

## ***Interactive comment on “Soil Moisture Estimation Based on Probabilistic Inversion over Heterogeneous Vegetated Fields Using Airborne PLMR Brightness Temperature” by Chunfeng Ma et al.***

### **Anonymous Referee #1**

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Review of the manuscript Soil Moisture Estimation Based on Probabilistic Inversion over Heterogeneous Vegetated Fields Using Airborne PLMR Brightness Temperature by Ma et al.

The topic of this manuscript is up-to-date and very informative for HESS readers. The approach is sound, but there are some doubts that it has been implemented correctly. Several multi-parameter retrieval methods and applications have been published before. A discussion of these examples is missing but necessary to inform about the state-of-the-art in this respect and the related references need to be given. Similarly,

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the intentions and results of previous PLMR applications should be discussed.

PLMR data processing should be described in more detail, a reference to previous publications is not sufficient to understand the approach. Hours and flight passes need to be given (just one day?). How did the authors handle different incidence angles? Was the data rasterized? How was soil surface temperature measured?

The L-MEB input data in Table 1 should be discussed a bit further. E.g., the use of fixed values for soil texture and bulk density should be explained (e.g. by the small sized target region). Surface soil temperature and vegetation temperature (and to a certain extent deep soil temperature) cannot be fixed and leads to wrong estimates. It varies strongly during a flight and between dates. Additional temperature measurements are necessary.

Moreover, a brief introduction to the Bayesian approach and some equations should be given. In its current form it is not sufficient. Some more words why soil surface roughness is related to LAI (and VWC) should be provided. What is the relationship between VWC and vegetation opacity in this study (tau is the needed vegetation parameter, not VWC)?

Averaging brightness temperatures of three incidence angles to retrieve roughness parameters is physically not valid and leads to wrong estimates.

Please provide also the optimal parameters, i.e.  $a_{1p}$ ,  $a_{2p}$  etc.

Additional language editing should remove small mistakes.

In total, due to several shortcomings in the presentation and doubts of correct method implementation I would reject this paper in its current form with request to re-submit after improvement.

Specific comments:

L. 15: L-band radiometers have ... their. ...

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L. 17: what are 'defects of the point-estimation algorithms'?

L. 24: not exceeding, but go below.

L. 26: introduce PI.

L. 46ff: give references.

L. 62: What are the characteristics of oasis environments and the challenges for SM retrieval?

L. 74: PLMR.

L. 80: What is the difference between the roughnesses?

L. 90: Retrieve.

L. 105ff: Some more information about the area of interest should be given.

L. 118: What is HRB?

L. 191ff: average TBs from different angles is not valid.

L. 278: important.

L. 286: roughness.

L. 301f: Please discuss the metrics.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-34, 2017.