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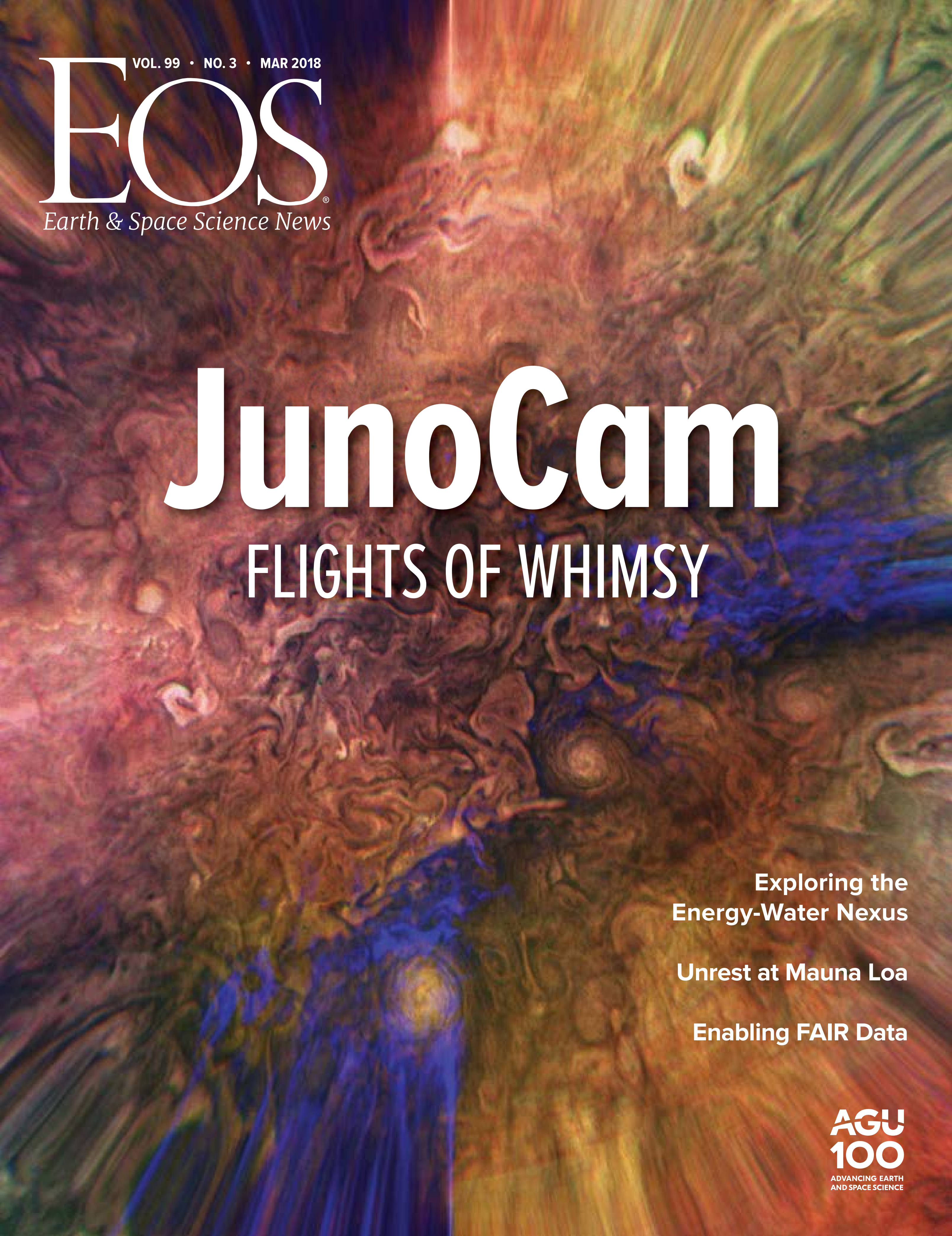

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Scientists Probe Water in Leaves via Satellite

Sensors on board satellites are able to detect a host of environmental metrics, from Arctic sea ice melt to the reproductive patterns of mule deer to logging and land clearing. One satellite-based measurement, called vegetation optical depth, is often used to track how plant life is responding to changes in climate.

