AVATAR

« A reVised dATing framework for quantifying geomorphological processes during the AnthRopocene method development for automated mapping of soil erosion on permanent grassland »

Abstract:
Artificial fallout radionuclides are found ubiquitously in the environment around the world and they provide the privileged marker candidates ("golden spikes") of the Anthropocene stratigraphic layers. The onset of their emissions coincided with the period of Great Acceleration that took place after World War II and that is characterised by an increase in soil degradation, which was often triggered by land use change. Particle-bound radiocesium and plutonium are widely used to date modern sediment archives and reconstruct soil redistribution rates during this period. However, although the fallout chronology is better constrained in the Northern Hemisphere, much less is known regarding the timing and the spatial distribution of their deposition in the Southern Hemisphere. The AVATAR project consortium will therefore fill this important knowledge gap through the compilation of all data available in the literature and in recently released declassified military archives. Then, it will conduct soil and sediment sampling in zones identified as data gaps based on the comprehensive literature survey. These soil and sediment samples (~2000 in total) will be analysed for cesium and plutonium to calculate their fallout radionuclide inventories and sources (i.e. the proportion of global fallout due to USSR and USA atmospheric nuclear bomb tests with a peak in 1963 vs. the proportion of fallout due to French nuclear tests conducted between 1966 and 1974 in the South Pacific) and to improve sediment core dating. Spatial analyses will be conducted to provide the first reference map of radiocesium and plutonium fallout in the southern hemisphere. Then, this improved fallout distribution knowledge will be used to reconstruct soil redistribution during the Anthropocene through an innovative combination of conversion and erosion models in two pilot large river basins of the southern hemisphere. Importantly, the AVATAR project will propose original methods to validate the spatial and the temporal distribution of sediment transfer reconstructions in these large river basins during the Anthropocene. Finally, the compiled databases and maps will be shared with a wide community including atmosphere scientists, climatologists, radio-toxicologists and soil scientists. A participative network to update and upgrade a fallout radionuclide database at the global scale will also be launched at the end of the project.