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Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrological effects of the temporal variability of the multiscaling of snowfall on the Canadian prairies" *by* K. R. Shook and J. W. Pomeroy

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Anonymous Referee #1

a) I somewhat missed the reality check. If recorded snow accumulation data exist, they should be considered for comparison. If not, that fact should be mentioned.

Agreed. Recorded snowfall data are not available for the simulated period and location. This will be clarified.

b) It is unclear why multifractality is so important. The data are only weakly multifractal, so why not try a simpler monofractal approach first and see how it performs wrt. snow

accumulation?

Multifractality was investigated as it is the more general case. Although the multifractality was weak in this case, it may be stronger in other locations or for other variables. Equally important, the existence of multifractality allows the use of disaggregation methods such as the random multiplicative cascade.

c) The spectrum is so noisy that one would think estimating the fractal parameters involves large uncertainty. This needs further commenting.

The power spectra of snowfall data are noisy. Part of the reason for the noise is that the value of β changes over the length of the dataset. However, the 5% and 95% confidence levels of the regressions shown in Fig. 3 indicate that the changes in the value of β are statistically-significant. The variability of the values of alpha and C1 in each section of time a series is shown in Figure 4b.

1281, 17: I think the term 'disadvantage' is somewhat inappropriate. Perhaps "feature" would be better.

1282, 1: A figure of snowfall observations may be helpful here. It's difficult to show the effects of wind on a snow catch time series. I'm not sure what kind of figure is meant.

1283, 9: It is not the frequency distribution that is stationary or not.

I'm not sure what you mean. The value of beta implies that the frequency distribution is stationary. However, the temporal distribution of snowfall, as identified by the multifractal distributions, are not stationary.

1283, 11: Which parameters were chosen for the spectral estimate (windows, chunk length,...)?

They will be specified.

1284, 14: Perhaps simply refer to the cumulative distribution function. Done.

1286, 25: It is mentioned that the CRHM does not need any calibration. How are the parameters mentioned on p1288, 12, determined?

The surface routines of CRHM use physically-based parameters such a crop height, which can be measured. In the case of this simulation, values were selected from the modelled basin located at Bad Lake, Saskatchewan.

1286, 27: Perhaps start an extra section for the downscaling. Agreed – a good idea.

1287, 2: A Figure may be helpful here.

I'll try.

1288, 25: Shook and Pomeroy (2010) should at least be accepted, no? Unfortunately it's still in review. I'll change the reference.

1289, 6: For comparison, a very simple downscaling, such as a constant snowfall, may be instructive.

The effects of a constant snowfall will be computed. However, as they have no values of alpha and C1, they cannot be plotted with the other downscaled values.

1296: "Fraction of dataset" should be explained. (Does it mean time?) Yes. I need a better term. I couldn't think of one.

1302: Legends are unreadable.

True. They will be enlarged.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 1279, 2010.