

Interactive comment on “A bare ground evaporation revision in the ECMWF land-surface scheme: evaluation of its impact using ground soil moisture and satellite microwave data” by C. Albergel et al.

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The authors thank the anonymous Reviewer #3 for his/her review of the manuscript and for her/his fruitful comments. For an easier comprehension, general comments of the Reviewer are also reported (3.XX).

3.1 [p. 6728, chapter 3.1.1: If you use your model to determine which stations are considered unreliable it is also possible that stations are sorted out because the model

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does not realistically model the soil moisture at a specific location. Maybe discuss a bit more that not only stations with disfunctional measurements or anon representative location are sorted out by this procedure but also stations that are located in an area where your model is not able to produce good results (e.g. because of wrong land surface or soil parameterisation).]

Response to 3.1

We agree that this point might be confusing; it was pointed out by Reviewer #2 too. For a better understanding the name of ‘quality control’ is removed in the revised version of the manuscript.

P6728-L25 ‘ Very little quality control is applied to measurements from NCRS-SCAN stations. Dharssi et al. (2011) used a simple quality control process to identify stations where sensors might be dysfunctional. ‘ Is replaced by: ‘ As indicated in NCRS-SCAN website, data are provisional and subject to revision, very little control is applied to measurements from NCRS-SCAN. Dharssi et al. (2011) used a simple process to identify stations where sensors might be dysfunctional. ‘

P.6728-L.23-24: ‘[...] a quality control is applied [...]’ is now ‘[...] a process is applied [...]’

Also, the following sentence is added: P3729, L.1: ‘This rather strict process has probably removed some good stations too (e.g. in areas where the model might not realistically represent soil moisture).’

However, a visual check was done (not shown) for the group of stations removed from our pool of stations (26 stations). Most often than not they present spurious patterns (e.g. sudden jump in the signal) or have very little data (few weeks) over 2010-2011.

3.2 [It would be interesting to see a comparison between SMOS data and the modelled TB. Maybe consider providing some figures in a next version of the manuscript.]

Response to 3.2

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We agree with Reviewer #3 on the interest of a comparison between SMOS data and the modelled TB. Although results presented in this study with SMOS are very preliminary they show that the new parameterization goes in the right direction. A full calibration of the CMEM platform, underway at ECMWF for SMOS activities, will enable a more fair comparison with SMOS data (Please see also Response to 3.3). However a full comparison is out of the scope of this paper.

P.6728, L.13: ECMWF is involved in global monitoring and data assimilation of the SMOS mission data. The development of a data monitoring system for the SMOS near real time product provides a timely quality check for the European Space Agency (ESA) and the SMOS calibration and validation teams. More information and comparison between SMOS data and modelled TB are available through ECMWF WebPages: http://www.ecmwf.int/research/ESA_projects/SMOS/index.html.

3.3 [Please discuss a bit more the significance of the global comparisons with SMOS data. As the RFI problems in SMOS Tb data are considerable in certain regions of the world, e.g. in central Europe, it would be even more interesting to do SMOS comparisons for different regions of the world and discuss the RFI impact on the data and the significance of the results individually for each region.]

Response to 3.3

Following Reviewer #3 comment (Reviewer #2 comment #2.14, also), we pointed out that the bias between SMOS observations and ECMWF simulated Tbs is not just related to the SM, but that other factors are also important. Soil moisture is only a component (although an important one) of the mean bias obtained between SMOS observations and model equivalents. RFI issue is mentioned P.6732. Although this study presents very preliminary results with SMOS, its main objective is to present the new bare ground evaporation formulation. A full calibration of the CMEM platform is underway at ECMWF; it will be followed by comparisons of SMOS TB for different regions of the world.

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We have added the following sentence in P6733-L13:

'These residual biases are also related to other factors such as the SMOS instrument or input parameters of the radiative transfer model, which are not straightforward to assess. Radio frequency interferences affecting the SMOS measurements (rising the brightness temperature) could also be responsible of the bias'.

And in P6733-L12, we have substituted '...to SMOS observations but with large global mean differences..' by '...to SMOS observations but with still large global mean differences..'

3.4 [P. 6720, l. 17: Please provide a short description of what HTESEL is. Is it a land surface model? On page 6722 TESSEL is mentioned. Here a short description would also ease understanding.]

Response to 3.4

We agree that a short description of HTESEL is missing in this section. The following paragraph is now added in the revised version of the manuscript:

P.6720, L.17: 'The model forecast for the land surface analysis is provided by the TESSEL land surface scheme (Van den Hurk et al., 2000) which was then upgraded to H-TESEL (Van den Hurk and Viterbo, 2003; Balsamo et al., 2009) with an improved soil hydrology. H-TESEL development was a response to weaknesses in the TESSEL hydrology; a Hortonian runoff scheme hardly producing surface runoff and the choice of a single global soil texture was not able to characterize different soil moisture regimes. So, for HTESEL the formulation of the soil hydrological conductivity and diffusivity was revised to be spatially variable according to a global soil texture map (FAO/UNESCO Digital Soil Map of the World, DSMW, FAO, 2003).'

New reference: van den Hurk B.J.J.M., P. Viterbo, A.C.M. Beljaars, and A.K. Betts, 2000: Offline validation of the ERA-40 surface scheme. ECMWF Tech. Memo., 295, 43 pp.

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3.5 [p. 6721, l. 27: Please provide a short description of what cycles are? Are these software versions?]

Response to 3.5

Cycles are versions of the Integrated Forecast system, for a better understanding, sentence P.6721, L.26 is rephrased in the revised version of the manuscript: 'The version of IFS used in operations at ECMWF from January 2010 to December 2011 spans from 35r3 to 37r3 [...]'

Minor points concerning the language are directly corrected in the text; authors thank again the anonymous Reviewer #3 for correcting them.

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