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Correction of dual-PRF Doppler velocity outliers: what if global aliasing is present?

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The dual-Pulse Repetition Frequency (PRF) measurement scheme is often used in operational Doppler weather radars to effectively extend the maximum measurable velocity interval. Unfortunately, the resulting radial velocity images present unfolding errors or outliers that arise inherently from the dual-PRF data processing technique. In this work we present a post-processing algorithm for identification and correction of these dual-PRF outliers. In common with the algorithms traditionally applied for the purpose, the proposed algorithm relies on spatial image filtering techniques for identification of the dual- PRF outliers, attending to their differential features. This new technique uses circular statistics and can be employed independently of post-processing dealiasing algorithms, a differentiating characteristic that offers increased flexibility for the design of quality control procedures. By means of simulated and pseudo-real dual-PRF velocity fields, we quantitatively analyse and discuss the correction ability of the algorithm, with particular emphasis on the correction of clustered outliers. In addition, we exemplify the potential of the proposed methodology to improve the quality of real dual-PRF data, through application to selected severe weather events registered by the weather radar network of the Meteorological Service of Catalonia. The resulting corrected velocity images are well suited for applications such as wind-shear and mesocyclone detection algorithms or assimilation in numerical weather prediction models.