THE NASA JPL AIRBORNE SNOW OBSERVATORY IN THE SOUTHERN SIERRA NEVADA (3D)

Peter Kirchner[1], Thomas H. Painter[2], Kostas Andreadis[2], Joe Boardman[3]
[1]Joint Institute for Regional Earth System Science and Engineering /Jet Propulsion Laboratory
[2]Jet Propulsion Laboratory, California Institute of Technology
[3]Analytical Imaging and Geophysics, Boulder, CO

Water, as the arbiter of energy and the essential nutrients of life, is a defining feature for the location health and condition of ecosystems. Precipitation in the form of winter snow dominates the regional climate and water resources of the Southern Sierra Nevada. Understanding the quantity and distribution of snow accumulation and the timing and magnitude of snow-melt is fundamental to water resources and ecosystem management in the region. With a changing climate we need better tools for identifying the key vulnerabilities and potential strategies for adapting to them. Some of these vulnerabilities: rising snow-lines, increased frequency of atmospheric rivers, and prolonged summer dry periods directly affect downstream water users, forest health, fire frequency, and ecosystem resilience. The two most critical properties for understanding snowmelt runoff and timing are the spatial and temporal distributions of snow water equivalent (SWE) and snow albedo. Despite their importance in controlling volume and timing of runoff, snowpack albedo and SWE are still poorly quantified in the Sierra Nevada. To address this need in the Sierra, the Western US, and as precursor to global retrievals, the Jet Propulsion Laboratory has developed the Airborne Snow Observatory (ASO), an imaging spectrometer and imaging LiDAR system, to quantify snow water equivalent and snow albedo. It will provide unprecedented knowledge of snow properties, and robust inputs to ecological and water management models of the future. The ASO mapped snow-free surface elevations in summer 2012 for baseline topography against which snow depth will be determined. The ASO will be evaluated during a multi-year Demonstration Mission of weekly acquisitions in the Tuolumne River Basin in the Sierra Nevada and the Uncompahgre River Basin of the Upper Colorado River beginning in spring 2013. We present initial results and discuss the potential use of ASO products for scientists, land managers and resource specialists for making decisions in an uncertain future.

Key words: Snow, Water, Ecosystems, Remote Sensing, SWE