

ECHO-ET: An ECOSTRESS-based Hourly ET dataset across the globe

Description:

Evapotranspiration (ET) is a crucial flux linking the Earth's water, carbon, and energy cycles. Studying the diurnal (i.e., diel) variations of ET can provide insights into ecosystem functioning and resilience and the responses to climate change. The ECOSystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) has been continuously monitoring the Earth within a latitude range of $\pm 52^\circ$ since June 2018. It provides high-resolution estimates of ET (L3_ET_PT-JPL) with a remarkable spatial resolution of 70 meters on a 1-5 day repeat cycle. By training a random forest model with the ERA5-hourly reanalysis dataset, MODIS-derived near-infrared reflectance of vegetation (NIRv), and ECOSTRESS ET snapshots, we generated a continuous global hourly ET dataset (0.05°). The evaluation of the gridded dataset with ECOSTRESS ET data yielded an overall r^2 of 0.95, RMSE of 29 W m^{-2} , and percent bias (PBIAS) of 0.08% across 13 biomes. Moreover, to minimize systematic errors arising from the randomness in the model's learning process and the accuracy and precision of the training data (i.e., ECOSTRESS ET snapshots), we separately corrected daytime and nighttime ET estimates during different phenological stages using eddy covariance (EC) measurements from 194 flux sites worldwide. Compared with the EC-based results, the monthly diurnal ET estimates achieved an r^2 of 0.72, an RMSE of 45 W m^{-2} , and a PBIAS of -1.02%.

Fair Data Use Policy:

We make this product available to the research community as we believe that its dissemination will lead to advancement in science. If you plan to use our data in a manuscript or presentation, we request that you inform us at an early stage of your work. You should ensure that your research does not significantly overlap with what we are currently working on with this product. In addition, if this data set is essential to your work, or if an important result or finding depends on the ECHO-ET data, co-authorship may be appropriate. You should inform us of your analysis and publication plans well in advance of submission of a paper, give us an opportunity to read and intellectually contribute to the manuscript, and, if appropriate, offer co-authorship.

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Metadata:

The dataset is provided in two versions: one organized by Coordinated Universal Time (UTC) and the other converted to local solar time (LST), enabling users to select the version most appropriate for their analysis.

Spatial resolution: 0.05°

Temporal resolution: Hourly

File format: GeoTIFF

Data type: float

Scale factor: N/A

Units: W m^{-2}

Temporal extent: 2018-2022

Spatial extent: Globe

Spatial extent: Globe

Map projection: Geographic

Fill values: -32767 (water bodies) and -32768 (lands under snow/ice throughout the year)

Citation:

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