

Towards a Radar-Based Precipitation Climatology for Germany

First Results and Future Perspectives



Thomas Junghänel

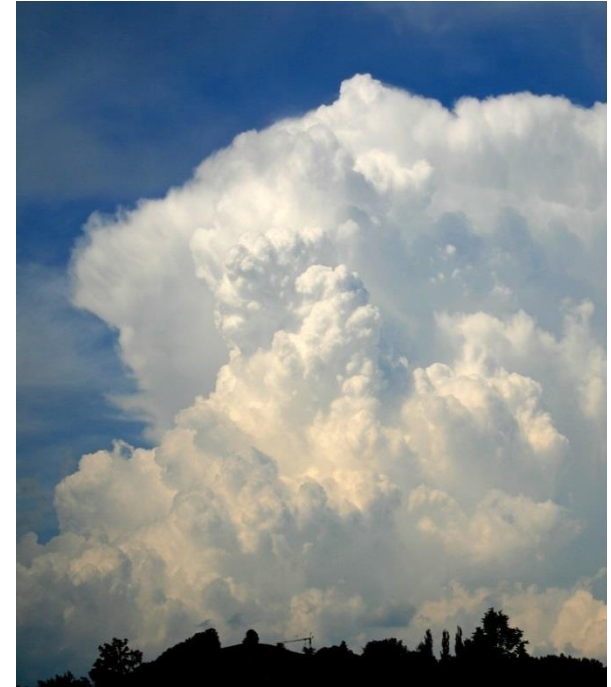
and T. Winterrath, C. Brendel, A. Schmitt, M. Hafer, E. Weigl, A. Becker

37th Conference on Radar Meteorology – 17th September 2015



Overview

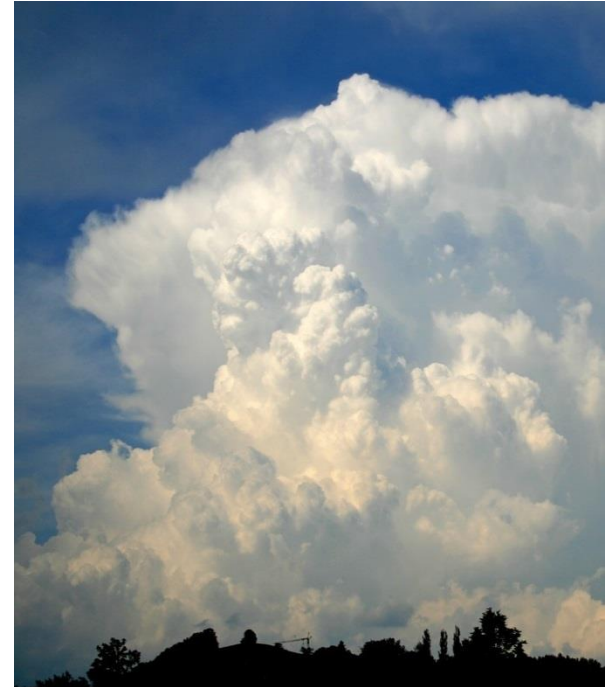
- 1** Project Facts
- 2** Data and Methods
- 3** First Results and Future Perspectives