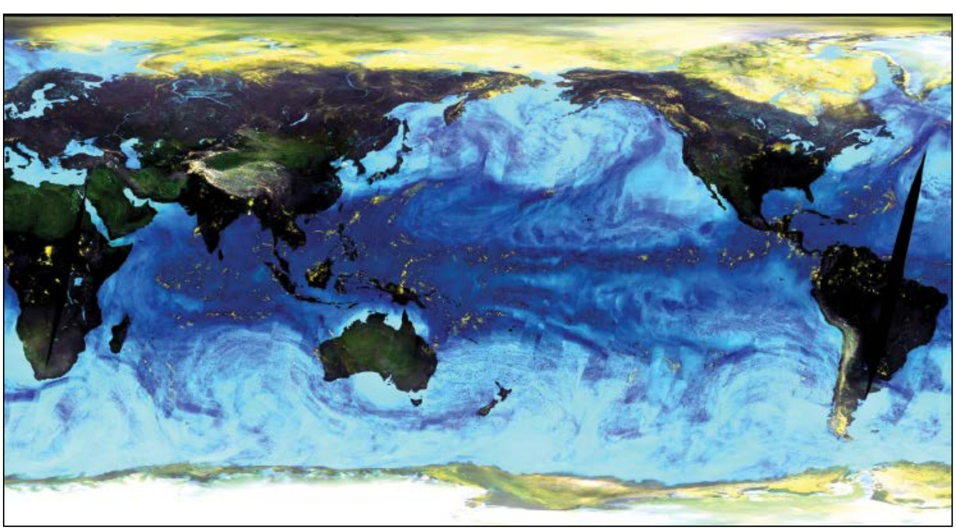
However, scientists have not fully disentangled several other interrelated components of vegetation optical depth, such as biomass (the amount of leafy, versus woody, parts of plants) and water stress (water scarcity due to drought or root damage, affecting a plant's ability to function). In particular, understanding how leaf water potential—the potential energy of water held in a leaf and available to transpire into the atmosphere—affects vegetation optical depth would greatly improve our ability to study how plants respond to water stress and droughts.

Being able to correctly interpret satellite data on vegetation optical depth is becoming increasingly important, as more satellite missions are launched each year, making these data sets more plentiful and accessible to scientists. In a new publication, *Momen et al.* use data collected by the Advanced Microwave Scanning Radiometer for EOS (AMSR-E) satellite instrument to develop a framework for scientists studying vegetation optical depth via satellite.

Using AMSR-E data, the researchers explored the relationships between vegetation water content, leaf area, leaf water potential, and total canopy biomass. They checked these relationships using observations of leaf water potential from three field sites in the United States: an evergreen woodland in New Mexico, a deciduous forest in Missouri, and a deciduous forest in Indiana. Using these relationships and site measurements, the authors estimated vegetation optical depth variations that matched the satellite data well.

The researchers also estimated leaf water potential on a global scale, and they were able to explain about 30% more of the vegetation optical depth signal by taking into account leaf area, and about 15% more by taking into account water potential, suggesting that vegetation optical depth is sensitive to both of these factors on a larger scale. They also found that vegetation optical depth was more highly correlated with leaf area in wetter regions with denser, taller canopies, whereas it was more highly correlated with plant water potential in dry, sparsely vegetated regions.

Using microwave sensors on board satellites to detect water in plants is a capability that was unimaginable mere decades ago. This study is a step toward perfecting this field of study, to provide the best possible information on regional and global climate. (*Journal of Geophysical Research: Biogeosciences*, https://doi.org/10.1002/2017JG004145, 2017) **—Sarah Witman, Freelance Writer**



"First light" images from the AMSR-E instrument on board NASA's Aqua satellite. Credit: AMSR-E Science Team, National Space Development Agency of Japan