

Responses to reviewers

We are very grateful to the Editor Dr Coenders-Gerrits, and to the reviewers, Drs Gudmundsson and Jaramillo, for their constructive comments of the manuscript. We totally agree with all their recommendations.

Editor Decision: Publish subject to technical corrections (16 Nov 2016) by Miriam Coenders-Gerrits

Comments to the Author: Please have look at the minor comments of the 2 reviewers.

Referee #1: L. Gudmundsson

I appreciate the authors revisions including the additional analysis which have been conducted based on suggestions made by the other reviewer. Overall it is still my evaluation that the authors do present an interesting and good trough thought analysis, which is now also presented more clearly. Admittedly, I did not have the time to check all the mathematical details, but I have carefully followed the logic of sections 2.1 and 2.2 as these forms the basis of the analysis. As these sections appear to be valid, I am confident that this is also the case for the remaining sections.

Apart from a few very minor suggestions listed below, I would fully support the publication of the presented paper in HESS.

Thank you!

Minor comments:

General: The jumps between the Turc and the Budyko space makes the article sometimes difficult to read. Therefore I would suggest to indicate which of the two options are used on a regular basis and at least once in each paragraph.

Ok (see Page 3, Line 7; Page 4, Line 17; Page 5, Lines 2 and 16; Page 6, Lines 12, 17 and 27; Page 8, Line 15; Page 13, Lines 6, 7, 9, 10, 11 and 14; Page 18, Line 5).

Abstract, line 10: DeltaS is referred to as change in soil water storage. Would it not be more correct to speak of changes in terrestrial water storage (which includes soils, groundwater, lakes, water stored in plants, snow, etc...)?

Ok (see Page 1, Line 10; Page 2, Lines 11-12).

Page 3, Line 7: On first reading it would be helpful if you include one sentence, stating that you focus on the Turc space as this is (in your evaluation) easier to grasp.

Ok (see Page 3, Line 7).

Page 5, lines 2-5: For me it still took a while to understand how you got to the three equations that specify the multipliers α , β , γ . I would appreciate if you could walk through the three respective limits and explain each equation step by step.

Ok, the text was rewritten and clarified (see Page 5, Lines 2-5).

Page 5, line 4: The notation " $\alpha \cdot 0$ " is somewhat confusing. I assume you would like to indicate " α times zero". Maybe substituting the " \cdot " with a cross (\times) may help?

Ok, we substitute the " \cdot " with a cross " \times " (see Page 5, Lines 3 and 18).

Page 5, lines 15 – 18: See the two comments above, the same applies for this section.

Ok, the text was rewritten and clarified (see Page 5, Lines 16-18).

Page 6, line 15: change to "...the ML formulation in the Budyko space (Eqs 14a,b) ..." (see also first comment)

Ok (see Page 6, Line 17).

Page 8, lines 1 – 6: The reasons for the differences obtained for the He and Hp scaling are not 100% clear to me and I have difficulties to understand why one would be superior over the other. Could you please expand?

Ok, the text was rewritten and clarified (see Page 8, Lines 3-9).

Referee#2: F. Jaramillo

All is in the Recommendations to the Editor.

Thank you!