Overview

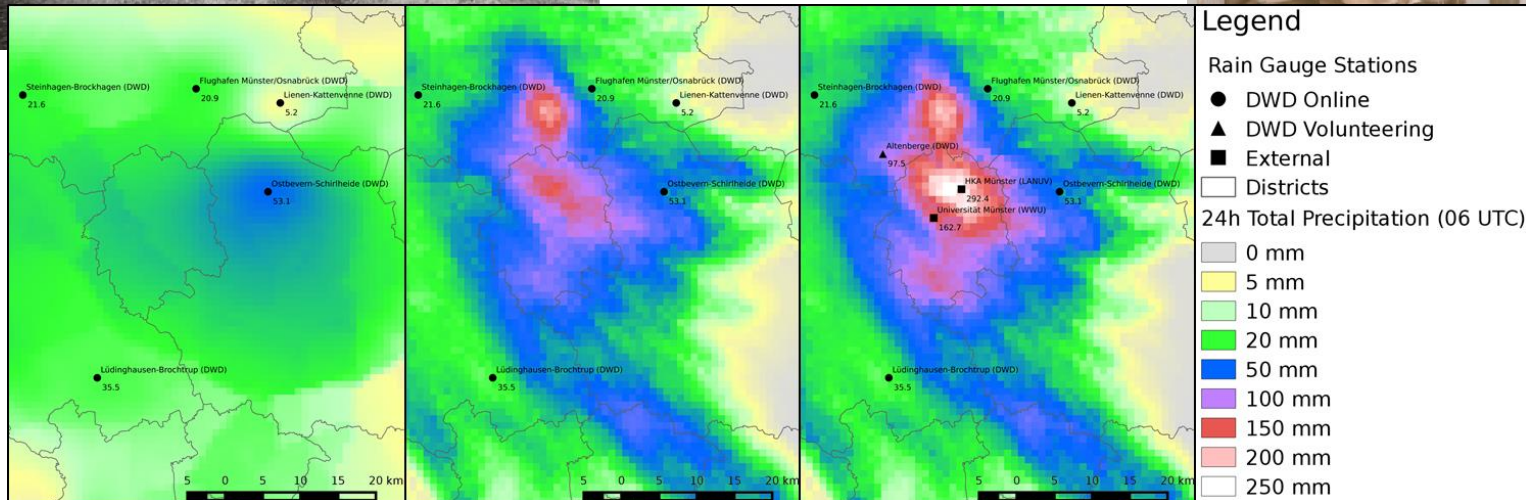
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Extreme Precipitation - A new Challenge



- Muenster, July 2014
- total precipitation: 293 mm / 12h



Rain gauge

Radar

Quantified radar

Project Facts

Joint Project of five Federal Institutes

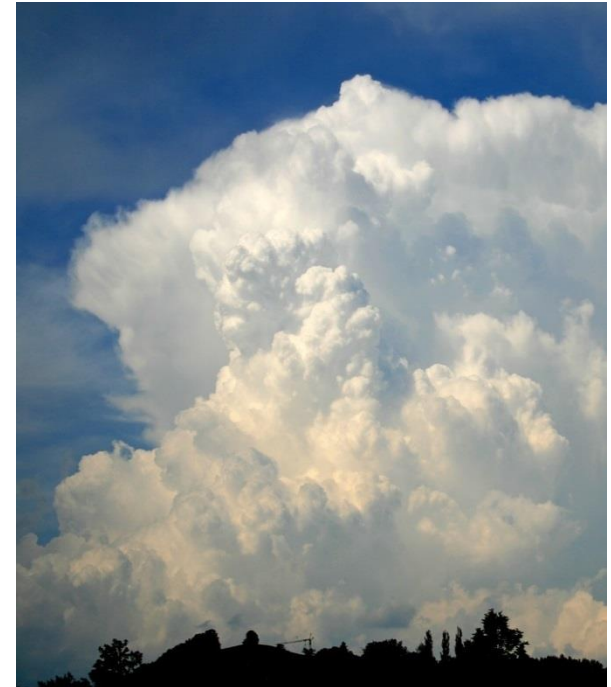


- Project duration: 2 years (2014 to 2016)
- High-resolution reanalysis of the precipitation patterns in Germany since 2001
- Analysis of heavy precipitation events and emphasis of hotspots in Germany
- User-optimized transformation of the scientific results



