Note to users on use of MODIS GPP/NPP (MOD17) datasets

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The objective of this document is to clarify the differences between NASA's MOD17 dataset and the improved MOD17 dataset generated by the Numerical Terradynamic Simulation Group (NTSG) at the University of Montana in order that users may best utilize the data products.

In a nutshell: The improved MOD17 is a post-reprocessed MODIS GPP/NPP dataset where the contaminated MODIS FPAR/LAI inputs to the MOD17 algorithm have been cleaned. However, we can only complete this post-reprocessing after an entire yearly input data is available. We strongly recommend use of the improved MOD17 data for validation or inter-comparison purposes where study periods cover full annual periods. Only for near real-time data needs can users use NASA's MOD17 dataset for the present year, but they should exclude the cloud-contaminated pixels as flagged in the quality assessment field. Without excluding contaminated pixels, NASA's MOD17 algorithm will underestimate GPP because of the lower MODIS FPAR induced by cloud contamination. Users may ignore the quality assessment field when using the improved MOD17 GPP because the contaminated MODIS FPAR/LAI values have been filled before calculating the improved MOD17.

Cloud-contamination is a major issue for MODIS land products (Figure 1). For other MODIS vegetation datasets, such as vegetation indices (MOD13) and FPAR/LAI (MOD15), which are 16-day and 8-day maximum value composite datasets, users can temporally fill the contaminated or missing data periods with any published methodology or a new mathematical method. Unlike these vegetation products, we **cannot** fill cloud-contaminated MOD17 GPP products with a simple mathematical method because the process of photosynthesis is largely controlled by meteorological conditions, such as solar radiation, air temperature and water availability. The other major controlling factor is the amount of chlorophyll as expressed by MODIS FPAR/LAI. In the improved MOD17 algorithm, we first temporally fill the contaminated MODIS FPAR/LAI, and then rerun the MOD17 algorithm with daily meteorological data as a driver. We cannot use the improved MOD17 method for near real-time data because temporally filling the contaminated or missing 8-day MODIS FPAR/LAI requires an entire year's data. NASA's MOD17 can serve as a near real-time dataset provided cloud-contaminated pixels are excluded by decoding the corresponding quality assessment field. Directly using NASA's MOD17 without excluding the contaminated GPP will produce underestimated GPP values given the low, cloud-contaminated FPAR as depicted in Figure 2. Details on how to improve MOD17 are described in Zhao et al. (2005; 2010).

Citation:
Zhao, M., F. A. Heinsch, R. R. Nemani, and S. W. Running. (2005). Improvements of the MODIS terrestrial gross and net primary production global data set. *Remote Sensing of Environment*, 95: 164–176.
Zhao, M., S. W. Running. (2010). Drought-induced reduction in global terrestrial net primary production from 2000 through 2009. *Science*, 329: 940-943.

