

Interactive comment on “Spatial and temporal variability of biophysical variables in Southwestern France from airborne L-band radiometry” by E. Zakharova et al.

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With great interest I read your paper on soil moisture and vegetation retrieval from airborne observations over South Western France. The paper is very concise and shows the quality of the different retrieval products.

The paper is in essence very clear, but some parts need more attention. The introduction is too short and does not have a clear rationale. Furthermore it needs more information about the vegetation optical depth because not a lot of readers know what a vegetation optical depth is. The results and discussion need a more thorough comparison analysis between the modeled and remotely sensed retrievals (for example a

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discussion on the changing spatial correlation over time was missing). In addition, a discussion on the b factor should be reconsidered because LAI is not always directly related to vegetation water content and the changes in b could easily be related to a wrong approximation of VWC. Therefore I recommend this paper for publication after major revisions as suggested below.

Introduction: General, the introduction is not well written and misses a clear rationale. I would strongly recommend to rewrite this section.

Page 897 Line 4: please explain why it is important for ecohydrology, hydrometeorology... give an example.

Page 897 Line 7: please give a reference here

Page 897 Line 17 to end. Please explain the relevance of this part first by a few lines. Now it is not clear for the reader how this section is related to your work.

Page 898 line 4: First ground based.... Jackson et al., 1986. This is not true Njoku and Kong were one of the first in 1977 (JGR paper). Please change

Page 898 Line 11, the BARC experiments were done in the early eighties and not carried out for SMOS... please change.

Page 898, line 21, please explain why an additional validation is still needed.

Page 898, line 22: This introduction part needs a more thorough description on VOD because a lot of readers don't know what VOD means. Vegetation studies with microwave observations already have a nice history; for example Choudhury was one of the first who demonstrated a global vegetation application in a desertification study (Choudhury, 1993). In addition a few of the coauthors of this paper wrote already an excellent review on vegetation optical depth in 1994 (Kerr and Wigneron, 1994). And now, eighteen years later, different researchers have been using VOD for different applications. Liu et al (2011) detected deforestation and agricultural intensification in VOD records, Miralles et al. (2011) used VOD records to estimate vegetation stress

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and in 2007 Liu et al. ,(2007) used VOD to show the impact of ENSO on vegetation in Australia. By addressing a few of these studies, you will put your work more in perspective and give the VOD more value.

Page 903 : Please explain the letters A to D in the Figure 3 caption.

Page 906: in the 2.3 Section: Please make a clear note here that the assumption to describe LAI as a function of VWC is not always true. A leafless tree does have a VWC but no LAI. An interesting example on this can be found in the FOSMEX study where Guglielmetti et al., (2008) found a small variation in transmissivity over the season for a beech forest in Germany. In this study the seasonal variation of VWC for this forest was probably different than the seasonal LAI variation.

Page 907: Line 25: Please quantify good correlation ($r > 0.5$) and explain what kind of correlation you use (Spearman or Pearson).

Page 908: Line 7: please describe how you obtain the standard deviation of differences. This statistical is not so common and needs a bit more explanation.

Page 908: Within this section a more thorough description of the soil moisture retrieval skills based on correlations is lacking and is now mostly focused on SDD. I would recommend to describe the differences in correlation between the models, and in situ in more detail, because they will give you more info on the retrieval skill than for example the SDD.

Page 909: Figure 5 is hard to read. I would recommend to make time series for the different regions (including LAI, precip and soil moisture.)

Page 910: Table 2 is very interesting especially the information on the change in spatial correspondence over time. It would be really nice if you could describe (and explain) this behavior. So when is there a good/bad spatial correlation between the model and the remote sensing product en why?

Page 911 Line 11: please be careful here. LAI is not always a good indicator for VWC

and this can be the reason why you find changes in b (see comment above).

Page 912 see comment on Page 908. I would rather see a discussion on the correlation than on the bias because of the representativeness of the in situ observations. The in situ observations have a support of just a few centimeters and they most likely don't represent the true absolute soil moisture value at model/remote sensing scale (which has a support of about 1 km). Therefore you have to be careful with an analysis on bias.

Page 914: again, it is important to realize that you cannot always use LAI to estimate VWC (especially at seasonal scale). This is probably the reason why you see a variation in the b parameter.

Richard de Jeu

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Choudhury (1993). Desertification. In Gurney, R.J. Foster, J.L. Parkinson, editors, *Atlas of satellite observations related to global change*. Cambridge University Press

Kerr and Wigneron (1994). Vegetation models and observations, a review, In *Passive Microwave Remote Sensing of Land-Atmosphere Interactions*, pages 317-344. VSP, Utrecht, the Netherlands

Liu, Y., R.A.M. de Jeu, M.F. McCabe, J.P. Evans and A.I.J.M. van Dijk (2012) Global long-term passive microwave satellite based retrievals of vegetation optical depth, *Geophysical Research Letters*, 38, L18402, doi: 10.1029/2011GL048684

Liu Y., R.A.M. De Jeu A.I.J.M. Van Dijk and M. Owe (2007) TRMM-TMI satellite observed soil moisture and vegetation density (1998–2005) show strong connection with El Nino in eastern Australia. *Geophysical Research Letters*, 34, doi:10.1029/2007GL030311.

Miralles, DG. Holmes, TRH, RAM De Jeu, JH Gash, AJ Dolman, and AGCA Meesters

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