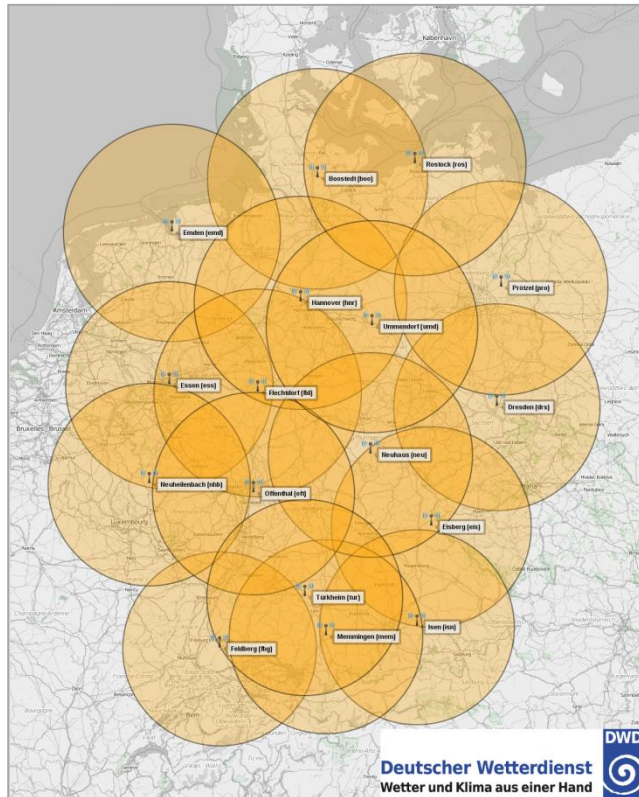
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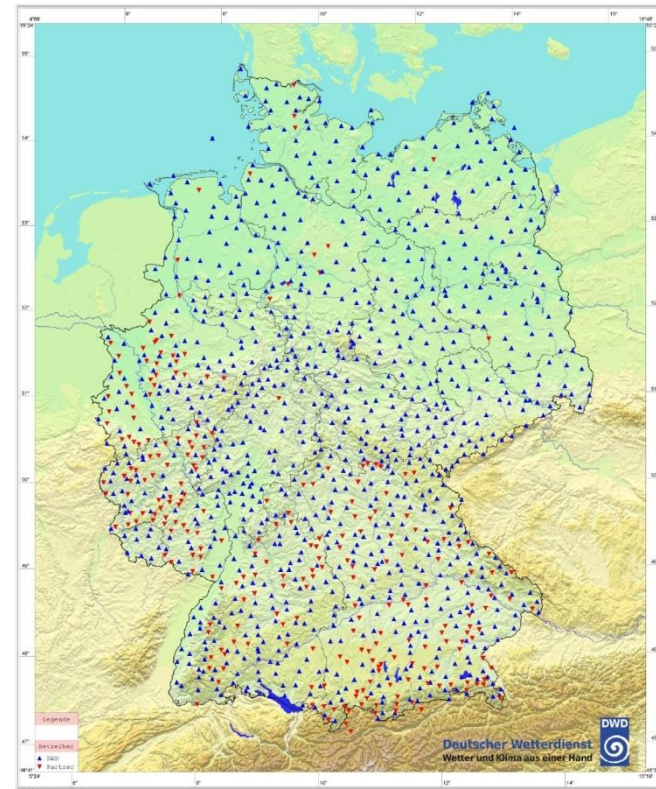


