

EGU21-10582

<https://doi.org/10.5194/egusphere-egu21-10582>

EGU General Assembly 2021

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Thermal UAS Imaging to Monitor Restored Peatlands

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Globally peatlands are degrading due to drainage and intensified land use e.g. for forestry, agriculture and peat extraction. Peatland restoration can recover biodiversity of the threatened habitats, reestablish the natural hydrological role of the peatland as retaining water and nutrients and diminish greenhouse gas emissions.

Restoration monitoring for peatlands is urgent in order to reveal the peatland hydrological recovery and ecological succession after restoration, needs for corrective actions and to enable further method development. Restoration monitoring with conventional approaches is laborious, time-consuming and does not cover large areas. Visual evaluation is biased, and the traditional systematic methods give only focused information while conditions for most of the site remain hidden.

Unmanned Aircraft Systems (UAS) imaging produces large coverage information on restoration success in high spatial resolution. Aerial perspective with superior resolution alone extends the monitoring aspect together with the photogrammetric high-precision digital elevation models (DEMs) allowed by the Structure from Motion (SfM) technology.

Additionally, external instruments such as thermal cameras attached in the drone allow revealing temperature anomalies and moisture patterns. We used thermal infrared (TIR) imaging to monitor changes at a boreal rewetted peatland site. The uncalibrated thermal data alone turned out to be useful showing near-surface flow routes recovered in restoration. We further applied a variety of processing methods for the data to explore their applicability on boreal peatlands. The results show the thermal UAS imaging to have great potential in monitoring the hydrological changes due to peatland restoration in high spatial resolution.