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Reconstruction of land degradation associated with recent agricultural expansion in Uruguay (1982-2019) based on sediment cores analyses

Anthony Foucher¹, Marcos Tassano², Guillermo Chalar³, Mirel Cabrera², Joan Gonzalez², Irène Lefèvre¹, and Olivier Evrard¹

¹Laboratoire des Sciences du Climat et de l'Environnement, Université Paris-Saclay - UVSQ, Gif-sur-Yvette, France

(anthony.foucher@lscce.ipsl.fr)

²Laboratorio de Radioquímica, Centro de Investigaciones Nucleares, Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay

³Sección Limnología, Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay

Recent agriculture expansion and land cover conversion (post-1985) induced major deleterious environmental effects in South-America in general and in Uruguay in particular, affecting locally the sustainability of soil and water resources. Whilst the environmental consequences of agriculture's development were largely studied (e.g. monitoring, modeling) in Europe or North America, much less attention was devoted to the intensity of land degradation in South-America and more specifically, on the Pampa Biome. In this study, sediment cores collected in two reservoirs installed along the Rio Negro river (catchments of 23.000 and 39.000 km²) and draining agricultural catchments were used for reconstructing the evolution of sediment dynamics and source contributions in this region during the last several decades. Various chemical and physical analyses were performed for characterizing this accumulated sediment (e.g. fallout radionuclides, organic matter properties (TOC, $\delta^{15}\text{N}$, $\delta^{13}\text{C}$, C:N), X-ray fluorescence). Results indicate the significant acceleration of sediment accumulation rates (e.g. by 67% on average in the Rincon del Bonete dam between 2003 and 2019) associated with major phases of agricultural expansion (e.g. expansion of soybean and afforestation). Sediment properties show an increase of native vegetation source contributions associated with the conversion of native grassland into cropland. Understanding the causes of past and present acceleration of sediment delivery are of prime importance in order to protect the soil and water resources with the design of adapted management schemes at the catchment scale.