The article entitled as “The Analytical Objective Hysteresis Model (AnOHM v1.0): Methodology to Determine Bulk Storage Heat Flux Coefficients” currently in submission to the journal of Geoscientific Model Development, developed an Analytical Objective Hysteresis Model (AnOHM) and performed sensitivity analysis of AnOHM to surface properties and hydrometeorological conditions. The results show that the offline evaluation of AnOHM for five different land convers generated good performances. The AnOHM improved modelling land surface processes. I recommend acceptance after revision. I am supplying comments, both general and specific as follows:

General comments:

1. This paper is potential and well organized, but the language proficiency still needs to be polished by Professor Sue Grimmond who is the fourth author and a native English speaker.

2. It will be great if authors compare their own results with the previous work.

3. This paper is lacking a formal Discussion section. I suggest the authors develop this section.

Abstract:

1. Line 14, suggest change “hampers application” to “hampers its application”.

2. Line 15, change “1-dimensional” to “one-dimensional”.

3. Lines 18-19, “From this albedo, Bowen ration and bulk transfer coefficient, solar radiation and wind speed are identified as being critical.” I strongly recommend the authors revise this statement.

4. Line 21, change “OHM coefficients to” to “OHM coefficients”.

1 Introduction

1. Page 2, Lines 9-10. “The volume of interest extends from the top of the roughness sub-layer to the depth in the ground where the vertical net heat conduction is zero on a daily basis (see Figure 2 in Masson et al., 2002).” The statement is contrary to its former statement.

2. Page 2, Lines 11-16. It is recommended to add the references at where is appropriate, such as after “e.g. 5%”, and after “the term becomes much more significant”,

3. Page 2, Lines 19-33, Page 3, Lines 1-17. What are the disadvantages and advantages of OHM compared with the other techniques to determine the storage heat flux? The parts of listed different techniques are verbose (Page 2, Lines 22-33).

4. Page 3, Line 3. How to determine a1, a2 and a3 by observations?

5 Page 3, Lines 14-16. Suggest change the statement "Although, Gao et al. (2003; 2008) solved the 1-dimensional advection-diffusion equation of coupled heat and liquid water transport to explore the physical relation of OHM coefficients *a1* and *a2* to the phase lag between Δ*QS* and *Q**," to "Although, the one-dimensional advection-diffusion equation of coupled heat and liquid water transport equation was solved by Gao et al. (2003, 2008), and the solution was used to explore the physical relation of OHM coefficients a1 and a2 to the phase lag between $\Delta Q_S$ and *Q** (Gao et al., 2010), ".

6. Page 3, Lines 19-26. What will be done and some results are mixed together. It is recommended that the authors revise those statements.

2 Model Development

1. Page 4. *t* should be defined below equation (3).

2. Page 4. It is strongly recommended putting equation (7) before equation (4), as "The steady-periodic solution of equation (3) with boundary condition, Ts=A_Ts sin(wt-Y)+Ts_aver (4)" .

3. Page 5. Albedo should be defined below equation (14).

4. Page 5, Line 9. It is recommended adding references or state the reason that it is reasonable to assume the incoming solar radiation and air temperature follow sinusoidal forms through a day as function of the mean value for the day.

5. Page 5, equation (8). Where is the term of longwave radiation from soil surface in the longwave radiation scale (equation (8))?

6. Page 7, Section 2.4. I strongly recommend adding statements about the advance of the AnOHM coefficients compared with the previous OHM coefficients. Based on the abstract, to enhance physical interpretations of the OHM coefficients is one of the paper's goals.

3 Sensitivity Analysis

1. Page 8, Line 20. "Stull, 1998" should be placed at "(Table 1a, based on values reported in Stull (1982))".

2. Page 9, Lines 15-17. Based on the statement "A positive (negative) *S* indicates an increase will lead to increase (decrease) in simulated value", an increase in albedo will increase $a_1$ and

$a_3$ while decrease $a_2$. Because Figure 2 shows that the S of $a_1$ and $a_3$ are positive and the S of $a_2$ is negative. It is strongly recommended double-checking the other statements for surface properties and the statements for hydrometerrolgical forcing parameters.

3. It may be interesting to compare the S of surface properties and hydrometerrolgical forcing parameters.

4. It is recommended comparing the results of sensitivity analysis to previous works.

## 4 Model Evaluation

1. What does the ability of AnOHM to capture intra-annual dynamics $\Delta Q_S$ impact its simulation $\Delta Q_S$?

2. It is recommended comparing the results of sensitivity analysis to previous works.

## 5 Concluding Remarks

1. Authors should be sure to inform the reader of what may be lacking in the study as well as needs for future work.

2. It is recommended to add statement that how the current work actually advances science.