

Interactive comment on “Modelling the spatial distribution of snow water equivalent at the catchment scale taking into account changes in snow covered area” by T. Skaugen and F. Randen

Anonymous Referee #3

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Skaugen and Randen propose a new method using a gamma distribution to represent the spatial distribution of SWE in catchments. They then apply the new method and compare it to one standard method. While this is a good approach, the authors could do a better job in demonstrating the added value of this approach. As it is now, one can say that there is basically no improvement in runoff simulations (Tab 1), and the internal snow simulations are not evaluated in a quantitative way including an evaluation of the significance of differences. Looking only on the figures it is not that easy to assess how much different the two methods actually were.

The new approach looks mathematically very sophisticated, but the authors did not convince me that it is necessarily more realistic in a physical sense. One crucial point is the assumption of a gamma distribution, which should be motivated better. Also, as far as I understand, snow redistribution is ignored in this approach. While this is true for many approaches, I think considering redistribution in many cases might be more important than using different distributions for the variation of snowfall.

I term unit (section 2.1. ff) needs to be clarified. What is actually meant by unit? How large is one unit? How can these abstract 'units' be related to reality? It remains rather unclear how topography and vegetation are considered. Only in the results I found an indication, that elevation zones might have been used. This needs to be clarified! In the conclusions the authors emphasize that the new formulation produces similar good results with one parameter less to be calibrated. However, if the parameters α and v are not estimated from observed precipitation, which probably is the case in most applications, the number of free parameters actually is increased.

The manuscript generally reads well, but the structure could be improved. As it is now some methods are first mentioned in the results and the discussion section includes some parts which better would fit in the results section.

Please provide units in all figures. Remove titles in Figs 8&9.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 11485, 2011.

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