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Applications for remotely sensed evapotranspiration data in monitoring water quality, water use, and water security

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Across the globe there are ever-increasing and competing demands for freshwater resources in support of food production, ecosystems services and human/industrial consumption. Recent studies using the GRACE satellite have identified severely stressed aquifers that are being unsustainably depleted due to over-extraction, primarily in support of irrigated agriculture. In addition, historic droughts and ongoing political conflicts threaten food and water security in many parts of the world. To facilitate wise water management, and to develop sustainable agricultural systems that will feed the Earth's growing population into the future, there is a critical need for robust assessments of daily water use, or evapotranspiration (ET), over a wide range in spatial scales – from field to globe. While Earth Observing (EO) satellites can play a significant role in this endeavor, no single satellite provides the combined spatial, spectral and temporal characteristics required for actionable ET monitoring world-wide. In this presentation we discuss new methods for combining information from the current suite of EO satellites to address issues of water quality, water use and water security, particularly as they pertain to agricultural production. These methods fuse multi-scale diagnostic ET retrievals generated using shortwave, thermal infrared and microwave datasets from multiple EO platforms to generate ET datacubes with both high spatial and temporal resolution. We highlight several case studies where such ET datacubes are being mined to investigate changes in water use patterns over agricultural landscapes in response to changing land use, land management, and climate forcings.