SoilGen2) to identify important drivers for paleosol development over the past 500 kyr. The structure of this PhD research is described below. First, we calibrate the soil model for various soil process parameters by confronting simulated and measured soil properties for interglacial soils formed in the CLP and test the effect of reconstructed dust addition patterns on soil development in the loess plateau. Second, we apply the calibrated model to assess the relative contributions of precipitation, temperature, evapotranspiration, vegetation and dust addition on paleosol formation. For the first time, we investigate paleosol response to the precessional and ice volume changes. Finally, the research highlights the potential of using SoilGen2 with LOVECLIM1.3 for quantifying soil-based ecosystem services.

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IAMAS#21

Coupling geophysical data, microtopography and high-resolution imagery to map a permafrost degradation gradient at the Stordalen mire, Abisko, Sweden: implications for iron-organic carbon interactions

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Arctic is warming nearly four times faster than the global average, and as a result, the permafrost temperature has increased by up to 0.39 ± 0.15 °C in the years 2007-2016. This warming is expected to generate a permafrost carbon feedback on the climate by enhancing permafrost thaw and biogeochemical transformation of previously frozen soil organic carbon. Yet, between 30% and 80% of soil organic carbon in permafrost is estimated to be stabilized by geochemical interactions with mineral elements such as iron and therefore less likely to be emitted as a greenhouse gas. These iron-organic carbon interactions may be modified by changing hydrological conditions in areas where thaw of ice-rich permafrost results in local subsidence and development of thermokarst landforms. The challenge is to identify the early stage of thermokarst landforms, and to quantify the influence of thermokarst development on iron-organic carbon interactions released upon thawing. Here, we investigate the relationship between geophysical parameters and microtopography with thermokarst development and the implications for iron-organic carbon interactions at Stordalen mire, Abisko, northern Sweden (discontinuous permafrost region). This site presents three stages of permafrost degradation: (i) a well-drained palsa on top of permafrost (poorly degraded); (ii) a bog with fluctuating water table depth (intermediate state of degradation); and (iii) a fully thawed and inundated fen which has undergone ground subsidence. We produced orthomosaics and digital elevation models of the study site by photogrammetry and we conducted spatially continuous electrical conductivity measurements of the soil by electromagnetic induction. We also monitored the temporal evolution of soil moisture, soil temperature and soil conductivity together with the geochemistry of the soil pore water along the gradient. Our results show that continuous bulk electrical conductivity is contrasted along the gradient and consistent with the results of the landscape classification derived from the orthomosaics and digital elevation models. This illustrates the effectiveness of the permafrost degradation gradient mapping: fen areas are saturated with water, bog areas are richer in solutes and sloped, and palsas are flat areas with significantly lower bulk conductivity. Bog areas are well identified as transitional zones based on bulk conductivity, salinity,

and pH values at depth that are significantly higher than those found in the palsa or fen. The Fe*III* concentrations in soil solution are at least an order of magnitude higher in bog and fen areas compared to palsa areas. These data support that physical degradation of permafrost and subsequent changes in soil moisture with thermokarst landform development from palsa to fen likely influence the geochemical conditions for the stability of iron-organic carbon interactions.

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IAMAS#24

Mechanistic approach towards the analysis of tree mortality in Belgian forests impacted by extreme weather events

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Tree mortality is a key driver of forest dynamics, and it is expected to become more common in the future as a result of climate change. Episodes of tree mortality associated with drought and heat stress have been reported in forests over the last decades and are expected to increase under ongoing climate change. Forests are the main contributors to the terrestrial carbon sink which can mitigate atmospheric CO2 rise and reduce global warming. However, tree mortality reduces this carbon sink and may even turn it into a source. Tree mortality at the ecosystem level remains challenging to quantify since long-term, tree-individual, reliable observations are uncertain. For this reason, here we adapted a satellite-model approach to work on regional forests and upscale the results to the global forest.
In Belgium, 30% of the territory of Wallonia is covered by forest which is the highest among all the three regions. The consecutive recent extreme events, especially the droughts and heat waves of 2018, 2019, and 2020, caused water stress and bark beetle attack. According to the 35 years (1985-2020) land use land cover change extracted by LANDSAT 5,7 and 8 satellite, there is no significant change in forest land in Wallonia, Belgium. Meanwhile, in the current years 2021-2022, there is a decrease in forest land with intensive forest management due to tree mortality. On the other hand, in Wallonia, the forest is distributed insignificant plots of broadleaf deciduous, coniferous, and mixed forests. However, we found that after the consecutive drought events and water stress with the Norway