Geophysical Research Abstracts
Vol. 12, EGU2010-8542, 2010
EGU General Assembly 2010

Changes in the Mineral Assemblage of Paddy Soils upon Redox Cycles

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Rice is one of the major cereal crops of global agriculture. World wide more than 10% of the arable land is used for rice production, mainly under temporarily waterlogged conditions. This leads to distinct redox cycles, governing the biogeochemistry of paddy soils. Yet, long-term effects of alternating redox conditions on the soil mineral matrix and properties are still not fully understood. The objective of the project is to elucidate the processes of mineral transformation as related to changing redox conditions and to time of rice cultivation.

Long-term effects of rice cultivation on the mineral assemblage were studied along a chronosequence of paddy soils (100, 700 and 2000a paddy soils) developed in comparable parent material in the province of Zhejiang, China. Top soils were analysed for the mineral assemblage and physicochemical properties using x-ray diffraction and chemical analyses, respectively.

All studied clay fractions showed a similar clay mineral assemblage (illite, chlorite, kaolinite, vermiculite, smectite). Differences among the paddy sites though could not be related to the time of cultivation. The CEC_{pot} of the clay fraction slightly increased from 100 to 2000 a paddy usage, which was partly attributed to a concurrent increase of C_{org}. With age the Fe_o/Fe_d-ratio in both the Alp and Ardp-horizon increased, with a maximum in the Ardp of the 2000 a paddy field. We conclude, that due to an increasing number of redox-cycles, long-term cultivation enhances the formation of microcrystalline Fe-hydroxides in the A-horizons of paddy soils. Chronological changes in the clay mineral assemblage could not be observed in this study.