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Hydrology and Earth System Sciences Discussions

Interactive comment on "Development of a conceptual model of the hydrologic response of tropical Andean micro-catchments in Southern Ecuador" *by* P. Crespo et al.

Anonymous Referee #2

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I agree with reviewer #1 that this promised to be a very interesting paper, but fell short on a number of points.

As noted by reviewer #1, the conceptual diagram of the model (Figure 2) is incomplete as it does not include the canopy and surface terms. As it stands, the figure seems to indicate that SOF occurs when S1 is full.

What is the significance of the interception and surface storages in the model? Are these used just to have a connection to measurements of the impact of the canopy and surface layer on water fluxes, or is contribution to the model behaviour significant (i.e. is there any reasonable difference from using a single storage that is the combination

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of the 2)?

The equation for evapotranspiration is incorrect when viewed in terms of the text in the paper. The text says that ET_a is satisfied by the water stored in the canopy and surface storage, with the remainder extracted from the first storage. However the equation has ET_a as only the component from the first storage. The equation used is a omewhat simplistic representation of the process (linear decline in ET_a from S1 being full to empty), ignoring the ability of plants to extract water from the soil, as well as the resistance to this under dry conditions. This will tend to under-estimate ET_a in wetter conditions, and possibly overestimate it in drier conditions. Granted the impact of this on the model may not be significant, but this has not been tested.

Equations 5 to 7 represent a standard exponentially decaying store with 2 modifications: A threshold in the storage (T_S1) and a storage coefficient that is dependent on the storage (equation 6). In equation 6, what is the relationship between the time constant parameter tau, and the model parameter a? Are these independent or related? Looking at the equation, it would appear that these would be highly correlated. Personally I would refrain from using tau as the symbol for the time constant parameter, as it is usually used to represent the time constant, and this might mislead readers. The time constant parameter is related to the time constant, but it is not the time constant.

The section on page 2485 discussing the direct overland flow (SOF) is poorly written, and difficult to follow.

It would be helpful to include a table of the parameter values, and a plot showing the uncertainty in these from GLUE.

The figures need attention.

The caption for figure 4 needs to be rewritten.

Figure 5: it is diffult to see anything in this figure?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 2475, 2012.