Geophysical Research Abstracts
Vol. 21, EGU2019-5766, 2019
EGU General Assembly 2019

Soil colloidal environmental records of P and C in the Atacama Desert

Erwin Klumpp (1), Ghazal Moradi (1), Ramona Mörchen (2), Anna Missong (1), Luka Trbojevic (1), Barbara Fuentes (3), Eva Lehndorff (2), Wulf Amelung (1), and Roland Bol (1)

(1) Research Centre Jülich GmbH, Institute Agrosphere, Jülich, Germany (e.klumpp@fz-juelich.de), (2) Institute of Crop Science and Resource Conservation, University of Bonn, 53115 Bonn, Germany, (3) Departamento de Ingeniería Química, Universidad Católica del Norte, Antofagasta, Chile

Despite numerous studies about the change of soil biogeochemical properties by climate alternation driven by elevation, latitude, etc. in arid to hype-arid regions, little is known about soil colloids (1-1000 nm) and nanoparticles (1-100 nm) as nutrient carriers and which events are driving this in such environments. We investigated the size and composition of water dispersible colloids (WDCs) to quantify colloidal bound C and P from three depth profiles in an altitudinal transect in the Atacama Desert (Paposo region) using asymmetric field flow field fractionation (A-FFFF) coupled online to various detectors (ICP-MS, organic carbon detector (OCD) and UV). One of the profiles (A; 200 cm) was located in a semi-arid part and the two others (70 cm depth) in an arid area in the vicinity of each other (B on an abandoned alluvial fan, and C on the more active part of the fan). Three size categories of WDCs were detected based on the FFF results, including nanoparticles from 0.6 to 24 nm, fine colloids from 24 to 210 nm, and medium colloids from 210 to 500 nm. Nanoparticles and soil colloids accounted for up to 60% of the bioavailable P concentration (Olsen P) at the surface layer of profile C. Moreover, the contribution of colloidal Corg to total Corg was 5% at the surface of profile A, with a maximum of 11% at depth of 115 cm, and maximum 1% at the surface layer of both profiles B and C. The size distribution of colloids and their elemental content was significantly different between B and C especially at upper 20 cm. Our results, showing pronounced local differences in soil colloidal properties, suggest that colloidal matter (here mainly C and P) preserved in the Atacama deserts is terrestrial proxy record of both local (e.g. intermittent drainage events) and larger scale (periods of dust input) of environmental changes which have occurred in this part of South America.