Carbon emission estimation through tropical peatland subsidence using interferometric synthetic aperture radar analysis

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The tropical peat swamp forests have been deforested by the rapid expansion of oil palm plantations in Borneo. As a result of drainage by the plantation development, land subsidence occurs through a series of steps of compaction, shrinkage, consolidation, and oxidative peat decomposition. Carbon is emitted through the peat decomposition. We estimated the ground displacement of a newly developed oil palm plantation from a peat swamp forest in Sarawak, Malaysia, using interferometric synthetic aperture radar (InSAR) analysis. The used data were C-band SAR data by Sentinel-1A operated by ESA. The analysis of ground displacement (subsidence) was conducted for approximately nine months from 31 August 2017 to 22 May 2018. The measured subsidence by InSAR analysis was 13.7 cm (18.3 cm year⁻¹) on average of the test site (2143 ha). Carbon emissions through the subsidence were estimated by multiplying the subsidence depth by peat bulk density of 0.1 Mg m⁻³ (Ishikura et al., 2019), peat carbon content of 52.8% (Ishikura et al., 2018), and the contribution rate of oxidative peat decomposition at 50%. Total carbon emissions were estimated 48.3 t C ha⁻¹ year⁻¹. This presentation reports the estimation results and the comparing evaluations with previous studies.

Keywords: carbon emissions, peat decomposition, C-band SAR, interferometric SAR