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Interactive comment on "pSNOWPACK: a forecasting tool for avalanche warning services" *by* S. Bellaire et al.

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This paper is a valuable contribution to assess the potential and limitations of Numerical Weather Prediction (NWP) forecasts to drive physically-based snow models. The paper mainly addresses the skill of predicted precipitation and the consequences of precipitation errors on the simulated snowpack dynamics at Mt. Fidelity. From a comparison between observed and forecasted precipitations, the authors propose different statistical methods to automatically adjust the forecasted precipitations. They assess their impact on the simulated total snow depth and on the 24-hour new snow amounts. Even if none of the proposed methods proves itself able to capture the largest new snow amounts while avoiding a long-term over-estimation of the total snow depth, the authors present an encouraging comparison between an observed snow profile and

the one simulated with the SNOWPACK model for the same date.

However, I fully share the major comment from the first referee: the results which are presented in the paper do not really address the ability of pSNOWPACK to help avalanche warning services in their daily analysis of snowpack stability. A change in the title and less conclusive sentences in the discussions and conclusions would better reflect the content and the main results of the paper. It is mainly a problem of wording and not a request for a major revision of the paper.

In addition to the recommendations of the first referee, I encourage the authors to strengthen their conclusions by extending the analysis of GEM15 outputs to other parameters which are critical for the evolution of the snowpack: - a detailed comparison between the forecasted and the observed temperatures would help to better understand the early season snow depth under-estimation (line 18 page 2264). Maybe it could help to explain the missing upper melt-freeze crust mentioned line 8, page 2263. Considering the importance of rain events on the destabilization and following stabilization of the snowpack, it is of primary importance to assess the skill of temperature forecasts all along the snow season. It could also help to understand the reason of the excessive settling rate which appears around mi-April on Figure 3; - it would be also very interesting to see a comparison between the observed and forecasted wind speeds and directions. Wind is a major cause of snowpack instability and it directly affects the density of fresh snow. It could also help to explain the important under-estimation of the simulated new snow amount on January the 15 th., which is extensively discussed line 11 page 2265; - if downward short-wave and long-wave radiation observations are available, a comparison with the forecasted data would be very relevant, since they control most of the snowcover energy budget, and play a major role in the formation of surface hoar and melt-freeze crusts; - precipitation skill is the focus of the paper. However, it is impossible to understand from the presented results whether the under-estimation of forecasted precipitations is a general behaviour or a local one. Since there are no convincing methods to adjust forecasted precipitations, this could be

a major limitation for a possible extension of pSNOWPACK to other locations. Therefore, it would be interesting to get a broader picture of GEM15 ability to predict winter precipitation over the mountain regions of Canada. Published papers or at least technical documentation should be available from CMC and could be referenced in detail to address this issue. An other way to discuss this important point could be through a reference to the spatial variability of winter precipitation around Rogers Pass. Nothing in the paper proves that Mt Fidelity snow depth observation is representative of the average snowpack around the instrumented field. We cannot exclude that the simulation of the snow depth using a direct forcing of SNOWPACK with GEM15 precipitation (blue curve on Fig.2) is more representative than the simulations using filtered precipitations. Rogers Pass has been for decades a major site for avalanche studies, it is likely that knowledge has been produced on the local spatial variability of snow depth and new snow amounts.

Since there is only one comparison between a simulated and an observed snow profile, I recommend to show the comparison between the observed and simulated density and temperature profiles. Both parameters are also of primary importance to assess the snowpack stability.

Typing errors: - page 2265 line 15: replace “can assumed” with “can be assumed”

Interactive comment on The Cryosphere Discuss., 5, 2253, 2011.