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Radar Rainfall Bias Correction based on Deep Learning Approach

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Radar rainfall measurement errors can be considerably attributed to various sources including intricate synoptic regimes. Temperature, humidity and wind are typically acknowledged as critical meteorological factors in inducing the precipitation discrepancies aloft and on the ground. The conventional practices mainly use the radar-gauge or geostatistical techniques by direct weighted interpolation algorithms as bias correction schemes whereas rarely consider the atmospheric effects. This study aims to comprehensively quantify those meteorological elements' impacts on radar-gauge rainfall bias correction based on a deep learning approach. The deep learning approach employs deep convolutional neural networks to automatically extract three-dimensional meteorological features for target recognition based on high range resolution profiles. The complex nonlinear relationships between input and target variables can be implicitly detected by such a scheme, which is validated on the test dataset.
The proposed bias correction scheme is expected to be a promising improvement in systematically minimizing the synthesized atmospheric effects on rainfall discrepancies between radar and rain gauges, which can be useful in many meteorological and hydrological applications (e.g., real-time flood forecasting) especially for regions with complex atmospheric conditions.