Two Types of Precipitation Measurement

17 C band radar stations operated by DWD

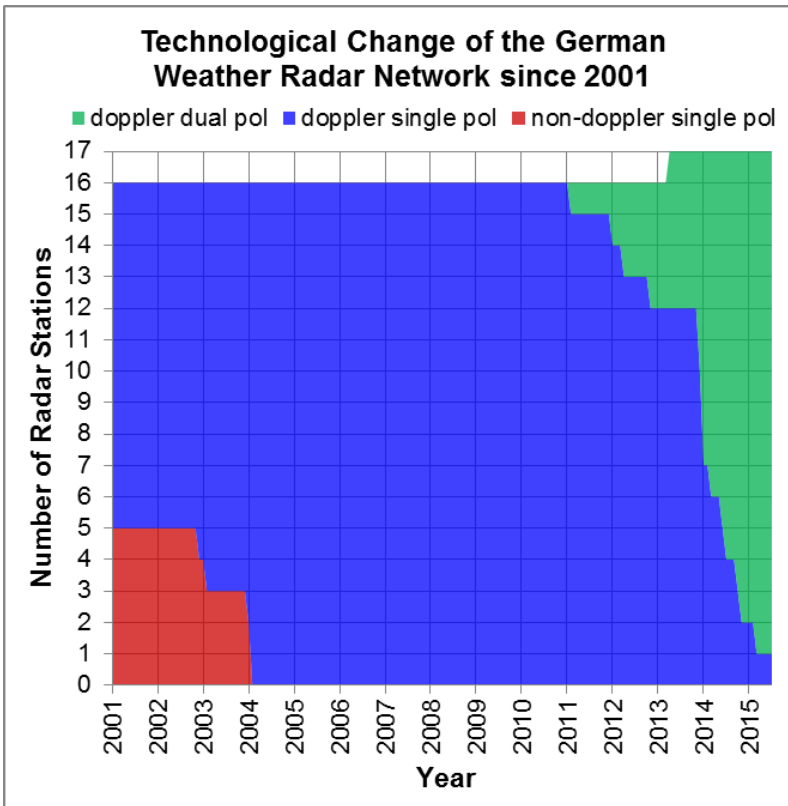
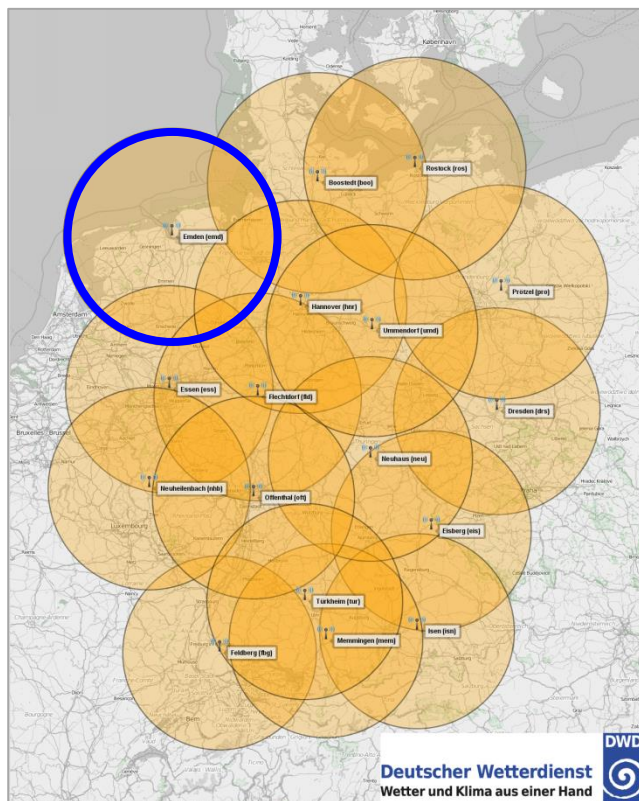


