Geophysical Research Abstracts
Vol. 18, EGU2016-4556-2, 2016
EGU General Assembly 2016

Characterization of climate- and human-induced slope, soil and grassland dynamics in Bavarian landscapes under climate change

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Since the Neolithic Revolution the intensification of agriculture has been causing increased erosion in Bavarian landscapes. The correlated sediments often induce the formation of new colluvial and alluvial soils (WRB: Regic Anthrosol and Fluvisol i.a.). The soils themselves are able to absorb, bind, and store considerable amounts of C- and N-compounds. Therefore, they are important reactors regarding climate-relevant greenhouse-gas balances in the atmosphere. Learning about the exact spatial extent and thickness of these soils in representative landscapes, but also about their geneses and processes is essential. It allows for a detailed quantification and understanding of the current and potential properties and characteristics of these soils in their role of greenhouse-gas reactors.

Two research locations were elected as representative Bavarian landscapes composed of different lithology and pedo-chemical environments (limestone versus crystalline setting): Rottenbuch is situated at the Ammer River in the Upper Bavarian pre-alpine forelands (Lkr. Weilheim-Schongau). The Otterbach Creek lies at the south-western foothills of the Bavarian Forest at the Donaurandbruch tectonic line next to Donaustauf (Lkr. Regensburg).

Detailed information on the soil horizons and layers within these research areas are accumulated by sounding or burrowing soil profiles and subsequently analyzing the soil samples in the lab. Geophysical methods, such as electrical resistivity tomography (ERT), seismic refraction tomography (SRT), and ground penetrating radar (GPR), allow for the extension of this point-source information into three dimensions. By repeatedly and regularly applying these methods, also temporal changes such as soil hydrology or freeze and thaw cycles can be monitored and their influence on fluxes and exchanges can be taken into account.