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Unveiling the Anthropocene Tapestry: A Journey into Norway's Peatlands

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Peatlands cover 3% of Earth's land surface and store 25% (600 GtC) of global soil carbon, playing a vital role in local and global water and carbon cycles. These ecosystems, with distinctive biodiversity, preserve Europe's natural heritage. Despite that, peatlands are some of the fastest disappearing ecosystems in the world. The Anthropocene is the time when humans became the main drivers shaping the environment, including wetlands. Many studies show that human activities have increasingly impacted peatlands since the Middle Ages as a result of economic and societal changes. Initially, minor disturbances like small settlements and limited forest clearings occurred. However, the growing economy led to deforestation, fires, drainage, and peat extraction, disrupting water conditions, especially over the past 300 years. Anthropogenic climate change causes rising temperatures that affect peatland ecosystems: plant communities, microbes, hydrology, and microclimate. Our research aims to reconstruct peatlands' environmental development to better understand these ecosystems' functioning under pressure from human activities and climate change. We will present preliminary results of water level and vegetation reconstructions at the Midtfjellmosen peatland in southern Norway. We hypothesized that climate and land-use-related feedbacks have triggered water table deficits in Norwegian peatlands, leading to groundwater lowering in the long term that altered vegetation and microbial communities. We used paleoecological methods to reconstruct the environmental conditions in the peatland. Palynological analysis provided information on changes in the vegetation within the peatland. Furthermore, analysis of testate amoebae (TA) allowed us to identify changes in water level. These single-celled protists build shells for protection and are deposited in peat after death, with species-specific shells aiding identification. Changes in TA communities indicate environmental disturbances, enabling the reconstruction of hydrological conditions, geochemistry, and pH in peatlands, that can be correlated with other proxies like pollen and plant macrofossils. The surface sampling from *Sphagnum* peatlands across Norway allowed for the construction of a novel TA calibration data set. The newly developed transfer function was used to reconstruct

paleohydrological changes that occurred during the development of the Midtfjellmosen peatland. The reconstructions will enable us to identify the human impact on this peatland and will allow us to assess whether the observed changes are related to global warming, an important issue for the sustainable management of this unique ecosystem. It should be emphasized that the emerging transfer function and high-resolution reconstruction from other proxies, will contribute to peatland ecology and paleoecology in Norway.

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