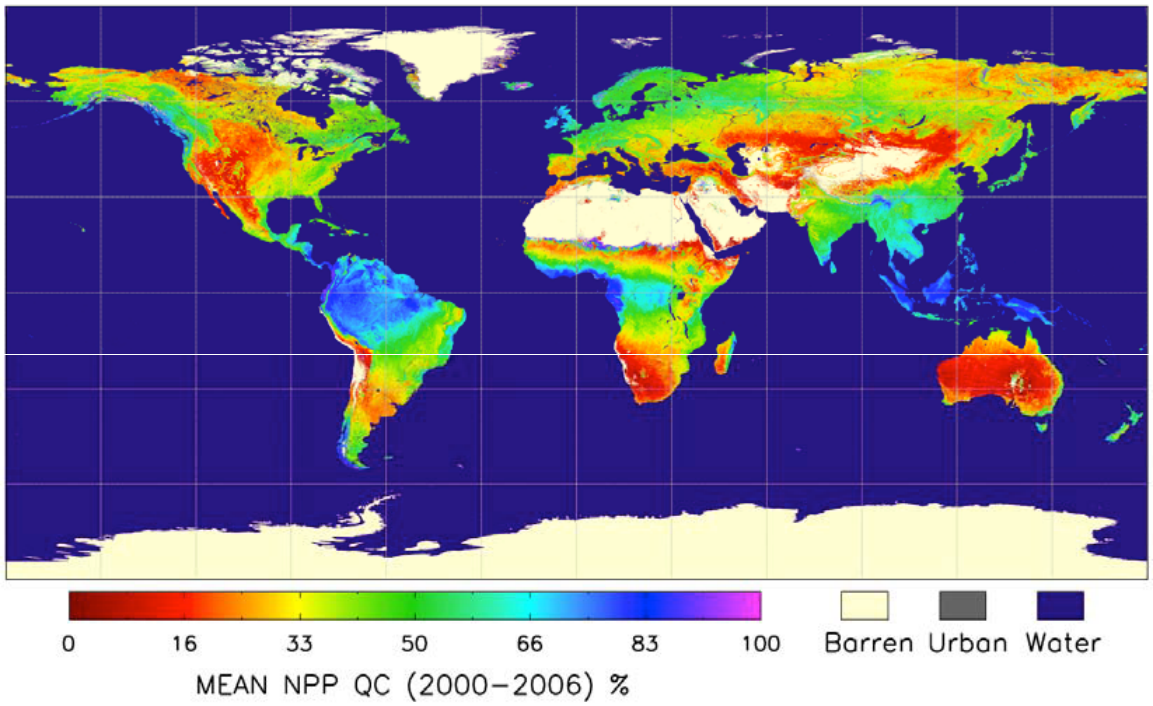

Figure 1. *The percentage of composite periods with MODIS FPAR/LAI being filled mostly due to cloud cover during a growing season (Zhao et al., 2005).*

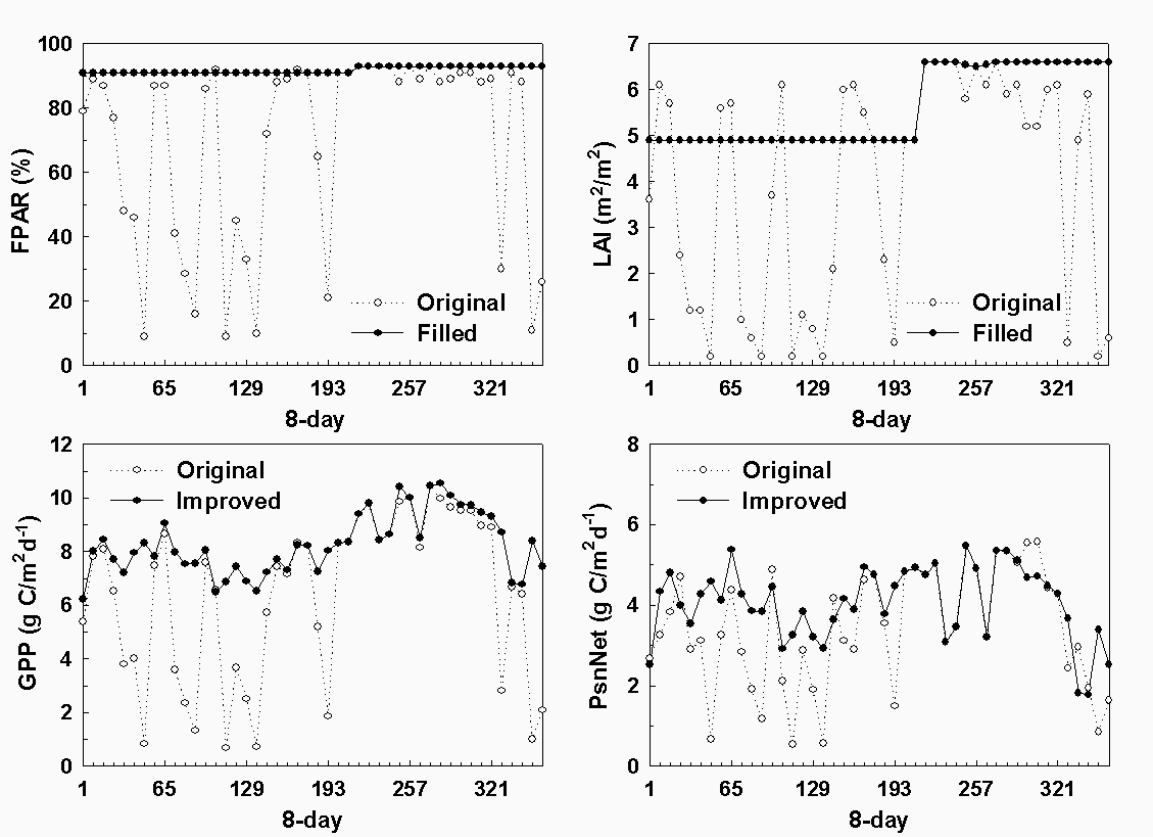

Figure 2. *An example of temporal filling of unreliable 8-day FPAR/LAI data and the improved 8-day GPP and PsnNet for one MODIS 1-km pixel located in the Amazon basin (Zhao et al., 2005).*