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Determining regional scale carbon losses from tropical peatlands using ISBAS-InSAR

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80% of peatlands in Indonesia and Malaysia (15% of Earth's soil carbon) are now drained for production of pulp wood and palm oil. Associated increased peat decomposition and large-scale forest fires are now significant contributors to global greenhouse gas emissions. However, carbon losses from these processes and the impact of peatland drainage remain poorly quantified across SE Asia because of the challenging scale and inaccessibility of dense tropical peatland forests.

Space-based platforms offer the opportunity for regular and efficient pan-regional monitoring and overcome inaccessibility of tropical peatland environments. A development in satellite interferometric synthetic aperture radar (InSAR) in monitoring surface motion has the potential to solve this problem. A new 'intermittent small baseline subset' (ISBAS) modelling technique provides excellent coverage across almost all land surfaces irrespective of ground cover, enabling long-term measurement of peatland surface motion across whole catchments, regions and countries. Importantly, the ISBAS technique is able to determine surface deformation under tropical forest canopy using C-band InSAR, enabling continuous monitoring of surface motion ranging from 0.1–40cm/yr at spatial scales $\geq 90 \times 90$ m.

This project aims to determine whether rate of subsidence of the peat surface measured by ISBAS-InSAR is a proxy for rate of carbon loss in tropical peatlands in SE Asia. ISBAS-InSAR time series and field measurements of subsidence will be used to monitor and characterise seasonal tropical peat surface oscillations over time and field radar experiments will investigate C-band radar signal attenuation with the peat surface at different moisture contents.