with Fe and Al oxides

Anja Miltner, Jan Achtenhagen, and Matthias Kästner

UFZ - Helmholtz Centre for Environmental Research, Department of Environmental Biotechnology, Leipzig, Germany (anja.miltner@ufz.de)

Recent studies have shown that microbial residues contribute significantly to soil organic matter (SOM) formation. This material, however, is readily degradable and thus needs to be stabilized in soil. We hypothesize that the interaction with minerals, in particular co-precipitation with metal oxyhydroxides, plays an important role in stabilization of cell envelope material. We therefore analyzed the mineralization of ^{14}C-labelled *Escherichia coli* cells and cell envelope fragments during incubation of the cell materials alone or after co-precipitation with either Fe or Al oxyhydroxide. We also tested the effect of environmental conditions, in particular oxygen supply and redox potential, on the stabilizing effect of the mineral phases. Co-precipitation with both Fe and Al oxyhydroxides decreased the mineralization significantly, indicating strong protection of biomass and biomass-derived fragments. Surprisingly, the mineralization of intact cells was higher than that of cell envelope fragments. This points to a higher recalcitrance of the cell envelope fragments, which therefore may be selectively enriched in SOM. Reductive conditions obtained after water-logging combined with excessive supply of an easily available carbon source resulted in increased mineralization in the treatments containing Fe oxyhydroxides, due to reductive dissolution of the Fe oxyhydroxide and thus loss of the stabilizing agent. We therefore conclude that co-precipitation with and incrustation by Fe or Al oxyhydroxides is a relevant stabilization mechanism for microbial residues. The same mechanism also may apply for SOM in general.