A few changes and additions were implemented in the dualpolQC module.

1. This module adds a separate quality control chain for the Canadian S-band dual-polarization radars. The Canadian radar QC applies a different command call. It is similar to the process in WSR-88D radars, but includes a few modifications. Fig 1(a1) and Fig 1(a2) show the reflectivity fields from the Canadian radars before and after the quality control.

2. The module adds a check for potential hardware issues. This addition removes the contaminated data from the MRMS system to prevent severe residual effects on downstream modules. Fig 2(b1) and Fig 2(b2) show a hardware situation observed in the operational system and the mitigation in the research system.

3. The module is modified for improved removal of residual clutter from the wind farms observed more distinctly in the accumulated QPE field. The reference data is updated with new wind turbine locations, and the identification logic is modified to be more aggressive. Fig 3(c1) and Fig 3(c2) demonstrate an example of clutter removal in the accumulated rain rate estimation.

4. It removes the residual clutter due to false identification of non-uniform beam filling and better retains the weak echoes in the winter season. Fig 4(d1) and 4(d2) demonstrate an example of the clutter removal.

5. The K_{DP} derivation is corrected for errors caused by the range folding returns that are observed in high elevation scans (Fig 5(e2)). In Fig 5(e2), the biased high-value of K_{DP} is corrected.

6. The modifications in dualpolQCLight relax the various thresholds used to mitigate non-hydrometeorological contamination to ensure the retention of tornadic hook echoes. Fig 6(f1) and Fig 6(f2) demonstrate an example of a hook echo that was completely removed by the stricter dualpolQC process, but was retained by the dualpolQCLight process.

7. The module includes updated management of the radar volume coverage pattern (VCP). It uses predefined VCP XML configuration files in the MRMS build, which alleviates future algorithm modifications from VCPs changes.

8. The terrain and blockage data are updated for radar KBOX. It corrects the false blockage due to the terrain error (Fig 7(g1)) and improves the QPE products. Fig 7(g2) and Fig 7(g3) show the radar quality index before and after the update.

SEE EXAMPLES ON FOLLOWING PAGES

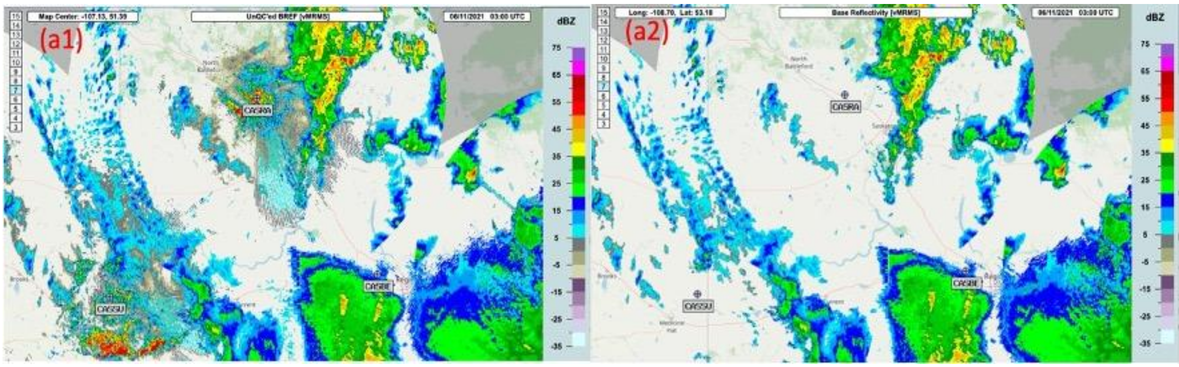

Fig 1 a1 and a2 show an example of the base reflectivity field covering Canadian radars before and after the quality control, respectively. The fields are valid at 0300 UTC 11 June 2021.

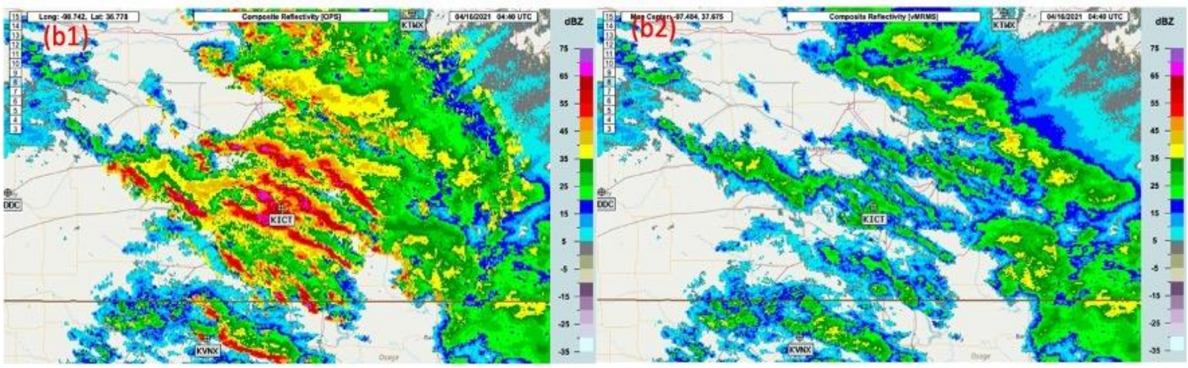

Fig 2 b1 shows the contaminated composite reflectivity due to the hardware issue from radar KCIT at 0440 UTC on 16 April 2021; b2 is the mitigated field by automatically removing the radar from the research system.

