Influence of irrigation and fertilization on iron isotope fractionation in a long-term agriculture field trial (Thyrow, Germany)

YING XING[1*], ANNE E. BERNS[1], BEI WU[1], KATHLIN SCHWEITZER[3], MICHAEL BAUMECKER[3], WULF AMELUNG[1,2]

[1] Institute of Bio- and Geosciences: Agrosphere Institute (IBG-3), Forschungszentrum Jülich GmbH, Jülich D-52425, Germany (y.xing@fz-juelich.de)

[2] Institute of Crop Science and Resource Conservation (INRES), Soil Science and Soil Ecology, University of Bonn, Bonn 53115, Germany

[3] Humboldt-Universität zu Berlin, Albrecht Daniel Thaer Institute, 10099 Berlin, Germany

Iron is one of the most abundant elements in soil and analysis of iron isotopes can be a powerful tool to elucidate the biogeochemical cycle of Fe in nature. Over the last two decades, studies of stable isotope variations of Fe have markedly increased, as there are multiple pedogenic processes which induce iron fractionation like continental weathering including dissolution, precipitation, biological processes and redox transformations. Up to date, there is only a limited number of studies that have investigated iron isotope fractionation in soil and, except for one study on a paddy field, none of them are related to agriculture soils.

We present first-time data of the stable iron isotope compositions in different depths (down to 100 cm) of agricultural fields. Under long-term irrigation we detected a depletion of light Fe isotopes in deeper soil horizons. By comparison, the non-irrigated plots displayed a relatively uniform isotope composition across all depths. After 50 years of irrigation, significant Fe losses could be detected in the irrigated plots. The Fe isotopes composition of the plant available Fe is also investigated. In all investigated layers, the irrigated plots displayed a greater plant available fraction (9 - 23 % total Fe) than their non-irrigated counter-parts (8 – 17 % total Fe). We will compare the isotope composition of plant available Fe to that of the strategy II plant *Triticum aestivum* L. grown on this field. We will hence present a comprehensive overview of the Fe isotope fractionation in a long-term irrigated agricultural soil-plant system.