Soil colloidal characterization regarding P and C_{org} in the Atacama desert

G. MORADI[1]*, L. TRBOJEVIC[1], A. MISSONG[1], R. MÖRCHEN[2], B. FUENTES[3], E. LEHNDORFF[2], W. AMELUNG[1], R. BOL[1], E. KLUMPP[1]

[1]Forschungszentrum Jülich, Institute of Bio- and Geoscience, Agrosphere (IBG-3) (Correspondence: g.moradi@fz-juelich.de, l.trbojevic@fz-juelich.de, a.missong@fz-juelich.de, r.bol@fz-juelich.de, e.klumpp@fz-juelich.de, w.amelung@fz-juelich.de)

[2]Institute of Crop Science and Resource Conservation, University of Bonn, 53115 Bonn, Germany (ramona.moerchen@uni-bonn.de, eva.lehndorff@uni-bayreuth.de)

[3] Laboratorio de Bioprocesos y Medio Ambiente, Departamento de Ingeniería Química, Universidad Católica del Norte, Antofagasta, Chile (bfuentes@ucn.cl)

Despite numerous investigations about the alternation of soil biochemical properties by climate change driven by elevation, latitude, etc. in arid to hyper-arid regions, little is known about soil colloids (1-1000 nm) and nanoparticles (1-100 nm) as nutrient carriers. We investigated the size and composition of water dispersible colloids (WDCs) from three depth profiles in an altitudinal transect at Paposo, Chile using asymmetric field flow field fractionation (A-FFFF) coupled online to various detectors (ICP-MS, UV and organic carbon detector). One of the soil profiles was located in a semi-arid part and the two others in an (hyper-)arid area in the vicinity of each other. According to the results three size fractions of soil colloids were identified, naming nanoparticles (NP) from 0.6 to 24 nm, fine colloids (FC) from 24 to 210 nm, and medium colloids (MC) from 210 to 500 nm. Comparison of the two profiles at the drier site, showed that the one located on a fan surface contained higher amounts of larger collodial sized particles probably due to the transfer of finer ones in case of water availability. In the less arid site, the NP were C_{org} dominated, while in the other two profiles inorganic components were most prevalent. The elemental composition of FC and MC of all the soil profiles was dominated by Si, Al and Fe. The avarage contribution of colloidal P and C_{org} to total P and total C_{org} was 32% and 5% at the semi-arid site, respectively; while these values were <20% and <0.5% in the more arid profiles. Our result show the importance of local site specific factors on the soil colloidal behavior and composition in environments subjected to various aridity regimes.