Hydrology and Earth System Sciences Discussions

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

Anonymous Referee #2

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While I appreciate the authors' efforts in applying the 3DVar of radar data to improve qpf for hydrological use, I have, frankly, several concerns over the general setting/orientation as well as the technical aspects of the paper.

General observations:

G1. The title as well as the content of the paper are mostly concerned with a traditionally typical problem in Meteorological community where data assimilation + weather radar have been widely discussed and documented. Although it is intended by the author to focus on the "hydrological' aspect, it is hardly so apart from using a catchment areal rainfall for testing the performance. In fact, most of the content, in my opinion, is superseded by a number of publications already appeared in different meteorological

journals. for a recent example, Sugimoto et al (2009).

G2. The content of the paper does not fit well the current title in terms of its scientific contribution - it is merely a case study using existing technics/models. Even for a case study paper, it still lacks of deeper insight into the problems presented in the paper, e.g., the reasons discussed in the paper needs to be consolidated by further experiments rather than staying as speculations.

G3. The fact that the study uses an outdated NWP dataset (1999 ECMWF deterministic forecast), although to some extent is unavoidable (data availability issues), it inevitably has a detrimental impact on its scientific value since the model has progressed by several generations since then.

Technical concerns:

T1. Eq. 2 is one of the key equations for the entire experiment. The equation is taken as it is from the current 3DVAR WRF system without showing its limitation/assumptions as well as its applicability in the area (SW England). If the equation does need to be modified, what the consequence will be, in terms of sensitivity.

T2. Eq. 3 is used as the original form of the Marshall-Palmer equation. There is no discussion as to why this form is used, e.g., any calibration, documentation, references etc?

T3. What is the point of configuring the WRF model to a 10 km resolution whereas the radar dataset is on a 2km grid. Back to the point of Hydrological use, I doubt whether the 10km resolution (even with an ideal 3DVAR improvement) can actually make sense for a catchment of 135 Km2.

T4. While the catchment rainfall can be used to measure the performance, other methods like showing the prognosis of the rainfall system with snapshots would give more details (and possibly reasoning) as to deciding a forecast is good or not.

Reference: Soichiro Sugimoto, N Andrew Crook, Juanzhen Sun, Qingnong Xiao, and

Dale M Barker (2009): An Examination of WRF 3DVAR Radar Data Assimilation on Its Capability in Retrieving Unobserved Variables and Forecasting Precipitation through Observing System Simulation Experiments. Monthly Weather Review, 137(11),pp. 4011-4029

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