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# Exploring complexity in the archaeological landscapes of monsoon Asia using lidar and deep learning

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Compelling evidence is now emerging that tropical environments were cradles of innovation and complexity from prehistory to the present. Tropical forests in particular have long been considered marginal and inhospitable, but recent work suggests that several critical milestones were achieved in these landscapes. Archaeology has revealed that vast expanses of the tropics were terraformed by increasingly complex societies, often in a quest to mitigate the sharp seasonality of the monsoon, and in some areas, ostensibly wild and pristine rainforests are now characterised by some ecologists as managed 'gardens'. Meanwhile, the giant low-density settlement complexes of 'rainforest civilisations' in many ways anticipate the sprawling megacities of our contemporary world, and offer a laboratory for understanding the profound challenges that they create.

To date, these emerging perspectives have largely been driven by advances in palaeobotany, archaeogenetics, isotopic analyses, and contemporary rainforest ecology. Remote sensing has thus far played only a modest role in this broader agenda, in spite of the unique capability of lidar technology to 'strip away' the vegetation that obscures tropical landscapes and reveal archives of human activity inscribed as topographic traces in the Earth's surface.

This presentation describes a broad research collaboration dedicated to tackling the core problems that currently constrain the so-called 'lidar revolution' in archaeology: We are currently deploying a new generation of lidar technologies to greatly expand coverage in Southeast Asia, home of perhaps the most important and understudied rainforest landscapes, and developing open access frameworks and infrastructures for aggregating, sharing and collaborating on new and existing lidar datasets. Our research agenda also involves building on recent advances in artificial intelligence to develop generic models for automated identification and analysis of archaeological topography in lidar data, in order to move beyond localised, culturally-specific applications. The overall aim of this work is to create consistent, comparable datasets of human impacts on the Earth's surface at global scale, with a view to understanding trajectories of innovation and complexity in the tropical world from the deep past to the present.