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| **Forest Resilience to Tropical Cyclones in Subtropical Rainforests assessed by Wind modelling and repeated Airborne LiDAR surveys** |
| Tropical cyclones cause widespread damage and mortality in natural forest ecosystems. Previous studies in plantations have shown that critical wind speeds depend on forest type and structure. These trends are, however, less clear for natural forests on rugged landscapes since the actual wind load experienced by trees are challenging to estimate and large datasets on forest height changes are difficult to collect.  Here we present findings on forest wind susceptibility by studying wet subtropical forests in Hong Kong affected by Typhoon Mangkhut in 2018. The region is currently in a >70-year restoration trajectory and contains a mosaic of natural rainforests and exotic plantations on a rugged landscape.  Changes in forest structure caused by the Typhoon Mangkhut was captured in repeated LiDAR datasets collected in years 2010, 2017, and 2020. We used computational fluid dynamics (CFD) modelling to estimate the wind load experienced by trees and compared it with LiDAR-derived canopy metrics.  Local forest heights were found to be strongly limited by wind, more so than by any other environmental factors considered. These height limits were attributable to the disproportionate damage incurred by the tallest trees during extreme tropical cyclones. Interestingly, forests exposed to relatively high long-term-average wind speeds were relatively unaffected by the typhoon, indicating that exposed forests were structurally acclimated to wind. We also found plantations to be more susceptible to typhoons than natural rainforests of comparable stature. The study represents the first detailed analysis of forest resistance to cyclones within complex tropical landscapes. |