Monitoring absolute calibration of a polarimetric weather radar

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Monitoring absolute calibration using disdrometer data and C-band radar data from birdbath scan showed promising results (Frech, 2013). Reflectivity data from the first far field range bin at 650 m height are related to MRR measurements close to the surface, assuming spatial and temporal homogeneity. This assumption is verified using MRR measurements which can fill the gap between the far field and the surface. We show results from the "warm" season 2014 (April – November). This study uses data from the research radar of the German Meteorological Service (DWD) at Hohenpeissenberg, which is the research system of the DWD weather radar network which consists of 18 identical C-Band systems (including the research radar; EEC DWSR5001/SDP/CE).

A new MRR (FM CW radar and operates at 24 GHz. Standard MRR signal processing for rain is used, including path attenuation correction and Mie- to-Rayleigh scattering adjustment. Vertical air motion related to mountain flow is neglected at the reference height of 650 m above site.

Operational utilization of birdbath scan:
- high resolution "profile" observation of weather events (see e.g. Frech and Steinmetz, 2015)
- Monitoring of ZDR and PhiDp offset
- Monitoring absolute calibration
- Monitoring of r and n path

Vertical pointing MRR with a range resolution of 50 m. The MRR is a FM-CW radar and operates at 24 GHz. Standard MRR signal processing for rain is used, including path attenuation correction and Mie-to-Rayleigh scattering adjustment. Vertical air motion related to mountain flow is neglected at the reference height of 650 m above site.

Internal 1-point calibration results 2014

System dBZ0v and resulting dBZ0v from 1-point calibration using ITSG, twice a day. Adjustment of dBZ0v was done July 1 st , new calibration constant beginning of May explains the increase of dBZ0 derived from internal calibration < 1 dB in H; losses, tx power etc. were measured, see simplification diagram. The necessity to adjust the calibration is not identified by the internal 1-point calibration. The adjustment of the calibration is suggested based on disdrometer - radar data comparison (see the table on this poster. Large deviations in dBZ0 relate to unstable power input by the ITSG.

Summary & Conclusion

Absolute calibration can be monitored using a co-located disdrometer.
- The MRR is used to validate the assumptions of the disdrometer – radar comparison.
- Advantage of the approach is the consideration of the full r and n path of a radar system.
- Internal calibration is independent from weather, but considers only parts of the radar system.
- The approach here is one element of a multi-source monitoring of absolute calibration

Table on this poster.

<table>
<thead>
<tr>
<th>Corresponding statistics (2k):</th>
<th>1st quartile</th>
<th>median</th>
<th>3rd quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disd. radar (dB)</td>
<td>0.5 (0.3)</td>
<td>0.6 (0.3)</td>
<td>0.7 (0.3)</td>
</tr>
<tr>
<td>Disd. MRR (dB)</td>
<td>0.2 (0.3)</td>
<td>0.2 (0.3)</td>
<td>0.2 (0.3)</td>
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<tr>
<td>Radar MRR (dB)</td>
<td>0.1 (0.2)</td>
<td>0.1 (0.2)</td>
<td>0.1 (0.2)</td>
</tr>
</tbody>
</table>

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