

# Study on the Satellite-based Spatial Evapotranspiration Evaluation Using Eddy Covariance Data

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## (a) Purpose of study or research hypothesis

The purpose of this study is to evaluate the adequacy of satellite-based spatial evaporation through the quantification of actual point-based evapotranspiration. In order to quantify actual evapotranspiration, the pre-processing of the eddy covariance flux data was performed by KoFlux standardization program such as coordinate transformation, density correction, and outlier removal. Subsequently, the alternative evapotranspiration was estimated by FAO Penman-Monteith, MDV, Kalman-Filter method to supplement the removed data.

## (b) Key issue(s) or problem(s) addressed

This study used the evapotranspiration series supplemented with Kalman-Filter as satellite-based evapotranspiration verification data. In this study, the spatial evapotranspiration was estimated in three ways: MODIS, GLDAS, and GLEAM.

## (c) Methodology or approach used

MODIS evapotranspiration was directly produced by running the Revised RS-PM Algorithm in ENVI. Input data such as net radiation, NDVI, and EVI required for the revised RS-PM algorithm are based on the MODIS product. The daily evapotranspiration was calculated based on the Sinusoidal theory. GLDAS evapotranspiration was extracted from GLDAS(Noah) data with 3 hours temporal resolution and 0.25° spatial resolution. Due to the large amount of data, GLDAS evapotranspiration was estimated after processing the data on Matlab basis. Later, ArcGIS was used to map the GLDAS evapotranspiration. Since GLEAM evapotranspiration is provided globally with a time resolution of 1 day and a spatial resolution of 25km, the region corresponding to Korea was extracted and quantified. In the case of GLEAM evapotranspiration, the data was pre-processed in Matlab, and an evaporation map was prepared in ArcGIS.

## (d) Results or conclusions derived from the project

showed similar statistics with the eddy covariance data. Bias calculated based on eddy covariance data showed FAO-PM 0.325, MDV 0.257, Kalman-Filter 0.216, and FAO-PM 0.298, MDV 0.145, Kalman-Filter 0.233 in 2013. RMSE showed characteristics of FAO-PM 0.614, MDV 0.520, Kalman-Filter 0.395 in 2013, FAO-PM 0.982, MDV 0.0704 and Kalman-Filter 0.498 in 2014. Based on the results of this analysis, it is judged that the Kalman-Filter method is highly applicable in the Seolmacheon basin. In conclusion, GLDAS evapotranspiration showed similar characteristics with eddy covariance data in 2013 and 2014. In addition, the daily evapotranspiration of GLDAS showed the most similar to daily evapotranspiration based on eddy covariance. Therefore, this study proposed GLDAS as a method for estimating spatial evaporation in Korea.

**(e) Implications of the project relevant to congress themes**

**Keywords :** Evapotranspiration, KoFlux, MODIS, GLDAS, GLEAM