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Quantifying changes in land-surface height in bioenergy palm oil plantations (Sumatra) using InSAR time series.

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Tropical peatlands in Southeast Asia cover ∼ 439,238 km sq. and represent ∼77 % of global tropical peatland carbon stores and ∼11 % of global peatland area. These landscapes are substantial C stores accounting for ∼17-19 % of the global peat C pool (Page et al., 2010). Within southeast Asia, Indonesian peatlands hold most C (57.4 Pg, 65 %), followed by Malaysia (9.1 Pg, 10 %). In recent decades the drive to use these soils for agriculture and often the palm oil biogenergy crop, has driven fire-clearing, deforestation and drainage of these carbon landscapes. The drainage can lead to respiration of the soil carbon store and subsidence of the peatland (Hooijer et al., 2012), reducing their strength as a current C store and their capacity for future soil C storage.
Using field-based surveying to monitor changes in the past peatland surface height, and over the large areas typical of commercial agricultural palm oil plantations, is challenging such that measurements are more likely to describe a small area and be only a snapshot in time. Upscaling and understanding the rate of change in surface height through time may be overcome using remote sensing approaches.
Here we present data on the change in peatland surface height in Indonesia palm oil plantations, detected using the Interferometry Synthetic Aperture Radar (InSAR) Small BAseline Set (SBAS) approach (Berardino et al., 2002). Using data from July 2007 to January 2011, we have generated a map of the rate of change of mean height, and time series of change in surface height for several plantation areas. To do this we used two independent ALOS L-band tracks SAR images, as there is a lack of ground data for validation, coherence in output provides confidence the results are representative. Our analysis to date shows that in drained and planted palm oil areas: 1) the rate of change in surface height (decrease) can vary; 2) the decrease in surface height can be up to 5 cm/year; 3) the largest decrease in surface height observed was 15 cm.
Here we will explain further our approach to estimating change in surface height and consider these results in the context of the loss of regional and global C storage.

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