Alignment between GPM Spaceborne Radar and Ground Radar Observations

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The Global Precipitation Measurement (GPM) mission core observatory satellite was launched in early 2014 to measure precipitation from space. Building upon the success of the Tropical Rainfall Measuring Mission (TRMM), the GPM mission is expected to enhance our understanding on precipitation microphysics, provide more accurate measurements of precipitation, and improve extreme weather forecasting, from tropical to middle and high latitude. As an integrated part of GPM mission, Ground Validation (GV) is critical to test the assumptions and performance of space-borne algorithms and products.

Among various validation tools, ground based dual-polarization radar is a powerful tool that can be used for accurate surface rainfall measurement. Recently, the National Weather Service (NWS) Weather Surveillance Radar-1988 Doppler ((WSR-88D)) network has been upgraded with dual-polarization capabilities. However, the alignment between space borne radar and ground radar observations is challenging due to the different propagation paths, synchronization mismatching and geometric distortion by spacecraft movement. In order to address this problem, Bolen and Chandrasekar (2002) proposed a methodology to simultaneous compare and align the TRMM precipitation radar (PR) measurements and ground radar observations.

In this paper, we implement this methodology to align GPM Dual-frequency Precipitation Radar (DPR) measurements with WSR-88D radar observations. The volume matching with geometric correction between WSR-88D radar reflectivity and GPM DPR reflectivity will be described in details. The alignment results will be presented for GPM overpasses at different areas using WSR-88D observations from KMLB, KHGX, KFWS, and KFTG radar.