Geophysical Research Abstracts
Vol. 19, EGU2017-4731-2, 2017
EGU General Assembly 2017

Measuring (bio)physical tree properties using accelerometers

Tim van Emmerik (1), Susan Steele-Dunne (1), Rolf Hut (1), Pierre Gentine (2), John Selker (3), and Nick van de Giesen (1)

(1) Water Resources Section, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, The Netherlands, (2) Columbia University, Department of Earth & Environmental Engineering, New York, NY, USA, (3) Department of Biological and Ecological Engineering, Oregon State University, Corvallis, OR, USA

Trees play a crucial role in the water, carbon and nitrogen cycle on local, regional and global scales. Understanding the exchange of heat, water, and CO_2 between trees and the atmosphere is important to assess the impact of drought, deforestation and climate change. Unfortunately, ground measurements of tree dynamics are often expensive, or difficult due to challenging environments.

We demonstrate the potential of measuring (bio)physical properties of trees using robust and affordable acceleration sensors. Tree sway is dependent on e.g. mass and wind energy absorption of the tree. By measuring tree acceleration we can relate the tree motion to external loads (e.g. precipitation), and tree (bio)physical properties (e.g. mass). Using five months of acceleration data of 19 trees in the Brazilian Amazon, we show that the frequency spectrum of tree sway is related to mass, precipitation, and canopy drag.

This presentation aims to show the concept of using accelerometers to measure tree dynamics, and we acknowledge that the presented example applications is not an exhaustive list. Further analyses are the scope of current research, and we hope to inspire others to explore additional applications.