Geophysical Research Abstracts
Vol. 19, EGU2017-3601, 2017
EGU General Assembly 2017

Fingerprinting selection for agroenvironmental catchment studies: EDXRF analysis for solving complex artificial mixtures

Romina Torres Astorga (1), Hugo Velasco (1), Gerd Dercon (2), and Lionel Mabit (2)

(1) Grupo de Estudios Ambientales, IMASL-CONICET-UNSL, San Luis, Argentina, (2) IAEA Joint FAO/IAEA Division, Soil and Water Management and Crop Nutrition Laboratory - Joint FAO/IAEA Division, Seibersdorf, Austria

Soil erosion and associated sediment transportation and deposition processes are key environmental problems in Central Argentinian watersheds. Several land use practices - such as intensive grazing and crop cultivation - are considered likely to increase significantly land degradation and soil/sediment erosion processes.

Characterized by highly erodible soils, the sub catchment Estancia Grande (12.3 km^2) located 23 km north east of San Luis has been investigated by using sediment source fingerprinting techniques to identify critical hot spots of land degradation.

The authors created 4 artificial mixtures using known quantities of the most representative sediment sources of the studied catchment. The first mixture was made using four rotation crop soil sources. The second and the third mixture were created using different proportions of 4 different soil sources including soils from a feedlot, a rotation crop, a walnut forest and a grazing soil. The last tested mixture contained the same sources as the third mixture but with the addition of a fifth soil source (i.e. a native bank soil).

The Energy Dispersive X Ray Fluorescence (EDXRF) analytical technique has been used to reconstruct the source sediment proportion of the original mixtures. Besides using a traditional method of fingerprint selection such as Kruskal–Wallis H-test and Discriminant Function Analysis (DFA), the authors used the actual source proportions in the mixtures and selected from the subset of tracers that passed the statistical tests specific elemental tracers that were in agreement with the expected mixture contents. The selection process ended with testing in a mixing model all possible combinations of the reduced number of tracers obtained. Alkaline earth metals especially Strontium (Sr) and Barium (Ba) were identified as the most effective fingerprints and provided a reduced Mean Absolute Error (MAE) of approximately 2% when reconstructing the 4 artificial mixtures.

This study demonstrates that the EDXRF fingerprinting approach performed very well in reconstructing our original mixtures especially in identifying and quantifying the contribution of the 4 rotation crop soil sources in the first mixture.