About 2000 rain gauges operated by DWD and state authorities



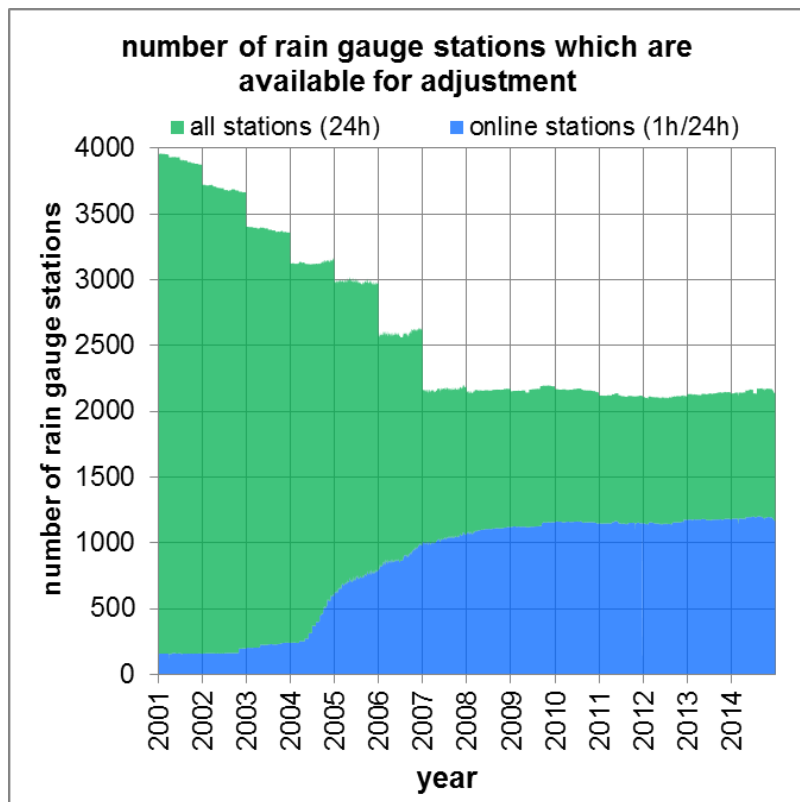
Radar Network

17 C band radar stations operated by DWD

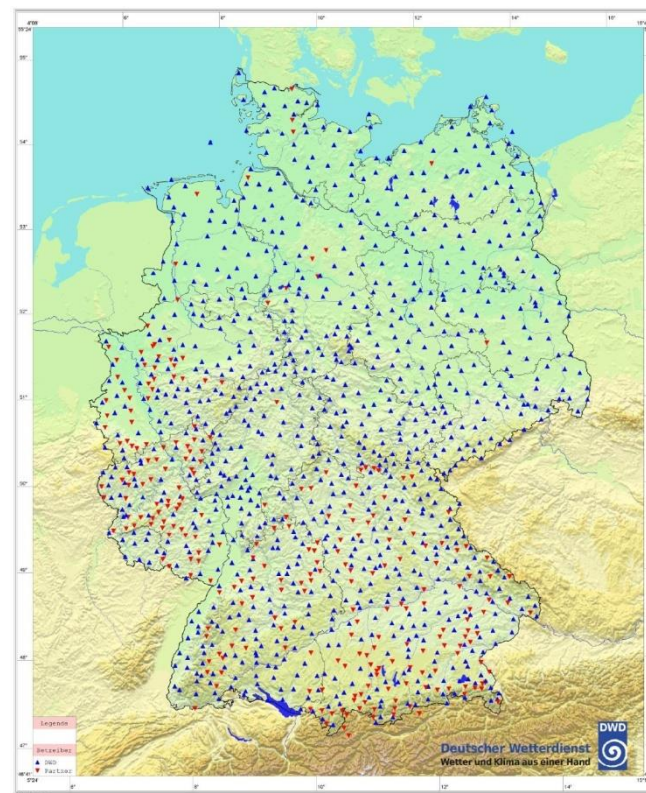


Current status: 16 dual pol doppler radar
