

## ***Interactive comment on “Modeling and measurement of two-layer-canopy interception losses in a subtropical mixed forest of central-south China” by G. Zhang et al.***

**Anonymous Referee #2**

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Review Zhang et al. Modelling and measurement of two-layer-canopy interception losses in a subtropical mixed forest of central-south China.

This ms deals with the modelling and measuring of throughfall in a subtropical mixed forest in China. Until now, this was not modelled for these forest in China. The authors use all standard procedures how to deal with these kind of measurements to simulate interception losses in forests. Novelties are: - two layer model and measurements; - the parameter values derived from the measurements which are in the same order as previously found;

- 1) Does the paper address relevant scientific questions within the scope of HESS? Yes
- 2) Does the paper present novel concepts, ideas, tools, or data? No (only data)
- 3) Are

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substantial conclusions reached? No, see major comment 4) Are the scientific methods and assumptions valid and clearly outlined? No, see major comment 5) Are the results sufficient to support the interpretations and conclusions? No, see major comment 6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes 7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? No, see below 8) Does the title clearly reflect the contents of the paper? Yes 9) Does the abstract provide a concise and complete summary? No, for instance 478.4 mm doesn't give information, you want to see it as fraction of the forest hydrological cycle. 10) Is the overall presentation well structured and clear? No, it can be more concise 11) Is the language fluent and precise? Yes 12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? 14) Are the number and quality of references appropriate? No (see major comments) 15) Is the amount and quality of supplementary material appropriate?

My major concern is about the quality of the data in combination with a detailed model. There is a debate about the values of the model parameters in combination with the quality of the measurements. This already started in 1996 by Calder and Hall, which conclude that the acquisition of high temporal and spatial resolution data is essential for the development and testing of detailed process-based interception models, such as the authors use. This was a reaction on the paper of Jetten (1996) who used a multi-layer model, while he had only the availability of throughfall data. Other papers are for instance from Klaassen W (2001, Water research research), Vrugt (2003, WRR) and Keim (2004, Agricultural forest Meteorology).

If I understand it correctly, measurements of throughfall and rainfall were measured weekly with 12 throughfall collectors. On a yearly basis this error is 2%. However, this error will be must larger if we look to the weekly measurements, due to spatial and temporal variability. If the authors should have hourly measurements (measured for

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instance with automatic throughfall measurements) they should find that this error will rise to maybe more than 100%.

As a result, the information of throughfall data is limited. Because the authors didn't had direct measurements of interception capacity or evaporation due to interception, these two processes are uncertain and can be compensated during the year. To calculate the storage capacity, the authors should account for these errors.

Because the process of drainage/interception evaporation and throughfall is highly dynamic and takes place on much shorter time intervals as they have measurements (hourly or even minutes), the model can compensate these different fluxes, for instance drainage vs evaporation. If less drainage occur, then the gapfraction of the canopy can be larger having more direct throughfall to compensate. In turn, having more interception evaporation will result in a higher capacity etc.

The limited amount of information of only throughfall data is highlighted several times in recent literature. Keim (2004), who give a reaction on a paper of Price and Carlyle Moses (which was cited in your ms), give clear arguments why these data have limited information and that physical interpretation of parameters estimated by statistical calibration of the Gash model is risky, and that conclusions cannot be accepted without supporting data. Vrugt et al. (Water Resources Research, 2003) concluded that measured throughfall dynamics contain only very limited information for the calibration of a four-parameter canopy interception model and are particularly inadequate to identify the storage capacity and evaporation efficiency from the forest canopy. Moreover, the results in this paper demonstrate that measured canopy water storage dynamics contain better and more reliable information than measured throughfall dynamics for the calibration of a canopy interception model, thereby increasing the prospects of finding the preferred parameter solutions. Moreover, as only one drying and wetting cycle of the canopy is needed for a reliable model calibration using measured canopy water storage dynamics, these observations are well suited to assess temporal variations in the values of the interception model parameter throughout the year.

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I found it strange that the author use references to Jetten (1996) and Price and Carlyle Moses (2003) but did not include the comments on these papers by Calder and Hall and Keim.

Concluding remark In my opinion the authors could only use a one parameter model (as in fig 5 and 6). A more detailed model may only be used if the other parameters can be linked to system properties. If the authors are able to cope with the uncertainties in their data and if information is left in their data (or if they have other data, like interception evaporation estimates by for instance eddy correlation), then this manuscript can be concerned for publication.

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Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 1995, 2005.

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