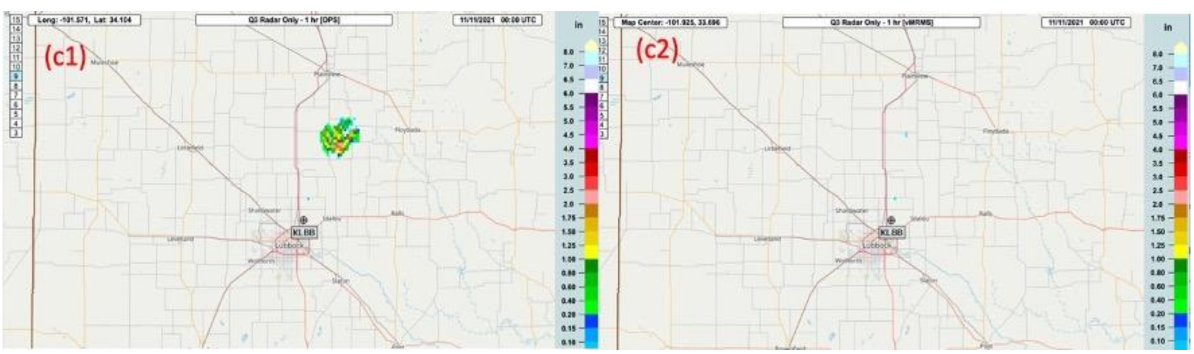

Fig 3 c1 and c2 show the one-hour rain rate accumulation with and without updates in the radar KLBB coverage. The one-hour data ends at 00 UTC on 11 November 2021.

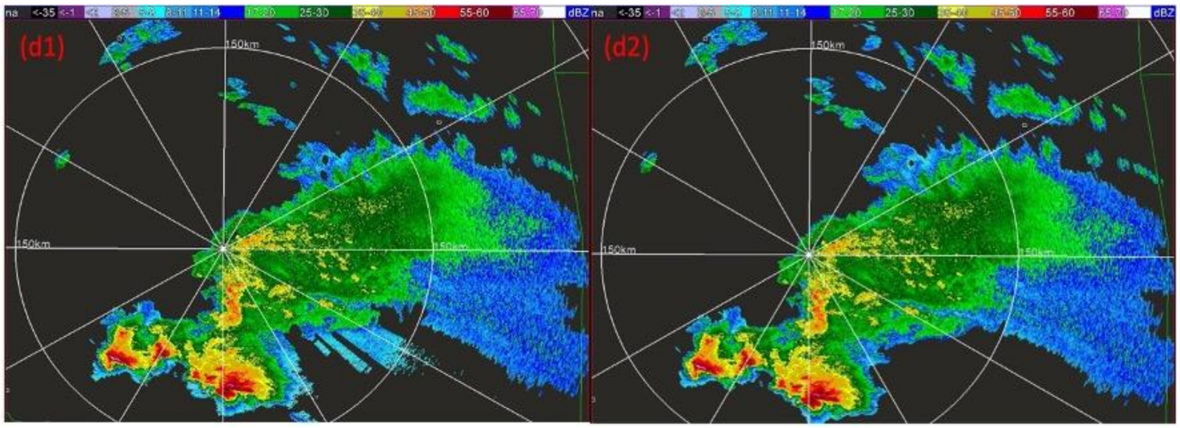

Fig 4 d1 and d2 show the changes for better clearing the residual clutter observed by KTLX at 0555 UTC 22 April 2020.

