

Interactive comment on “Multiscale soil moisture estimates using static and roving cosmic-ray soil moisture sensors” by David McJannet et al.

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Review of the paper: “Multiscale soil moisture estimates using static and roving cosmic-ray soil moisture sensors” by: David McJannet GENERAL COMMENTS The paper describes a research project aimed at producing soil moisture estimates at a range of scales that are commensurate with model and satellite retrievals. The study involved static cosmic ray neutron sensors and rover surveys across both broad (36 km at 9 km resolution) and intensive (10 x 10 km at 1 km resolution) scales in a cropping district in the Mallee region of Victoria, Australia. Given the ever increasing lack of ground measurements, having medium-to-high resolution observations of soil moisture against which validating satellite soil moisture products is extremely important. With the advent of Sentinel 1 satellite sensor we will have soon soil moisture estimates at 1 km of reso-

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lution or even lower. Hence, studies involving any technique for retrieving or expand the availability of these information are very welcome in literature. For this reason, I think the topic is of interest for the journal readership and worth the consideration for the publishing in HESS journal. The paper is also well written and structured and concise at point. My main recommendation for the authors is to put more effort to underline the real merit of the paper by trying to underline the differences with respect to previous studies and add material that makes the study more close to a scientific paper than a technical report. Indeed, I struggled a bit to grasp the novelty and potentiality of the study – “The paper describes a research project” as written by the authors in the abstract – and this does not do justice to the merit of the study. My suggestion is to provide a comparison of the rover estimates with a model or other types of observations (like the gravimetric measurements the authors have collected) demonstrating the reliability of the rover estimates in terms of reproducing spatial pattern of soil moisture which can be extremely useful for validating high-resolution satellite soil moisture products.

RESPONSE: In response to the reviewer comments we have now made major changes and compared distributed gravimetric point samples from each survey to rover results for both the intensive and broad scale products. We have also compared rover survey results at intensive and broad scale against distributed point samples and 5 km resolution water balance model estimates of soil moisture. For this analysis we have used the recently operationalised Australian Bureau of Meteorology water balance model estimates of root zone soil moisture. We have added two new figures to this reposnse to show this comparison (see end of this submission)

In addition to this we also believe that the components of this paper that make it novel include; 1) our newly developed clay to lattice water relationship which we apply to nationally available soil property grid for Australia, 2) use of digital soil mapping products to account for the spatial variation in soil properties across the survey area and facilitate data processing, 3) presenting results of a nested high resolution survey within

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a larger broad scale survey which enabled us to test our experimental/driving speed design, 4) providing further evidence that N0 for static probes is strongly controlled by biomass, and 5) demonstrating temporal stability in soil moisture in this dry land setting. Significant rewording and new text and figures has been added throughout.

I also have other comments the authors can be considered to improve the manuscript. I report below my comments in order of appearance indicating also their relevance. (COMMENTS REMOVED FROM TABLE FOR RESPONSE): Page3, Line 102, Minor: Define fp here. Cosmic-ray neutron intensity, fp, is part. ... RESPONSE: Fixed

Page 5, Line 155, Minor: 18 time..faster? RESPONSE: Reworded to “The rover has counting rates approximately 18 times greater than that of a standard static sensor under the same condition, thus, allowing for measurements to be made at one minute intervals.”

Page 7, Section 3.2 and 3.3, Moderate Figures 4 and 5 not cited in text RESPONSE: Fixed

Page 7, Section 3.5 Intensive scale rover survey, Moderate, I think it is too much optimistic to say that the agreement is excellent based on only on two points and three times. Why not comparing spatially with model estimates? RESPONSE: We have now introduced two independent data sets to assess the rover performance and this has been a major change to the paper. These independent measures are distributed gravimetric point samples collected during each survey and estimates from the recently operationalised bureau of meteorology water balance model (5km resolution) estimates of root zone soil moisture. These two independent products are compared against both the intensive and broad scale results to demonstrate. Two new figures have been added results new text has been added to results and discussion sections.

Page 8, Line 264-277, Moderate/Major, Provide more details about the point-area regression analysis. It is not completely clear from the text. RESPONSE: this section has been reworded for clarity and the need for future surveys to improve these relationships

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has been added.