1 single pol doppler radar

Rain Gauge Network

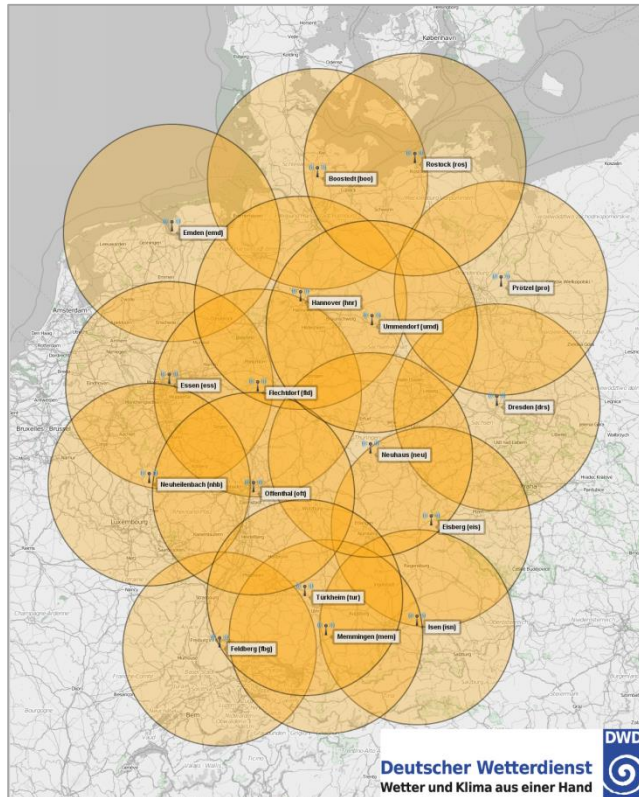


About 2000 rain gauges operated by DWD and state authorities

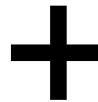
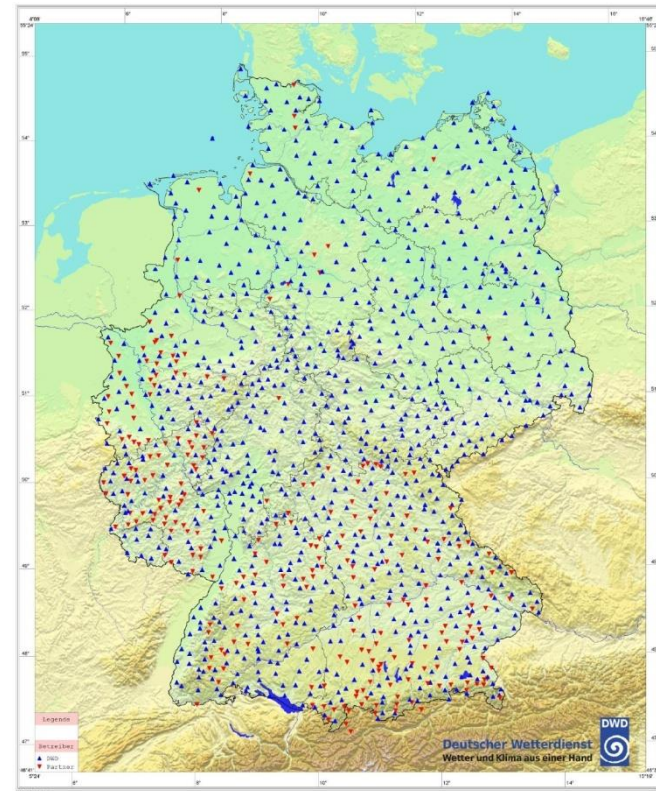


Radar-Online-Adjustment (RADOLAN)

