

## ***Interactive comment on “A study on weather radar data assimilation for numerical rainfall prediction” by J. Liu et al.***

### **Anonymous Referee #1**

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This manuscript deals with an important topic from the perspective of short-term hydrological forecasting (nowcasting), namely the assimilation of radar rainfall data in Numerical Weather Prediction (NWP) models. However, the current version of the manuscript seems to merely provide some preliminary results using a relatively old radar rainfall dataset. Although manuscripts do not necessarily have to present positive results (i.e. scientific success stories), the presentation of disappointing results does require a thorough analysis of the origins of such results as well as a clear view on the way forward. Because of the limited scope of the presented analysis publication of this manuscript is not recommended. Some issues that require more attention are the following:

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- The use of the English language, particularly in Introduction, should be improved.
- The literature references do not seem to be fully up to date. In particular, references to important recent work on radar rainfall nowcasting from MeteoSwiss (Germann et al.), McGill University (Zawadzki et al.) as well as UPC Barcelona (Berenguer et al.) is lacking.
- Where do the coefficients in the observation operator (Eq.(2)) come from? How appropriate are they for the climatological conditions in Southwest England? What could be the potential bias and uncertainty associated with these coefficients and how would they affect the presented results?
- What is the influence of resampling the radar rainfall data on 2x2 km and 5x5 km cartesian grids (Section 3.3) instead of using the original polar data? Why is the potentially important information contained in the vertical profile of reflectivity (which could have been derived from the original volume-scan reflectivity data) not employed in the presented data assimilation study? In summary, can such a relatively old (albeit well-documented) radar rainfall dataset (from the mid 1990's) still be employed to present the state-of-the-art when it comes to radar rainfall data assimilation in NWP-models in the year 2012?
- How appropriate is the employed Z-R relationship (Eq.(3)) for the climatological conditions in Southwest England? What could be the potential bias and uncertainty associated with these coefficients and how would they affect the presented results? This is obviously related to the same questions concerning Eq.(2).
- The authors state that "[...] catchment areal rainfall [is] obtained by averaging the rain gauge observations using the Thiessen polygon method. It is treated as the ground truth for evaluating the WRF results". It seems to be doubtful to assume the classical Thiessen polygon method to represent the method of reference in the presented data assimilation framework, as if more appropriate geostatistical (kriging) methods would not have become available over the past decades. In particular, such methods would

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allow a quantification of the associated uncertainty in the interpolated rain gauge fields, an important aspect which is not treated in the current study.

- The authors present disappointing results in terms of catchment-average rainfall evolution and accumulation, both without and with data assimilation. Although they admit this may be related to the properties of the employed radar rainfall dataset, it is not clear to the reader what would be achievable in terms of results on the basis of state-of-the-art (polarimetric) weather radars that have become the reference for radar rainfall information in recent years.

- Finally, although the authors claim to attempt to present an analysis of radar rainfall assimilation in NWP-models from a hydrological perspective, they do not treat the important aspect of the hydrological application of their results, e.g. in hydrological modeling and/or short-term hydrological forecasting (nowcasting).

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