Geophysical Research Abstracts
Vol. 17, EGU2015-14974, 2015
EGU General Assembly 2015

Recent evolution of permafrost soils: insight from U-Th series nuclides

marie-laure Bagard (1), Francois Chabaux (1), Sophie Rihs (1), Oleg Pokrovsky (2), and Jérome Viers (2)

(1) CNRS et université de Strasbourg, LHyGES, EOST, 1 rue Blessig, 67084 Strasbourg, France, (2) CNRS et Université Paul Sabatier - Toulouse, GET, OMP, Toulouse France

Permafrost ecosystems are particularly sensitive to climate warming, which notably induces a deepening of the active layer (the maximum thawing depth during summer time). As a consequence, geochemical and hydrological fluxes within boreal areas are expected to be significantly affected in the future. Understanding the relationship between environmental changes and permafrost modifications is then a major challenge. This work aims to evaluate in a Siberian watershed the dynamics of the permafrost active layer and their recent modifications by combining a classic study of long-lived nuclides to the study of short-lived nuclides of U and Th decay series in two soil profiles. These profiles, located on opposite slopes (north- and south-facing slopes) of the Kulingdakan watershed (Putorana Plateau, Central Siberia), were sampled at several depths within the active layer and (238U), (230Th), (232Th), (226Ra), (228Ra), (228Th), (210Pb) were measured on bulk soil samples by TIMS or gamma spectrometry.

Our results show that south-facing and north-facing soil profiles are significantly different in terms of evolution of chemical concentrations and nuclide activities; north-facing soil profile is strongly affected by atmospheric inputs whereas long-lived nuclide dynamics within south-facing soil profile are dominated by weathering and exhibit more complex patterns. The amount of above-ground biomass being the single varying parameter between the two slopes of the watershed, we suggest that the structuring of permafrost active layer is very sensitive to vegetation activity and that the functioning of boreal soils will be significantly modified by its development due to more favorable climatic conditions. Moreover, the coupling of long and short-lived nuclides highlights the superimposition of a recent mobilization of chemical elements within soils (<10 years) over a much older soil structuring (>8000 years), which can be observed for both soil profiles. The shallowest layer of north-facing soil profile presents a recent increase of Th leaching that we link to the development of vegetation activity and/or organic matter degradation.