Page 16, Figure 1, Minor, Provide scale of the figure and indication of the size of the box. RESPONSE: Scale now added to zoom in area. Box dimensions added to caption too.

Based on the comments above I recommend the publication after MODERATE/MAJOR REVISIONS.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-358>, 2017.

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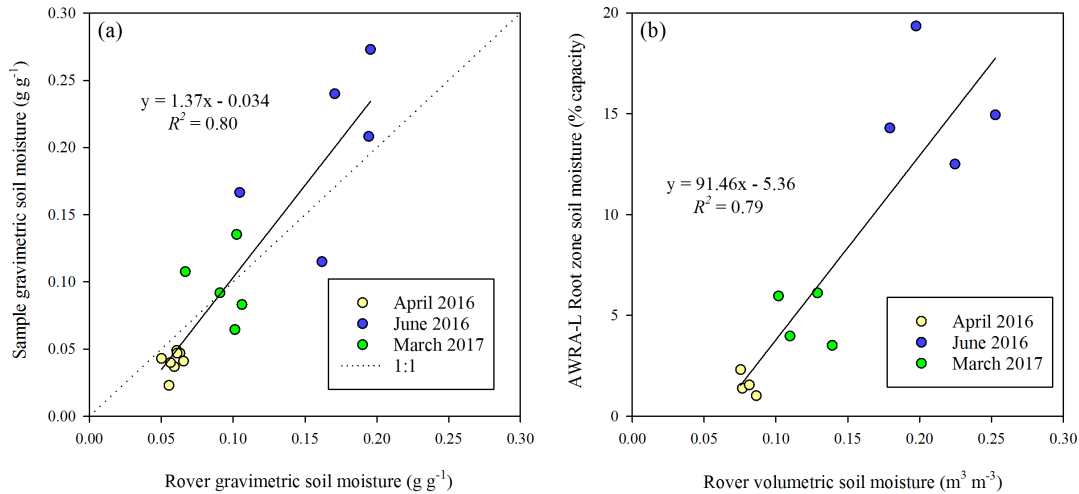


Fig. 1. Intensive rover survey versus gravimetric soil moisture and AWRA_L model estimates

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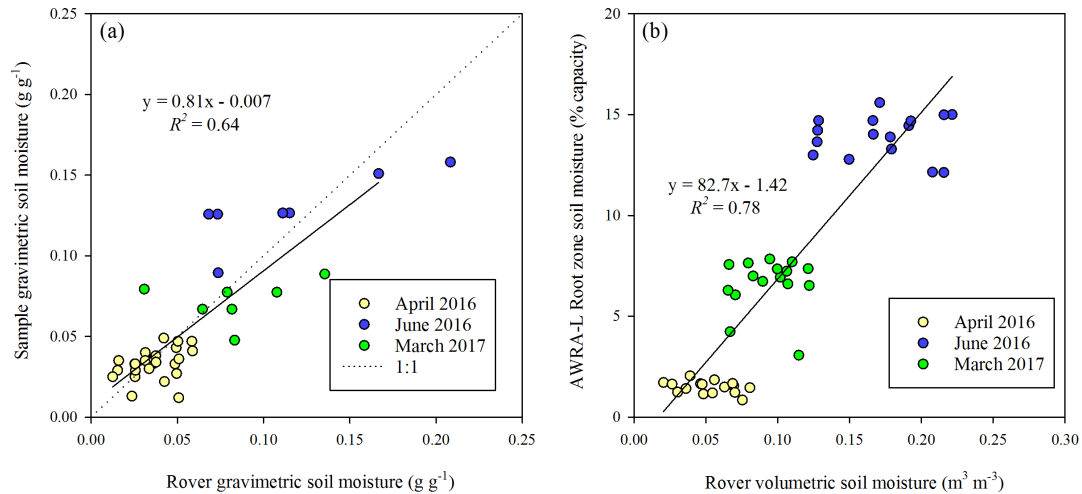


Fig. 2. Broad scale rover survey versus gravimetric soil moisture and AWRA_L model estimates

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