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PRELIMINARY STUDY ON THE USE OF RADIONUCLIDES 137Cs AND 210Pb AND SPECTRORADIOMETRY TECHNIQUES AS TOOLS TO DETERMINE SOIL EROSION STATES

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Natural (210Pbunsupported, 226Ra, 210Po and 7Be) and artificial (239,240Pu, 137Cs) radionuclides are largely used as tools for studying and quantifying soil erosion. The global fallout of artificial radionuclides derived from weapons testing that took place during the 1940's and the 1960's was rapidly and firmly fixed in the soil surface, allowing to calculate further soil erosion by comparing inventories at individual sampling points with a reference inventory representing the local fallout input. This procedure is complemented with the 210Pbuns inventory calculation as indicator of the local average of radionuclides deposition.

Spectroradiometry is a further technique in the determination of soil erosion processes, by characterising soil surface reflectance values and relating these with soil properties such as structure, texture, mineral composition and organic matter content obtained from laboratory analyses. The effect of erosion on these soils implies the presence of contrasting soil horizons emerging at the surface. In this study, surface reflectance measurements of soil samples are determined and associated to data obtained from the laboratory analyses.

This is a preliminary study about the use of both, radionuclides determination and laboratory spectroradiometry techniques, to evaluate soil erosion processes in well-developed soils in an agricultural area near to Camarena within the Province of Toledo (Central Spain).

The methodology includes the test of the sampling devices during the sampling campaign, the radionuclides analysis at different soil depths and the determination of their activity concentration levels by means of gamma spectrometry. Spectroradiometry is implemented to associate soil surface reflectance measurements to soil properties related to soil erosion processes.

The inventories for 137Cs and 210Pbexc are similar to the Spanish reference inventories for semiarid areas and allows comparing them. Furthermore, gamma spectrometry data are appropriate to be implemented in mathematical models and for applying the in situ technique in further work. Spectroradiometry results correlate well with soil properties measured in the laboratory and can easily be applied to determine these properties more quickly and easily, as well as for integration with gamma spectrometry results.

This preliminary erosion study applying both instrumental techniques shows consistent results, however, ongoing work is needed to statistically validate these results. In this case, both techniques are complementary with coherent results.

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