Thank you for your valuable review and skilled comments. Our reply is as follows:

General comments

- The paper demonstrates the effect of shallow groundwater on land surface temperature and surface energy balance variables, which is not well studied issue that can be important for water management and climate studies. For this purpose the authors modelled two hypothetic soil profiles with the same soil physical properties under the same meteorological circumstances, but different groundwater conditions. Results are presented in a clear and structured way and form a good foundation for the companion paper. The authors conclude that the soil profile with shallow groundwater with obviously, a higher soil moisture content at the soil surface results in a higher latent heat flux if the potential evaporation demand is sufficient. In addition, a higher soil moisture content results in a lower albedo, which results in a higher net radiation. This also increases the latent heat flux. The higher volumetric heat capacity of the profile with shallow groundwater causes a delayed temperature response and the increased thermal conductivity increased the intensity of the ground heat flux. It was not possible to investigate the effect of soil moisture on emissivity, because of restrictions of the model.

Specific comments

- The results of the synthetic modelling experiment provide important information for application in real study areas. Since the heterogeneity in soil types will be higher in real cases, a more quantitative analysis of a few different soil profiles could give more information on the critical depth at which the shallow groundwater still has an influence on the surface energy balance. At least, for the analysed soil profile the critical depth for detection by a remote sensing based surface energy balance model can be determined.
- We will illustrate how the critical depth changes among variant soil types by conducting more numerical simulations on some profiles of major soil types (i.e. clay, loam and sand).

- Some literature references should be added to illustrate the relation between soil moisture and emissivity and to confirm the assumption that the effect on the surface energy balance is negligible.
- Generally, emissivity increases with increasing soil moisture (Salisbury and Daria, 1992; Ogawa et al., 2006; Mira et al., 2007; Hulley et al., 2010). Yet, studies that handled the effect of soil moisture on emissivity are relatively few. We argued that the influence of emissivity effect within shallow ground effect may be minor due the involvement of emissivity in both the incoming and the outgoing longwave radiations. Equation (2) illustrates that the two components work in opposite

directions which reduces the magnitude of emissivity effect. For example, Hulley et al. (2010) mentioned that a decrease in emissivity of 10% will result in a decrease in net longwave radiation of only 7 (W/m^2). As you observed, in our experiment we were not able to trace this effect as SHAW assumes a fixed value of emissivity. Nevertheless, we believe that the calculations of SHAW can be further enhanced by adopting a satisfying and operational mathematical formula that describes the dependency of emissivity on soil moisture. This will need further investigations and numerical effort however.

- On page 8646, lines 24-26 three assumptions have been made. They should be discussed in section 4.
- We will do this.

- **Technical corrections**

In general the paper is written in a clear, structured way. However, the use of articles
("the" or "a(n)") in the paper is not always correct:
Page 8640, line 10: change to "...get a higher magnitude..."
Page 8641, line 15: change to "...amplitude of the annual..."
Page 8642, line 9: change to "...section above the water table..."
Page 8642, line 23: change to "...components at the land surface..."
Page 8644, line 11: change to "...that the water table...moisture at the land surface..."
Page 8644, line 22: change to "At the land surface..."
Page 8644, line 24: change to "...characteristics of the soil surface..."
Page 8645, line 1: change to "...is the latent heat flux..."
Page 8645, line 3: change to "...between the land surface...is the ground heat..."
Page 8645, line 15: change to "...balance at the land surface..."
Page 8645, line 16: change to "...presence is the latent heat..."
Page 8648, line 9: change to "...k is the von Karman..."
Page 8651, line 25: change to "...it is a temperate climate..."
Page 8652, line 15: change to "...balance at the soil surface..."
Page 8652, line 17: change to "...at the land surface..."
Page 8654, line 13: change to "...had a higher..."
Page 8654, line 15: change to "...condition, the soil temperature..."
Page 8656, line 11: change to "...which decreased the soil..."
Page 8656, line 20: change to "...air above the land surface..."
Page 8656, line 21: change to "...the subsurface soil layers..."
Page 8657, line 20: change to "...detect the groundwater effect..."
Page 8658, line 4: change to "...groundwater have a wetter..."
Page 8658, line 9: change to "...they get a higher..."
Page 8658, line 20: change to "...of detecting the shallow groundwater..."
Page 8658, line 22: change to "...firstly, the latent heat flux..."
Page 8658, line 25: change to "...groundwater on a remotely..."

- **Other corrections:**

Page 8641, line 4: remove "," after "1930's,"
Page 8646, line 9: "Lout" is not defined
Page 8648, line 9: change to "u is wind speed..."
Page 8650, line 12: reference to Brooks and Corey, 1966 is missing in list
Page 8651, lines 23-24: add references to GEM and Köppen
Page 8658, lines 27-28: make the sentence more generic; "Those maps can be calculated using surface energy balance models, such as the Surface Energy Balance System..."
In fig.2 the dashed line probably denotes 0 degrees celcius. Please add label to y-axis.

- We highly appreciate your keen effort in enhancing the script. We will correct for them accordingly.

References

Brooks, R. H. and A. T. Corey (1966), Properties of porous media affecting fluid flow, Journal of the Irrigation and Drainage Division, ASCE. 92(IR2), 61-88.

Hulley, G.C., Hook, S.J., & Baldridge, A.M. (2010) Investigating the Effects of Soil Moisture on Thermal Infrared Land Surface Temperature and Emissivity Using Satellite Retrievals and Laboratory Measurements. Remote Sensing of Environment, 114, 1480-1493

Mira, M., Valor, E., Boluda, R., Caselles, V., & Coll, C. (2007). Influence of soil water content on the thermal infrared emissivity of bare soils: Implication for land surface temperature determination. Journal of Geophysical Research-Earth Surface, 112(F4), F04003.

Ogawa, K., Schmugge, T., & Rokugawa, S. (2006). Observations of the dependence of the thermal infrared emissivity on soil moisture. Geophysical Research Abstracts, 8, 04996.

Salisbury, J. W., & Daria, D. M. (1992). Infrared (8–14 μM) remote-sensing of soil particle-size. Remote Sensing of Environment, 42(2), 157−165.