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Hydrol. Earth Syst. Sci., 13, 617-627, 2009
www.hydrol-earth-syst-sci.net/13/617/2009/

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Use of satellite data to assess the impacts of irrigation withdrawals on Upper Klamath Lake, Oregon

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Abstract. Competition for scarce water resources in the Upper Klamath River Basin, Oregon has generated conflict among its stakeholders, as demonstrated by recent regulations on withdrawals from Upper Klamath Lake. Information on agricultural water usage can help assess the hydrologic impacts of irrigation and support operational decisions. This paper presents an experimental satellite-based evapotranspiration estimation system that is combined with the Variable Infiltration Capacity (VIC) hydrological model to estimate irrigation consumption, which is then used to assess the effects of irrigated agriculture on lake storage volumes and water levels. The hydrological model is calibrated with streamflow observations and used to estimate unmeasured lake inflows and guide water budget calculations. When combined with the VIC model, the satellite-based evapotranspiration estimation system shows that irrigation caused a decline of 0.3 m in average annual water levels and 0.5 m in mean October water levels, and an increase of 0.5 m in annual water level ranges at the lake from 2001 to 2005. The results demonstrate the potential of satellite data for agricultural water resource management at the regional scale.

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Citation: Tang, Q., Rosenberg, E. A., and Lettenmaier, D. P.: Use of satellite data to assess the impacts of irrigation withdrawals on Upper Klamath Lake, Oregon, Hydrol. Earth Syst. Sci., 13, 617-627, 2009. [Bibtex](#) [EndNote](#) [Reference Manager](#)



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