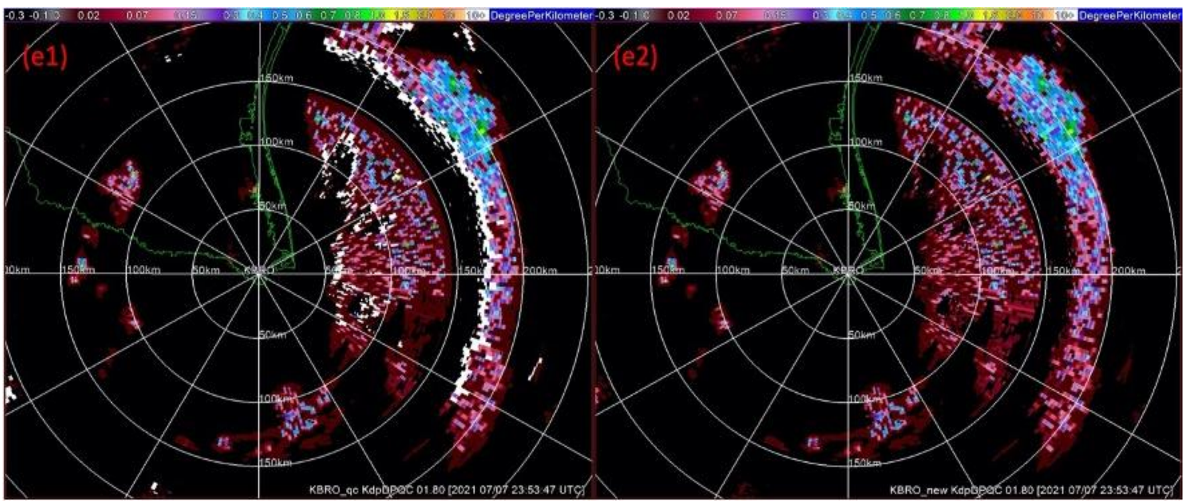

Fig 5 e1 and e2 show the difference in the derived KDP at 2353 UTC on 7 July 2021. The data is observed by radar KBRO at a 1.8-deg elevation angle, and the abnormally high value in KDP is corrected.

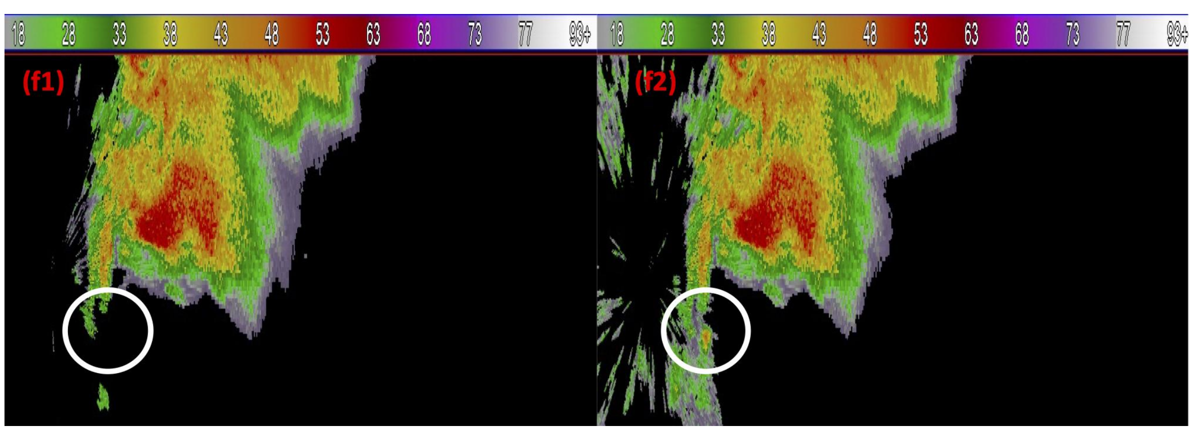

Fig 6f1 and 6f2 show the reflectivity fields after (f1) the regular DPQC and (f2) DPQCLight processes at 0.5-deg elevation. The data was observed by KOUN at 2238 UTC on 10 May 2010.

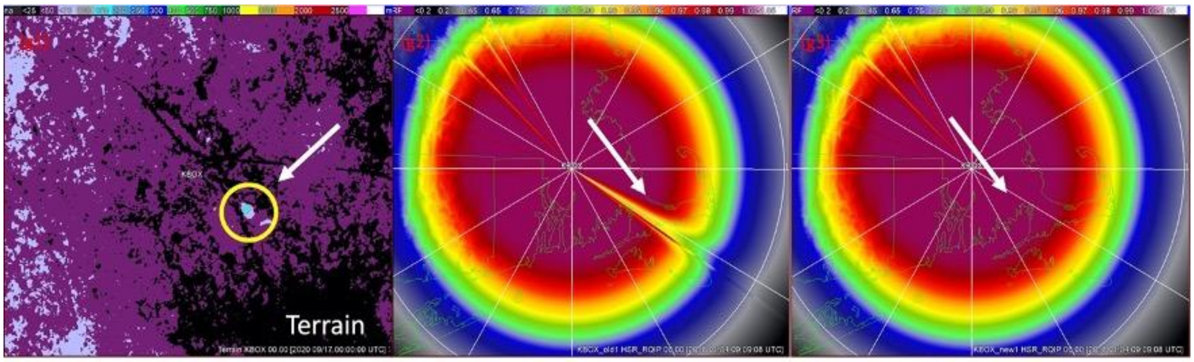

Fig 7g1 shows the error terrain data that caused the false blockage indicated in the radar quality index (RQI) field in Fig 7g2. Fig 7g3 shows the RQI after the update.

References:

L. Tang, J. Zhang, M. Simpson, A. Arthur, H. Grams, Y. Wang, and C. Langston, 2020: Updates on the radar data quality control in the MRMS quantitative precipitation estimation system. *J. Atmos. Oceanic Technol.*, 37, 1521-1537.