Responses to Reviewer 3:

We appreciate the generally positive comments and constructive suggestions from the reviewer. Our detailed responses are given after each comment (*italics)* below.

1) *Page 1, line 14, it is recommended describing OHM limitation more clearly.*
Response: Due to the limitation in space of the abstract, we have elaborated the limitations of OHM in coefficient availability in the introduction of the revised manuscript.

2) *Please check Eq.27 in page 7. Does it maybe* $a_{3F} = -a_1 \frac{f_T}{f}(1-\alpha)\overline{K}_{\downarrow} - a_1 Q_F$*?*

Based on Eq.22, $\Delta Q_S = a_1(Q^* + Q_F) + a_2 \frac{\partial(Q^*+Q_F)}{\partial t} + a_{3F}$ *when* Q_F *is included. With the assumption that* Q_F *is diurnal invariant,*

$$\Delta Q_S = a_1(Q^* + Q_F) + a_2 \frac{\partial(Q^* + Q_F)}{\partial t} + a_{3F}$$
$$= a_1 Q^* + a_2 \frac{\partial Q^*}{\partial t} + a_1 Q_F + a_{3F}$$

so $a_3 = a_1 Q_F + a_{3F}o$*, and* $a_{3F} = a_3 - a_1 Q_F = -a_1 \frac{f_T}{f}(1-\alpha)\overline{K}_{\downarrow} - a_1 Q_F$.

Response: We thank the reviewer for providing another derivation of a_{3F}. However, the reviewer's derivation is NOT within the framework of AnOHM/OHM, whose aim is to establish the relationship between the heat storage ΔQ_S and net radiation Q^*, rather than the sum of Q^* and anthropogenic heat Q_F (i.e., $Q^* + Q_F$). In fact, by replacing equation 14 with equation 26 and following the steps in section 2.2, one can finally obtain equation 27.

3) *In page 10, a greater in incoming solar radiation* ($K_{\downarrow}$) *will lead to smaller* ΔQ_S*, why? In general, net radiation mostly depends on* $K_{\downarrow}$*, and the larger* $K_{\downarrow}$*, the larger net radiation which will lead to larger* ΔQ_S.

Response: We note that we do NOT mean the larger $K_{\downarrow}$ will lead to "the smaller ΔQ_S" (as interpreted by the reviewer) but "a smaller portion of (the solar energy will be partitioned) to ΔQ_S". In other words, it is NOT the smaller *absolute magnitude* of ΔQ_S but the smaller *partitioning fraction* of ΔQ_S that will be resulted in given a larger $K_{\downarrow}$.

4) *In Figure 5, the blue solid line (URB) is large differently from other lines in (a) and (c). Based on Figure 5a, the* ΔQ_S *can be up to 70% of net radiation, it's too large to believe. In addition, there's also large difference between simulation and observation in Figure 5a, 5b. Please explain them.*

Response: The two concerns of the reviewer are addressed as follows:

a. *Too large ratio (e.g., 0.7) between* ΔQ_S *and* Q^* *to believe*:
Figure 5a shows the coefficient a_1, which essentially is NOT the ratio between ΔQ_S and Q^* but rather characterize such ratio. That being said, high values of a_1 (>0.7) have been reported for urban environments in literature (e.g., Doll et al. (1985), Grimmond and Oke (1999)). As such, the values of a_1 reported here are not as surprising as the reviewer claimed to be.

b. *Large difference between simulation and observation in Figure 5a and 5b*:

First, Figure 5 is meant to demonstrate the seasonality in the AnOHM/OHM coefficients rather than the comparison in such coefficients between observations and predictions as they are based on different sites/land covers. In other words, the key message delivered by Figure 5 is that the AnOHM/OHM coefficients vary between seasons within a year and their seasonality should thus be considered in conducting OHM simulations.
Besides, the large differences in a_1 (Figure 5a) and a_2 (Figure 5b) between Anandakumar (1999) and the other sites inherently imply the distinct impacts of different land covers/surface status on energy partitioning, which is widely observed and well reported in literature (e.g., Li et al. (2015), Bateni and Entekhabi (2012), Teuling et al. (2010)). Also, we note that the negative values of a_2 observed Anandakumar (1999) (squares in Figure 5b) can be explained by the phase difference between ΔQ_S and Q^* (see equation 24) and a more detailed discussion on this phase difference is referred to Sun et al. (2013).

References:

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