

## **Development of a Long-Term Evapotranspiration Product for Mexico from Remote Sensing.**

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Evapotranspiration (ET) is a key variable in the terrestrial water cycle that provides the link between the land surface and the atmosphere. It is also potentially the largest component of the land water budget and is therefore central to quantifying and managing water resources. However, at the spatial scales necessary for making informed decisions about, for example, water allocation, reservoir management and irrigation scheduling, ground observations of ET are essentially non-existent. An emerging potential source of data is from remote sensing, that has the advantage of having global and near temporally continuous coverage. In this paper we develop a method for estimating ET from mostly remote sensing data sources for Mexico and provide a long-term and high resolution dataset that can help answer questions about water variability and change.

The method is based on a modified Penman-Monteith algorithm (RS-PM) which is generally considered the most accurate method for estimating potential evaporation (PE) and hence ET over large vegetated regions. Key to estimating ET is determining the value of canopy conductance which is scaled from stomatal conductance using the vegetation leaf area index (LAI). The method also makes adjustments to conductance to reflect the daily variation of environmental controls such as humidity and temperature. Evaporation directly from the soil surface is also calculated. Daily inputs of surface radiation and meteorology are taken from the WRCP International Satellite Cloud Climatology Project (ISCCP) database which are derived from satellite radiances and modeled data for 1984-2006. These data are downscaled from 280km resolution to 1/8th degree resolution using the fine scale data from the North America Regional Reanalysis (NARR). Surface characteristics, including albedo and emissivity, are taken from the ISCCP, and vegetation cover and LAI are resampled from AVHRR remotely sensed datasets.

Using the RS-PM method and ISCCP input datasets, daily time series of PE and ET have been generated at 1/8th degree resolution for 1984-2006 for the whole of Mexico. The data are evaluated against a number of other large scale estimates of ET from off-line land surface modeling (VIC) and atmospheric reanalysis (NARR), and station measurements of pan evaporation. These evaluations indicate good agreement in the seasonal cycle and spatial distribution of both PE and ET with a slight underestimation by the RS-PM. For PE, the NARR is higher on average by about 1mm/day that can be attributed to the higher NARR shortwave radiation. For ET, the RS-PM has a low bias in the summer/autumn relative to VIC and NARR and a slight high bias in the spring. Overall there is general agreement in the amplitude and phase of the seasonal cycle with the largest differences restricted to warmer and more humid regions. The monthly bias and rmse relative to VIC over the whole of Mexico are -0.13 and 0.39 mm/day respectively. One potential drawback of the RS-PM method is that it does not calculate direct evaporation of water lying on the vegetation canopy, which can be a significant part of the total evapotranspiration and thus may explain part of these differences.

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