

## ***Interactive comment on “Parameter sensitivity to climate and landscape variability of a simple, lumped salt and water balance model” by M. A. Bari and K. R. J. Smettem***

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This paper describes application and parameter analysis of a lumped salt and water balance model.

In general, this paper gives a short description of the model, gives short insights in the application of the model for different research catchments in South Western Australia, and presents a (sensitivity) analysis of 7 calibrated parameters. It ends with a short discussion of the physical significance of parameters. A sensitivity analysis is only given in part 6.5 (about 1 page + 3 figures).

This paper gives many interesting details about model application, model calibration,

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sensitivity and model structure. But this paper is not well structured and has no clear focus.

The title is misleading: It says 'parameter sensitivity to climate and landscape variability' but neither the impact of climate variability nor the effect of landscape variability are discussed.

The authors published two other papers describing the water balance and the salt balance model respectively. The actual paper can not be published as a stand alone paper: Without the mathematical background a broad discussion about the physical meaning of parameters is superfluous. This paper is NOT a sensitivity study at all. It mixes application, calibration, parameter discussion, performance analysis without having a clear structure.

The application of the model in different catchments and climatic zones could help to elucidate the physical or at least mathematical meaning of several parameters, but this has not been discussed in this paper.

**this paper needs to be restructured and - in part - rewritten, focus on the topics given by your title!**

**Some details:**

Introduction:

1406/26: model equations / parameters are approximations / abstractions of the real world. Therefore most parameters are not directly measurable...

1407: the actual discussion about uncertainty analysis (parameter/structure/data) is not reflected in the introduction.

1408/1409: wrong order: first you should introduce the location/region than describe the hydrologic characteristics

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1409/6: Why you cite no references concerning previous research in the catchments Ernies and Salmon

1412/24: Why you take a 5 calibration period for the control catchments but 14 for the others?! What are the calibration methods?! Trial and Error, automatic calibration, what algorithms?

1412/1415: Why you first describe the model application including visible correlations of time series (chapter 5) and than the parameter estimation procedure? (chapter 6), this makes no sense! Change order

1418/4ff: references?!

1420/14ff: key parameters: Why are the chosen parameters the 'key parameters'?

1420/18 Why do you select Betalling Creek? Possibly in the low rainfall zone different processes are dominant? How to deal with structural uncertainty of the model?

1422/15ff: How is this chapter connected to the previous ones? This is not a discussion

1423/10ff: Mathematical description necessary...

1423/22: A similar value.... → scale independ?

1423/24: 5m/day → reality or (calibrated) model parameter?

1424/1ff: This par is not useful without mathematical background!

1425/11ff: A key finding... → why? This suggests: Overparametrisation / poor data available / model structure too complex compared to data availability? Are your finding 'expert knowledge' or based on analysis...

1425: poor discussion, climate, landscape not discussed at all...

1. Use completely different structure: material: catchments, data, model methods: calibration (PEST??), performance criteria, sensitivity analysis (additional methods? E.g. MCAT/DYNIA from Wagener or GLUE from Beven, Gupta et al.... results: model performances, parameter study discussion

2. Add Discussion:

model structure / mathematical behaviour / parameter uncertainty / parameter sensitivity should be addressed in detail, in addition model's sensitivity (= clear distinguishability of model parameter sets for different climate/landscapes) should be discussed

3. Rewrite your introduction: Make clear what you really want, focus on the topics given by the title

**Some Technical corrections:** 1407/8: Wagener et. al  
1407/9: Beven and Freer  
1408/3: Hingston and Gailitis, 1976 -> missing in the references!  
1409/8: ...groundwater system is seasonally....

**Figures:** general: not a good selection, bad quality Figure 3: not clear at all!  
Figure 4: Observed: line too thin!, part b) -> why 1980?  
Figure 5: Observed: line almost invisible  
Figure 6: not necessary  
Figure 7: Where is part a) = streamflow??, figure shows only salinity and salt load!  
Figure 10: bad quality

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