Abstract

This project offers a comparative study between a ground-based weather station and satellite-based method of calculating evapotranspiration (ET). Using four selected cloudless days measured between 10:28 am and 11:30 am DST local in Los Angeles in 2016 (08 February, 19 April, 22 June, and 08 July), the aim of this project is to determine if the Normalized Difference Vegetation Index (NDVI) Triangle method, a satellite-based methodology, could be used as an acceptable alternative to measure ET for locations without a ground-based weather station.

The Moulton Niguel Water District (MNWD), located in Orange County, California was selected as the study area for this project. Weather station #245, located on the Coto De Caza golf course, generated the ground-based weather data for the Penman-Monteith calculation of evapotranspiration for the MNWD. In contrast, the satellite method used the Landsat Data Continuity Mission's (LDCM) multispectral and thermal bands to calculate ET by Land Surface Temperature (LST) and NDVI values. These two data inputs, by the application of band math, were combined to create a two-dimensional NDVI Triangle pixel plot evapotranspiration estimate for each day calculated. The data from the two methodologies were then compared, with the assumption the Penman-Monteith method was the most accurate measure of ET.
The results were statistically compared and analyzed for accuracy through Root Mean Square Error (RMSE), Mean Absolute Deviation (MAD), Mean Absolute Percentage Error (MAPE) and the coefficient of determination calculations. The results, although limited by sample size, indicate the NDVI Triangle method can be used to estimate ET. The process of creating the NDVI Triangle 2-D plot from multispectral and thermal bands from the LDCM is presented in detail, in addition to the process of defining the dry and wet edges of the plotted NDVI Triangle.