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Remotely sensed temperature is a proxy of greenhouse gas emissions in intact and managed peatlands

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Besides water table depth, soil temperature is one of the main drivers of greenhouse gas (GHG) emissions in intact and managed peatlands. In this work, we evaluate the performance of remotely sensed land surface temperature (LST) as a proxy of greenhouse gas emissions in intact, drained and extracted peatlands. For this, we used chamber-measured carbon dioxide (CO₂) and methane (CH₄) data from seven peatlands in Estonia collected during vegetation season in 2017–2020. Additionally, we used temperature and water table depth data measured in situ. We studied relationships between CO₂, CH₄, in-situ parameters and remotely sensed LST from Landsat 7 and 8, and MODIS Terra. Results of our study suggest that LST has stronger relationships with surface and soil temperature as well as with ecosystem respiration (R_{eco}) over drained and extracted sites than over intact ones. Over the extracted sites the correlation between R_{eco} CO₂ and LST is 0.7, and over the drained sites correlation is 0.5. In natural sites, we revealed a moderate positive relationship between LST and CO₂ emitted in hollows (correlation is 0.6) while it is weak in hummocks (correlation is 0.3). Our study contributes to the better understanding of relationships between greenhouse gas emissions and their remotely sensed proxies over peatlands with different management status and enables better spatial assessment of GHG emissions in drainage affected northern temperate peatlands.