

Interactive comment on “Relating surface backscatter response from TRMM Precipitation Radar to soil moisture: results over a semi-arid region” by H. Stephen et al.

Anonymous Referee #3

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The paper presents a new method for retrieving soil moisture contents from Ku-band radar observations. It is generally clear and well written, and its results and discussions are interesting. However, there are some remarks I would like the author to elaborate on:

- It seems that the model proposed in this paper needs more detailed description. The linear relationships between Ku-band radar backscatter and both ‘soil water contents’ and ‘vegetations structures’ are not clear. It is unlikely that soil moisture contents affect the slope of linear function. Additional plots illustrating dependence of backscattering

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coefficients on soil moisture contents and vegetation densities can help to understand the model.

- Could authors provide more details in obtaining several states variables in the model? It is questionable whether the model is well-posed.

- Could authors provide strengths and weaknesses of the proposed model-based approaches as compared with temporal change detection approaches (e.g., Wagner et al., 1999; Kim and van Zyl, 2009)? In addition, it is required to provide more discussions on Ku-band radar remote sensing of land surface and on advantages of TRMM PR in soil moisture retrievals.

- Inversion approaches needs further evaluation. Temporal stabilities of model parameters are questionable particularly in Ku-band. I would welcome deeper assessments on temporal changes in mean backscatter, incidence angle dependency, and vegetation structure. Inverse problems may be ill-conditioned and, thus, temporal instabilities of states variables can highly affect the inversion performance.

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