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OpenET: Applications of Satellite-based Evapotranspiration Data for Water Resources Management in the Western United States

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Advancing water security in overallocated river basins globally requires consistent and reproducible information on consumptive use of water that can anchor the development of data-driven solutions to the challenge of balancing water supply and demand. OpenET is a fully automated system for field-scale (30 m), satellite-based mapping of evapotranspiration (ET) at daily, monthly and annual timesteps. OpenET currently provides spatially contiguous data throughout the 23 westernmost states in the continental US, and includes both current information as well as multi-year timeseries of ET. The OpenET consortium has implemented an ensemble of satellite-based ET models (ALEXI/DisALEXI, eeMETRIC, PT-JPL, geeSEBAL, SIMS and SSEBop) on Google Earth Engine, which provides a shared computing platform for collaboration on processing of data from Landsat and other satellites, land cover and meteorological inputs, leading to increased consistency and accuracy across the ensemble of models. Earth Engine also facilitates hosting and distribution of data via open data collections and an application programming interface.

We provide updates on the OpenET framework, open data services and data access tools, approach to geographic expansion, recent accuracy assessments, and describe how a user-driven design approach has facilitated successful applications of OpenET data for a wide range of water resource management activities. Applications to date include: use of ET data to improve quantification of ET and consumptive use in Oregon, Utah and the Upper Colorado River Basin; streamlining of water use reporting requirements in the California Delta; support for calculation of water budgets for the implementation of the Sustainable Groundwater Management Act in California; and integration into decision support tools for irrigation management. The use cases demonstrate how satellite-derived ET data that are easily accessed and seen as broadly accepted can accelerate adoption of innovative water management practices at scale, and support advances in the sustainability of water supplies. Uptake and use of data by the OpenET science community has also led to advances in our understanding of the impacts of landcover change, irrigation intensification and wildfire events on hydrology and the water security.