

Interactive comment on “Reconnoitering the effect of shallow groundwater on land surface temperature and surface energy balance using MODIS and SEBS” by F. Alkhaier et al.

Anonymous Referee #3

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General

In this companion paper the authors convincingly show that there is a strong relationship between groundwater depth on the one hand and land surface soil temperature and the SEBS calculated surface energy balance on the other hand. This was already predicted from their modelling exercise in the companion paper and now it is proven with real remote sensing data. There are three issues to be resolved before publication:

1. The conclusion at the end of the abstract that MODIS is suitable for shallow groundwater effect detection is too strong. It should be added that this is only been shown for

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this particular climate and for an area without much vegetation.

2. The structure of the paper: I feel that section 3 on SEBS is incomprehensible. It provides a bunch of equations without explaining how in what order they are applied. Therefore, I would either provide an recipe-type of description in an appendix and only provide a small explanation of principles in the main text or provide only the explanation of principles and refer to the original reference (Su 2001).

3. The method does indeed show a correlation between groundwater depth and land surface temperature, but how valid is this to actually predict groundwater depth? Are the relationships constant in time (or perhaps the relationship with groundwater depth and the z-score of surface temperature $(T - \text{Mean}_T) / \text{std}_T$ is constant in time such that it can be applied at different times and at locations with a similar soil type. The authors should explore this possibility by e.g. a split sample exercise.

Minor comments

Page 8672, Line 5: Add "the effect of" before "groundwater" and remove "effect" after "groundwater". The same in line 6.

Page 8672, line 16: "clearly"

Page 8673: What is assimilative capacity of unconfined aquifers? Ans shallow groundwater occurs mainly because topographic drivers are not present, so in lowlands, but also in altiplanos, even if recharge is small.

Page 8674 and the rest of the paper: the use of the English language could be improved. I suggest letting an English native speaker look at it.

Section 4.1: Here assumed relations between water table depth and landscape features are explored. However, we should also have the following analysis added to make sure that the assumed relations are not indirect:

* Plot water table depth against surface elevation as well as texture against surface

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elevation. Texture and surface elevation may explain some of variation in groundwater depth.

* Also, it is better to plot relative degree of saturation ($\theta/\theta_{\text{sat}}$) instead of the absolute soil moisture, because this may be too texture dependent and thus interfere too much with relation water table depth- soil wetness.

Figure 2: Why is there so little vegetation in the shallow water table depth area? Is there a salinity problem?

Figure 3: reverse the colour scale on the soil moisture plot: Blue for high, red for low soil moisture.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 8671, 2011.

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