



Can accelerometers detect mass variations in Amazonian trees?

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The mass of trees is influenced by physiological processes within the tree (e.g. transpiration and root water uptake), as well as external loads (e.g. intercepted precipitation). Recent studies have found diurnal variations in radar backscatter over vegetated areas, which might be attributed to mass changes of the vegetation layer. Field measurements are required to study the driving processes. This study aims to use measured three-dimensional displacement and acceleration of trees, to detect and quantify their diurnal (bio)mass variations. Accelerometers and dendrometers were installed on seven different tree species in the Amazon rainforest. Trees were selected to cover a broad range of wood density. Using spectral analysis, the governing frequencies in the acceleration time series were found. The governing frequencies showed a diurnal pattern, as well as a change during precipitation events. Our results suggest that we can separate and potentially quantify tree mass changes due to (1) internal water redistribution and (2) intercepted precipitation. This will allow further investigation of the effect of precipitation and water stress on tree dynamics in forest canopies.