

**APPLICATION OF A STATISTICAL TRANSFORMATION TO
ENHANCE THE SATELLITE-BASED ET ESTIMATION**

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ABSTRACT: Satellite imagery has become a key in estimating spatially distributed evapotranspiration (ET). However, cloudless satellite images are less frequent than needed, leaving large gaps in growing season ET calculations. Previous research has utilized the low-resolution MODIS satellite images (600 m) as a means of filling gaps between the high-resolution LANDSAT images (30 m). It relies on a linear regression approach which captures the mean value but neglects the variance. We applied a statistical transformation, more specifically a Weibull-Weibull Transformation between MODIS and LANDSAT satellite data to estimate ET at the 600 meter resolution, taking into account both the mean and variance of the MODIS data to capture a more accurate spatial variability. The methodology relies on the assumption that there is a statistical relationship between LANDSAT and MODIS imagery. Three sets of images were downloaded for both MODIS and LANDSAT for corresponding days, and the instantaneous ET was calculated for each using the METRIC process. The LANDSAT images were aggregated from 30 meter resolution to the 600 meter resolution to obtain the statistical relationship between their cumulative distribution functions (CDFs). The intermediate MODIS image was adjusted into a new CDF, derived from time-weighted averages of the difference in the means and the ratio of the standard deviations between the prior and posterior LANDSAT and MODIS images. The statistically adjusted MODIS image (600 meters) was downscaled back to a 30 meter resolution, while maintaining the mean value of the adjusted MODIS ET in each 600 meter grid. We compared the estimated 30 meter ET with the original LANDSAT image for verification. This study also used gridded reference ET instead of single weather station reference ET to calculate the reference ET fraction (ET_rF) at each pixel which captures the spatial variability of weather conditions within the image area. Future work will include processing of additional MODIS images to interpolate between LANDSAT images for more accurate estimates of spatially distributed ET during the growing season.

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