

Interactive comment on “Remote sensing of annual terrestrial gross primary productivity from MODIS: an assessment using the FLUXNET La Thuile dataset” by M. Verma et al.

Anonymous Referee #1

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This is an interesting study which compared different proxies of remotely-sensed GPP, such as NDVI, EVI, etc., and estimated GPP using methods of remote sensing data plus meteorological data, with GPP derived from La Thuile dataset. Authors try to examine the strength and weaknesses of remotely sensed methods in estimating GPP. I suggest a major revision be needed for the paper.

The major weakness of the study is that authors didn't discuss the uncertainties in both La Thuile GPP dataset and their comparison method. Authors treat GPP from FLUXNET La Thuile data set as ground truth, and their conclusion need to take cautions. Firstly, GPP from eddy flux towers are not directly measured but derived by combining empirical models with measured NEE and other environmental variables.

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As to the uncertainties in La Thuile GPP dataset, there has been debate between scientists who are in charge of individual eddy flux towers and those who want to generate a sort of “uniform” GPP data set from eddy flux towers, such as FLUXNET La Thuile dataset. The former argued that they know their sites and thus a unique method and night-time wind speed threshold should be applied to derive GPP for their tower sites; whereas scientists who proposed La Thuile dataset use a uniform method across all towers to derive GPP. Thus how much confidence we have in the GPP from La Thuile is an open question. Secondly, there is a scale issue involved in comparing MODIS data with GPP from eddy flux towers. The location and size of footprint of the fluxes measured at towers are different from each other and highly dynamics which is influenced by i) site topography and homogeneity; ii) wind speed and direction; and iii) height of eddy flux towers. On the other hand, MODIS 500-m or 1-km data is in fact not 500-m or 1-km due to low frequency of nadir pixels (Tan et al., 2006). Therefore, in some cases, a direct comparison between MODIS data and GPP from eddy flux towers is problematic though almost all related studies follow such direct comparison. But for the study of inter-annual variability, a subtle year-to-year change, both uncertainties in GPP from La Thuile and mismatch in scale become a major issue. Therefore, authors should state the uncertainties of using “exceeded $\pm 10\%$ of mean annual GPP at each site” to represent the large anomalies since they don't know how much uncertainties in the GPP from La Thuile dataset as to inter-annual variability. They also need to clearly state the cautions of their conclusions in the abstract due to the two major issues I stated above, though continuous refinement of remote sensing-based methods for monitoring GPP is another issue.

Citation: Tan, B., Woodcock, C. E., Hu, J., Zhang, P., Ozdogan, M., Huang, D., ... & Myneni, R. B. (2006). The impact of gridding artifacts on the local spatial properties of MODIS data: Implications for validation, compositing, and band-to-band registration across resolutions. *Remote Sensing of Environment*, 105(2), 98-114.

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