

## ***Interactive comment on “Towards understanding the mean annual water-energy balance equation based on an Ohms-type approach” by Xu Shan et al.***

### **Anonymous Referee #1**

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The authors aim to define a new Budyko-type relationship (it seems) by using an Ohm's approach.

The article has a very strange structure. There is really no justification on the knowledge gap for the research. The literature review is rather "old" and convoluted, mentioning relevant but rather old formulations. Much has happened in the Budyko field after the Zhang, Fu and MCY formulations. Budyko-type empirical models of ET. I couldn't even find in the text what is the Ohm's law or approach that the authors are discussing. In the beginning, it sounded interesting to be able to include moisture recycling into the Budyko framework, by using a Lagrangian particle tracking method, but

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then, in Page 4 to 6 I just got lost. The manuscript is made up of disconnected parts without a clear thread.

You end up with another expression of E in terms of P and  $E_o$  before the discussion, the MCY formulation. Is this suppose to be the main result, that your formulations ends up in the same expression? I think the article goes into too much detail, and loses the big picture.

You are giving mathematical explanations and derivations from the beginning, but I don't really understand what is the research question of this manuscript. Which are the objectives? What is the hypothesis? I am not saying that the new formulation is wrong, but rather what is the purpose of it? It might be interesting what you state, but the relevance or how it contributes to the field is not evident.

Other issues:

The abstract and conclusions are complicated and dense to read.

L. 23 what equation, you have not shown it

Eq. 1 and 2 – you are not defining variables in the equations, and Eq. looks strange. E in terms of E?

L: 5 and 6 . Which is the dry condition and which the wet condition?

L. 9 an analytical equation of what?

L. 10 a derivative of the mean water energy balance? that is not variable?

L.11 What is n, what is m? Specially n results being important, since it is shown in the last equation but you never say what it means.

L: 20 but isn't  $F_{us}$  equation also an implicit function?

Some figures could greatly help, showing the Budyko space.

L. 13 I have never her of the Carrot Limit.

C2

In Eq. 9, what is the physical meaning of conductance?

L. 2 what is the Ohms approach? You have not talked about it or introduced it?

Section 2. Still no sign of the Ohms approach.

The structure of the manuscript is really strange. Where are the results?

So the main result do this article is the last equation, which you don't even number. It looks like yet another expression of  $E$  in terms of  $P$  and  $E_o$ . This can have value at some point, but the relevance is not discussed.

As a recommendation, I think that the authors should rewrite the article thinking in a broader audience. Explaining variables and equations much more clearly. Giving a logical structure to the manuscript, and defining a literature review that shows the knowledge gap, and the aim and objectives that will be used to address that knowledge gap. Also, a clearer relationship between the intercatchment assessment (Figure 1) and the Budyko framework would increase the value of the manuscript, it is not clear from the current version. Also, what is the reason of using the Lagrangian and Ohm's approaches? It is not stated.

Also, maybe putting some real values for a specific catchment to the conceptualization reached by the authors could make its application easier as well as understanding its advantages.

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