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Interactive comment on "Analysis of the linearised observation operator in a soil moisture and temperature analysis scheme" *by* I. Dharssi et al.

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Referee comments are partially repeated in italics. Our reply is in plain text.

The authors proposed and analyzed a linearized observation operator ...

The topic ... is very interesting but I think it is too technical to fit into the scope of SOIL. The manuscript is generally very well written.

We agree that the subject matter is technical but it is necessary to consider the technical details for practical applications such as weather forecasting and data

assimilation. We believe that the subject matter of this paper is within the scope of SOIL. Particularly as the "journal especially values papers that go beyond disciplinary boundaries and/or highlight the interactions and feedbacks between the soil system and other Earth system components" e.g. soil and atmosphere.

However, in the introduction a clear statement of the research question or hypothesis is missing, ... It is necessary to add references for (a) to (c).

The Introduction has been significantly revised and clear statements of the research question have been added. Many additional references have been added to provide a more comprehensive literature overview of the subject. The statements (506:27) about the model specific nature of model soil moisture have been removed due to the major revisions to the Introduction. We still strongly support those statements but they are not required in the Introduction. References have been provided to all the given examples on the assimilation of indirect measurements. In the Acknowledgements section we explain work done since the publication of Dharssi et al., 2012.

At the end of section 3.2 it ... I find this not very surprising, but the question is: ... Are the used Ks-values comparable to measured ones or is Ks just a calibration parameter?

Section 3.2 has been significantly re-written to make clear the relevance and importance of the results. Additional information about the Ks-values has also been added to answer the reviewers questions.

In general, the manuscript lacks a clear rationale and structure ... I think major revisions are required.

The manuscript has been significantly revised to make clear the rationale and novelty of the work and the significance of the results. A PDF showing the differences between the revised and original manuscript has been attached as a supplement. The revised paper is added as a supplement to the reply to Referee 2.