

Category I - Hydrology, Climatology & Hydraulics

Monitoring California Water Resources from Space

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Executive Summary

A comprehensive monitoring system for California water resources would be greatly enhanced by the large-scale view afforded by satellite remote sensing. Until recently however, only precipitation could be reliably observed from space. Fortunately, several current and near-future satellite missions have now demonstrated the capability for monitoring soil moisture, snow water equivalent, heights of inland water bodies (e.g. rivers, lakes, reservoirs) and changes in total water storage (i.e. the aggregate of all of the snow, surface waters, soil moisture and groundwater). The goal of this proposal is to exploit these new capabilities to develop a framework for monitoring California water resources from space. The focus of the proposed research will be on soil moisture, inland water bodies, changes in the mass of the snowpack, and changes in groundwater and total water storage. Specific objectives are to 1) prepare statewide maps of surface soil moisture using the AMSR-E satellite; 2) Estimate monthly changes in the mass of the Sierra snowpack using data from the GRACE satellite; 3) Estimate monthly changes in total water storage for state's the major watersheds using GRACE; 4) Explore the performance of the current generation of ocean (e.g. TOPEX/Jason) and ice (e.g. ICESat) altimeters to monitor the heights of the state's major rivers, lakes and reservoirs; and 5) Estimate changes in groundwater storage by combining GRACE water storage change estimates with AMSR-E soil moisture estimates and state-of-the-art land surface models. All estimates will be compared to available ground-based observations. The proposed satellite-based framework could provide an important component in a comprehensive water resources monitoring strategy that is central to managing and predicting current and future water availability and hydrologic extremes such as flooding and drought. Additionally, it could be incorporated into current and new methods for natural hazards monitoring and prediction (e.g. mass movements).