Geophysical Research Abstracts
Vol. 16, EGU2014-11978-1, 2014
EGU General Assembly 2014

GEMAS: Distribution of major elements in Polish agricultural soil

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Amount and quality of produced food is highly dependent on soil chemical properties and composition. The GEMAS project (Geochemical Mapping of Agricultural and Grazing Land Soil of Europe) has provided new homogeneous geochemical data for Polish agricultural soils. This study presents the distribution of common major elements such as CaO, MgO, Fe_2O_3, Al_2O_3, K_2O, Na_2O, SiO_2, determined in 129 samples of agricultural soil of Poland. The total element concentrations obtained by X-ray fluorescence spectroscopy (XRF) were compared with the results from aqua regia acid digestion determined by ICP-MS. The distribution patterns of selected major elements reveal two major geochemical provinces - the northern province and the southern province, distinguished with respect to the natural geochemical background and resulting from the geological evolution of the region. The soil of the northern province (Polish Lowland), dominated by glacial deposits, show low contents of CaO, MgO, Fe_2O_3, Al_2O_3, K_2O, Na_2O, and high contents of SiO_2. High silica content reflects the presence of sand-rich deposits which belong to the larger European feature with cover sands and loess of mainly Weichselian age and stretching from Ukraine to western Germany and Denmark. The southern province is characterised by high concentrations of almost all major elements (except SiO_2). Soils in the Sudetes, Upper Silesia and the Carpathian Mountains developed in majority on pre-Quaternary rocks. In the Sudetes, soil formed on magmatic and metamorphic rocks of Paleozoic age. In the Carpathians and Upper Silesia, the flysch and molasse formations containing various material of magmatic and sedimentary origin constitute the immediate substratum of soil.