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Hydrology and Earth System Sciences Discussions

Interactive comment on "A qualitative description of shallow groundwater effect on surface soil temperature" *by* F. Alkhaier et al.

Anonymous Referee #3

Received and published: 29 June 2009

The paper explores the effect of ground-water depth on soil surface temperature, which may have important ramifications on surface energy balance closure and remote sensing of the surface energy balance and shallow ground-water. While the paper presents some interesting results, more information is required to assess the validity of the results.

The paper presents correlations between shallow surface temperatures and ground-water depth that suggest a linkage between the two. However, other factors need to be ruled out as potential factors. My immediate reaction was that elevation could be a factor influencing both; lower elevation could be related to higher air temperature and shallow ground-water depth. However, I was able to locate the study site with

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GoogleEarth and found that the elevation did not vary significantly. Therefore, the authors need to give the elevation range and discount its influence on air temperature. The results would be much more palatable if data on air temperature at each site were available to discount this as potential factor influencing differences in surface temperature between the sites. Could there be a gradient in air temperature between sites and across the study area? The authors need to comment on this.

The results suggest a negative correlation between soil temperature and ground-water depth, which is counterintuitive. More discussion is needed to explore this. Although this is counterintuitive, this observation does agree with the simulation results in Figure 6, which show warmer surface temperatures during the winter the simulation with shallow ground water. The authors fail to make this connection to support the observations. Evaporation during the winter would likely be minimal, which may be why the surface above a shallow ground water is not cooler during this period.

The conclusion (page 2140, lines 16-17) states that the observation obtained from the final day of observation when the soil was wetted the day before "clarifies the direct effect of ground water on skin temperature". I do not necessarily agree. If the soils were wetted to saturation to remove the effect of the shallow ground water, wouldn't one expect no difference in soil temperature between the sites? Again, more information is required to assess the results. It is stated (page 2135, lines 24-25) that the sites were watered until saturation. The amount of water, which could greatly influence results, will depend on the rate applied and the conductivity of the soil. How deeply were the soils saturated? If only the very surface was saturated, then the water would have been redistributed by the following day, resulting in relatively little influence at each site; the effect of the applied water could be very ephemeral.

Editorial suggestions:

Page 2131, line 24: delete "Where"

Page 2135, line 7: change "net" to "network"

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Page 2135, line 24: change “used water” to “applied water”

Page 2136, line 2: this sentence is confusing; reword it.

Page 2136, line 3: replace “in” with “at”

Page 2137, line 1: delete “profiles”

Page 2137, lines 19-20: delete “oscillations reach”

Page 2138, line 1: give depths of samples

Page 2138, line 11: delete “of both profiles”

Page 2139, line 21: delete “thereby”

Page 2140, line 3: change “increase” to “increases”

Page 2140, line 13: change “till” to “until”

Page 2140, line 24: change “summery” to “summary”

Figure 4: Indicate the depth of the soil moisture values in the caption.

Figure 6: reword caption to “simulated skin temperature”

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 2129, 2009.

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