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Microwave based implementation of a two-source energy balance model to estimate evapotranspiration

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There is a need for observation-based methodologies to estimate evapotranspiration (ET) at diverse spatial domains. The ALEXI methodology (Atmosphere Land Exchange Inverse) is a time difference implementation of the two-source energy balance method and provides diagnostic estimates of actual ET. ALEXI has been implemented with thermal infrared (TIR) observations at diverse spatial scales to estimate crop water use, as an indicator of agricultural drought, and for the study hydrological impacts of climate variations and land-use change. While TIR is the most direct measurement of physical land surface temperature (LST), sole reliance on TIR limits the sampling to clear skies. It also impacts the accuracy if the cloud masking fails. Passive microwave (MW) methods to estimate LST could help to overcome this limitation and provide a more cloud tolerant alternative to TIR. As a first test of the functioning of a MW-based LST within the ALEXI framework we ran two parallel implementations of ALEXI, one with TIR-LST (MODIS), and one with MW-LST (without any calibrations to accommodate MW-LST). This paper presents an analysis of the clear sky ET estimates for the years 2003-2013 and explores the level of agreement between the MW- and TIR-based ET and derived stress indices.