A Big Earth Data Platform for Three Poles

**Dataset of ground truth land surface evapotranspiration at the satellite pixel scale in the Heihe River Basin (from the single station observation to satellite pixel scale) Version 1.0**

1、Description

The evapotranspiration (ET) is an important variable connecting land energy balance, water cycle and carbon cycle. Accurate monitoring and estimations of ET are essential not only for water resources management but also for simulating regional, global climate, and hydrological cycles. Remote sensing technology is an effective method to monitor ET. At present, a variety of ET remote sensing products have been produced and released. However, in the process of validation, there is a problem of spatial scale mismatch between ET remote sensing estimation value and station observation value, especially on heterogeneous surface. Therefore, it is very important to obtain the ground truth ET values at the satellite pixel scale by upscaling method on heterogeneous surface. In this study, using the station observation data and multi-source remote sensing information, the ET observed at a single ground station is upscaled to the satellite pixel scale, and the ground truth ET values at the satellite pixel scale in Heihe River Basin is obtained.  
Based on the ET data observed by the eddy covariance (EC) at 15 stations (3 superstations and 12 ordinary stations) in the Heihe integrated observatory network, combined with the fused high-resolution remote sensing data (surface temperature, vegetation index, net radiation, etc.) and atmospheric reanalysis data, the upscaling is carried out to obtain the ground truth ET at the satellite pixel scale. The distribution diagram is shown in Figure 1. Specifically, firstly, the spatial heterogeneity of the spatial heterogeneity of the land surface hydrothermal conditions was evaluated; Secondly, nine upscaling methods (the integrated Priestley-Taylor equation method, the Penman-Monteith equation combined with EnKF method, the Penman-Monteith equation combined with SCE\_UA method, EC observation value, artificial neural network, Bayesian linear regression, deep belief network, Gaussian process regression, and random fores and directly taking the EC observation value as the ground truth ET) were compared and analyzed through direct validation and cross-validation; Finally, a comprehensive method (directly using the EC observation value on the homogeneous underlying surface; using the Gaussian process regression method for upscaling on the moderately heterogeneous underlying surface and highly heterogeneous underlying surface) was optimized to obtain the groud truth ET at the satellite pixel scale at 15 typical underlying surfaces in Heihe River Basin (2010-2016, spatial resolution of 1km). The results showed that the ground truth ET at the satellite pixel scale is relatively reliable. Compared with the pixel scale reference value (LAS observation value), the MAPE of the ground turth ET at the satellite pixel scale at the three superstations are 1.57%, 3.23% and 4.59% respectively, which can meet the needs of the validation of ET remote sensing products. For all site information and data processing, please refer to Liu et al. (2018), and for upscaling methods, please refer to Li et al. (2021).

2、Keywords

Theme：Lysimeter,Hydrology,Atmospheric Water Vapor  
Discipline：Atmosphere,Terrestrial Surface  
Places：Heihe River Basin  
Time：2010-2016

3、Data details

1.Scale：None

2.Projection：

3.Filesize：7.4MB

4.Data format：None

4、Space scope

|  |  |  |
| --- | --- | --- |
| - | north：42.7 | - |
| west：97.0 | - | east：102.0 |
| - | south：37.8 | - |

5、Time frame:2009-12-31 16:00:00+00:00--2016-12-30 16:00:00+00:00

6、Reference method

References to data:

LIU Shaomin, XU Ziwei, LI Xiang . Dataset of ground truth land surface evapotranspiration at the satellite pixel scale in the Heihe River Basin (from the single station observation to satellite pixel scale) Version 1.0. A Big Earth Data Platform for Three Poles, doi:10.11888/Atmos.tpdc.2725092022

References to articles:

Li, X., Liu, S.M., Yang, X.F., Ma, Y.F., He X.L., Xu, Z.W., Xu, T.R., Song, L.S., Zhang, Y., Hu, X., Ju, Q., &Zhang X.D. (2021). Upscaling evapotranspiration from a single-site to satellite pixel scale. Remote Sensing, 13(20), 4072. doi.org/10.3390/rs13204072.  
  
Liu, S., Li, X., Xu, Z., Che, T., Xiao, Q., Ma, M., Liu, Q., Jin, R., Guo, J., Wang, L., Wang, W., Qi, Y., Li, H., Xu, T., Ran, Y., Hu, X., Shi, S., Zhu, Z., Tan, J., Zhang, Y., Ren, Z. (2018). The Heihe Integrated Observatory Network: A basin‐scale land surface processes observatory in China. Vadose Zone Journal, 17,180072. https://doi.org/10.2136/vzj2018.04.0072.  
  
刘绍民, 贾贞贞, 徐同仁, 马燕飞, 周会珍, 李新, 徐自为, 张圆, 宋立生, 姚云军, 刘照言. (2021). 国家标准《地表蒸散发遥感产品真实性检验》. GB/T 40033-2021.

7、Supporting project information

8、Data resource provider

name: XU Ziwei  
unit: Beijing Normal University  
email: xuzw@bnu.edu.cn  
  
name: LIU Shaomin  
unit: Beijing Normal University  
email: smliu@bnu.edu.cn  
  
name: LI Xiang   
unit: Beijing normal university  
email: lixianggeo@qq.com