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Hydrology and Earth System Sciences
Discussions

Interactive comment on "The effect of flow and orography on the spatial distribution of the very short-term predictability of rainfall" *by* L. Foresti and A. Seed

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We thank Hidde Leijnse for the feedback. The detailed answers are provided below.

Answer 1. The lower accuracy of the radar measurements in the inner Victorian Alps is likely to affect the optical flow estimates. In particular, the blockage of radar beams, the rainfall attenuation and overshooting can affect the optical flow in a way that it reduces the Lagrangian correlation estimates (and consequently the lifetimes). In addition, it seems that there is a proportional effect between the precipitation lifetime and the climatological precipitation amount: lower is the amount lower is the lifetime (see e.g.

Berenguer and Sempere-Torres, 2013). We will add these additional interpretations in the manuscript.

Answer 2. Thanks for the remark. Both the C- and S- band radars of Yarrawonga and Melbourne have a 1 degree azimuth and 250 m range resolution (see for instance Rennie, 2012). Despite having the same nominal resolution, the rainfall field exhibits more power in the last two cascade levels in the sourroundings of the Melbourne radar, which can explain the lower spectral exponent beta2 (Figure 4b). However, the patterns observed in Figure 4b seem to be more connected to the type of radar rather than to a different rainfall behaviour. We still cannot explain which component of the radar data processing chain provokes this effect. We will modify the text to include these additional thoughts.

Answer 3. Of course, at these temporal scales the radar measurement uncertainty will be much more relevant than the very-short predictability obtained by a nowcasting system. The goal of the dicussion was exactly to show that increasing the radar resolution does not necessarily lead to significant improvements in nowcasting, in particular if the lifetime is close to the temporal resolution of the radar. Very-high resolution nowcasts are computationally demanding and it is worth questioning whether the downstream hydrological applications are able to take advantage of such high resolution and very-short predictability. These observations motivate the further development of ensemble quantitative precipitation estimation systems and their combination with ensemble nowcasting systems, in particular because the measurement uncertainty is an important fraction of the nowcast errors up to one hour lead time.

Answer 4. From a previous paper (Foresti and Seed, 2014) we had the feeling that the forecast biases are easier to study if the topographic barrier is radially oriented with respect to the radar. This reduces the impact of range dependent radar biases when studying the spatial distribution of forecast biases. In fact, the windward and leeward sides of the topographic barrier would be located at the same range from the radar. However, it is much harder to draw these conclusions by observing the fields of

precipitation lifetime and we will remove this interpretation from the manuscript.

References:

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