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Interactive comment on "High resolution land surface modeling utilizing remote sensing parameters and the Noah-UCM: a case study in the Los Angeles Basin" *by* P. Vahmani and T. S. Hogue

Anonymous Referee #1

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Summary: The paper investigates the utility of remote sensing products in the Noah-UCM framework in the LA basin, a highly urbanized area. The authors found that the remotely-sensed green vegetation fraction significantly enhances the Noah-UCM capability to reproduce evapotranspiration in urban areas. The authors also found that green vegetation fraction and impervious surface area improve the model capability to reproduce surface urban heat island effect (the difference in the land surface temperature between vegetated pixels and highly urbanized pixels). In my opinion, the paper is a significant contribution to the urban modeling field and shows that the modeling community should pay more attention to utilizing high-resolution remote sensing information in land surface models, especially urban models that require a lot of inputs. As such, I recommend acceptance for publication after minor revisions.

Major Comments: 1, My major concern is related to the forcing for the simulations. The authors used ten CIMIS and eight NCDC stations to generate the forcing for the simulations that cover an area of 49km2 at a spatial resolution of 30m. CMIS is used for solar radiation; NCDC is used for other variables; both are used for precipitation. Judging from Fig.1 one find that only 1 NCDC station is located in the study domain. All other stations are fairly far away from the study domain and some of them are strongly affected by other urban areas. This might cause some biases in the forcing that is supposed to represent the urban atmospheric conditions in the study domain. The authors may want to address this question since it might be the case that the biases in the atmospheric forcing are counteracted by some other biases that the remote-sensing data sets introduce (just like the situation where the authors found including all remote-sensed parameters in the simulates reduces the performance of the model in reproducing ET as compared to only including GVF and ISA). The authors may also want to provide a figure showing the spatial distribution of some forcing variables such as radiation and temperature.

2, It might be interesting to design a scenario in which irrigation is turned off and compare the sensitivity of the model to remote sensing information and the sensitivity to irrigation. The reason I raised this question is because in the validation of ET, the authors used the ET derived from CIMIS observations (using ETo and a landscape coefficient). Given that the simulations are also forced by CIMIS observations, there is some expectation that the Noah-UCM simulated ET should be consistent with the derived ET, as long as one considers the effect of landscape coefficient that is largely about irrigation. So I'm curious how much does irrigation contribute to the correlation between simulated and derived ET in Fig. 4a.

3, LST validation: first, can the authors comment on why there is no consistence in terms of R2 and RMSE across the last three scenarios in Fig. 6? Second, the au-

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thors attributed the underestimation of LST values over high density residential and industrial/commercial areas to the surface temperature/ground heat flux scheme in the UCMs (lines 526 to 532), which I don't fully agree. If the authors used default LST value from UCM, which represents an aggregated surface temperature of the roof and the canyon, it is not a direct aggregation of the surface temperature of each component (roof+canyon). Instead, it uses the aggregated sensible heat flux (roof + canyon) and a turbulent transfer coefficient to infer an aggregated surface temperature that will produce the same amount of sensible heat flux. So the surface temperature calculations for each component should not significantly affect the aggregated surface temperature. Recently some inconsistence is found in the calculation of the turbulent transfer coefficient, at least in the WRF version of the Noah-UCM (Li, D., E. Bou-Zeid, 2014: Quality and Sensitivity of High-Resolution Numerical Simulation of Urban Heat Islands. Environmental Research Letters, 9, 055001 doi:10.1088/1748-9326/9/5/055001). The calculation of the turbulent transfer coefficient is using the roughness length of the non-impervious part of the same grid cell. This will cause some significant biases in the aggregated surface temperature.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 7469, 2014.