Late Holocene ecosystem change and disturbance dynamics in central European mountain forests

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Investigating past changes in temperate mountain spruce forest ecosystems and the processes behind them can provide valuable information for understanding present and future ecosystem dynamics. To assess the late Holocene ecosystem change and disturbance history in mountain spruce forests, we sampled four small forest hollows from the High Tatra mountains in Slovakia.

We use pollen analysis to reconstruct changes in forest composition over the last circa 5000 cal. yr BP. Fire history is analysed using macroscopic charcoal counts and charcoal area measurements. As disturbance is one of the key factors shaping mountain forest dynamics, the analysed pollen records will be processed with a new method quantifying disturbance based on plant ecological indices (Kuneš et al. 2019). These indices for disturbance will be attributed to pollen taxa and then disturbance frequency and severity for the whole community will be calculated. We assess the role of climate and human impact as potential drivers on the past forest and disturbance dynamics. The climate variable will be constructed from modelled climate data for the last 4000 years and for the past 1000 years we will use climate reconstruction from the tree-ring records from the region. We use human indicator pollen taxa as the variable for human influence on ecosystem dynamics, and to indicate human activity in the region.

Preliminary results demonstrate opening of the landscape circa 800-500 cal. yr BP in connection with a change in the disturbance regime as indicated by the disturbance indices. The presence of human indicator pollen taxa in all small hollow records suggest landscape opening in connection with anthropogenic activity in the region. In addition, the charcoal records demonstrate periods of fire, which coincide with the opening of landscape and it is plausible that change in the fire regime is connected to the intensified human activity in the region. These results will be discussed further in the presentation in the light of climate data and further data analysis.
Reference: