Biogeosciences Discuss., 12, C5452–C5454, 2015
www.biogeosciences-discuss.net/12/C5452/2015/

Biogeosciences Discussions
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Interactive comment on "Characterizing Leaf Area Index (LAI) and Vertical Foliage Profile (VFP) over the United States" *by* H. Tang et al.

H. Fang (Referee)

fanghl@lreis.ac.cn

Received and published: 16 September 2015

The authors derive and validate LAI and VFP products derived from waveform GLAS over the conterminous United States. The paper is an extension of earlier studies focused on a specific site. The LAI and VFP information over US is interesting for the terrestrial ecosystem community, however the presentation of the paper needs to be improved. It may be reconsidered after a major revision.

GENERAL COMMENTS

My main concern is about the presentation of the GLAS LAI over US (Figure 5). This figure does not help much about our understanding of the LAI distribution but may even

lead to misunderstandings, because of the overly simple statistics at the ecoregion level. I would suggest the authors to draw dotted maps or gridded maps in 65 m resolution, that may give readers a better concept of the GLAS LAI. Grassland and crop types may be avoided, as they are not discussed in the text and may have been severely underestimated. Likewise, I doubt the value of the LAI statistics in Table 1. The standard deviations are rather high, many times larger than the mean LAI values, because of the huge diversity over an ecoregion.

A fine validation of the GLAS LAI over the conterminous US may only be realized through comparison with existing Landsat and MODIS LAI. My understanding is that the Landsat LAI was generated over California only (Ganguly et al. 2012). Please provide the proper reference for the Landsat LAI over the US, which was used in the comparison with the GLAS LAI (Figure 4). I would like to know the quality of the Landsat LAI maps over US. I strongly encourage the authors to further compare GLAS LAI with MODIS LAI, as was done in their earlier study (Tang et al. 2014). This won't be much effort based on what has been done by the authors. Moreover, please note the differences between the Landsat and MODIS estimated LAIs and the lidar derived Plant Area Index (PAI), even though they may be numerically similar (Tang et al. 2014).

I'm not in favor of the environmental studies in Section 3.3. It would be more interesting to look into the seasonal LAI and VFP variations since the multi-year data are available.

DETAILED COMMENTS

contiguous United States -> conterminous United States. The latter is more used in authoritative publications.

P13677L24. Saturation is also an issue for lidar LAI estimations. Likewise, I disagree with the statement in P13687L17 "the non-saturation advantage of lidar data against passive remote sensing in observing high LAI forests".

P13679L3. Full name for CONUS

BGD

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Section 2.2. P13680L4-9. Please briefly introduce the methods here, rather than referring to other papers.

Section 2.3 How good are the LVIS retrievals compared to field measurements? Please mark the four LVIS field sites in Fig. 5.

Please put all resultant R2, bias, and RMSE in the figures. Only introduce them in the text when necessary.

P13685L7-10. The Pearsno's correlation was not shown. Why this is relevant anyway?

P13686L11. Slope may be a factor. How's the topography of the four validation sites?

P13687L18-19. Fig. 4a shows that GLAS underestimates for all LAI values. Please discuss.

Ganguly, S., Nemani, R.R., Zhang, G., Hashimoto, H., Milesi, C., Michaelis, A., Wang, W., Votava, P., Samanta, A., Melton, F., Dungan, J.L., Vermote, E., Gao, F., Knyazikhin, Y., & Myneni, R.B. (2012). Generating global Leaf Area Index from Landsat: Algorithm formulation and demonstration. Remote Sensing of Environment, 122, 185-202.

Tang, H., Brolly, M., Zhao, F., Strahler, A.H., Schaaf, C.L., Ganguly, S., Zhang, G., & Dubayah, R. (2014). Deriving and validating Leaf Area Index (LAI) at multiple spatial scales through lidar remote sensing: A case study in Sierra National Forest, CA. Remote Sensing of Environment, 143, 131-141.

Interactive comment on Biogeosciences Discuss., 12, 13675, 2015.