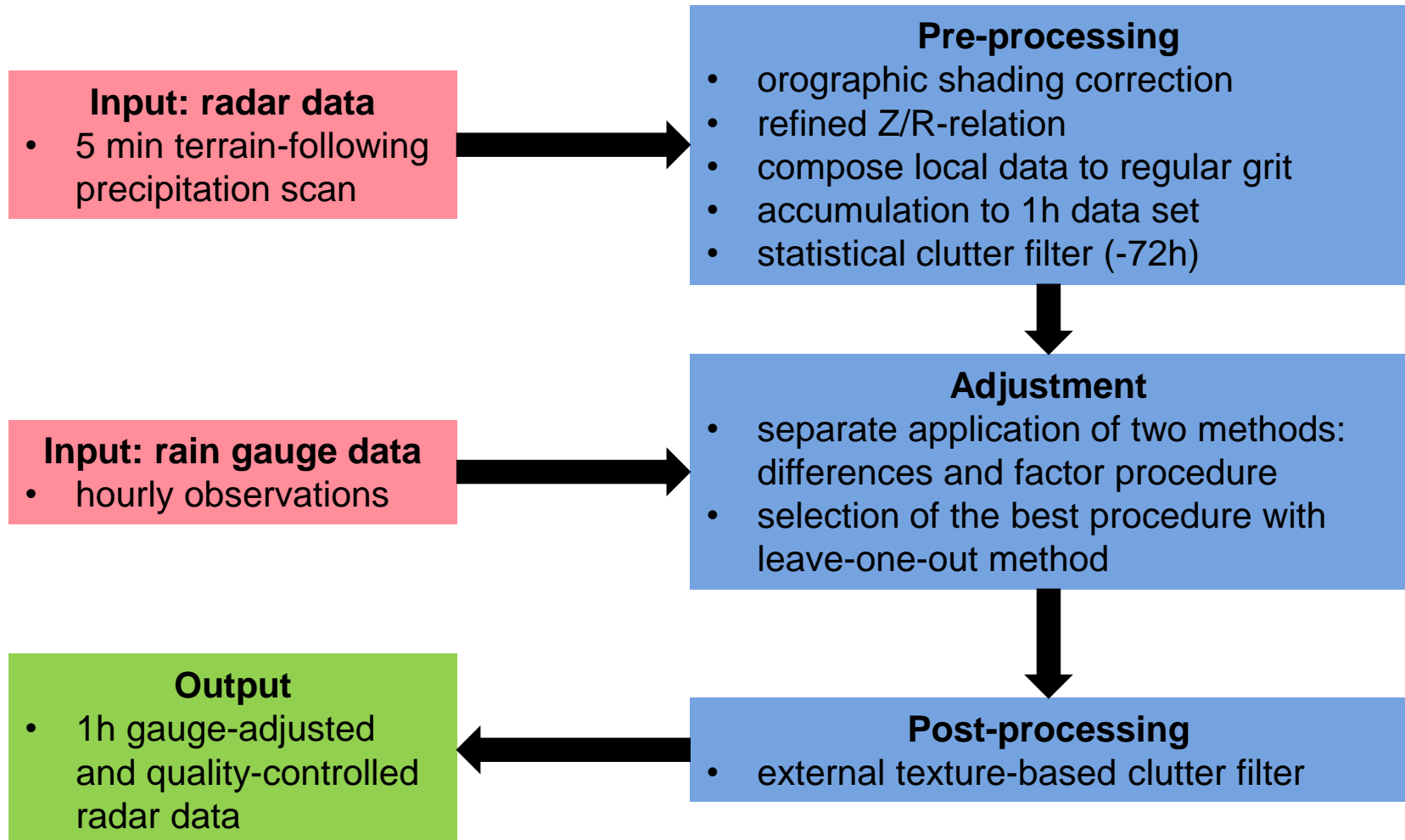
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About 2000 rain gauges operated by DWD and state authorities



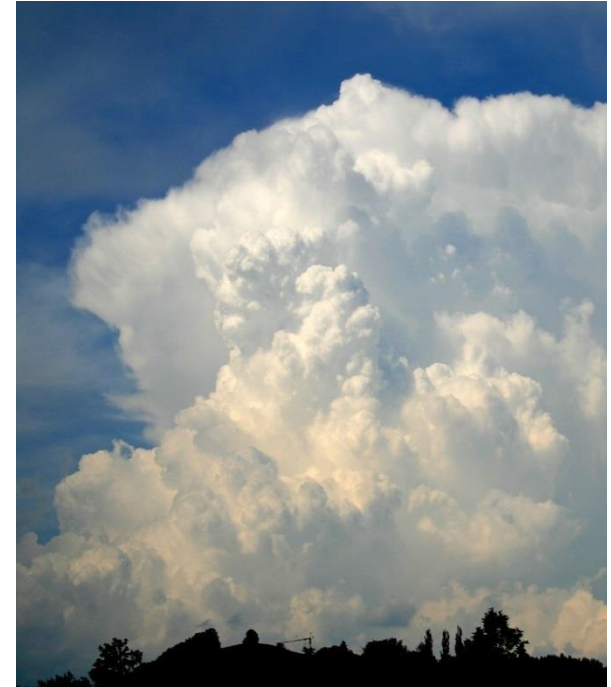
Radar-Online-Adjustment (RADOLAN)





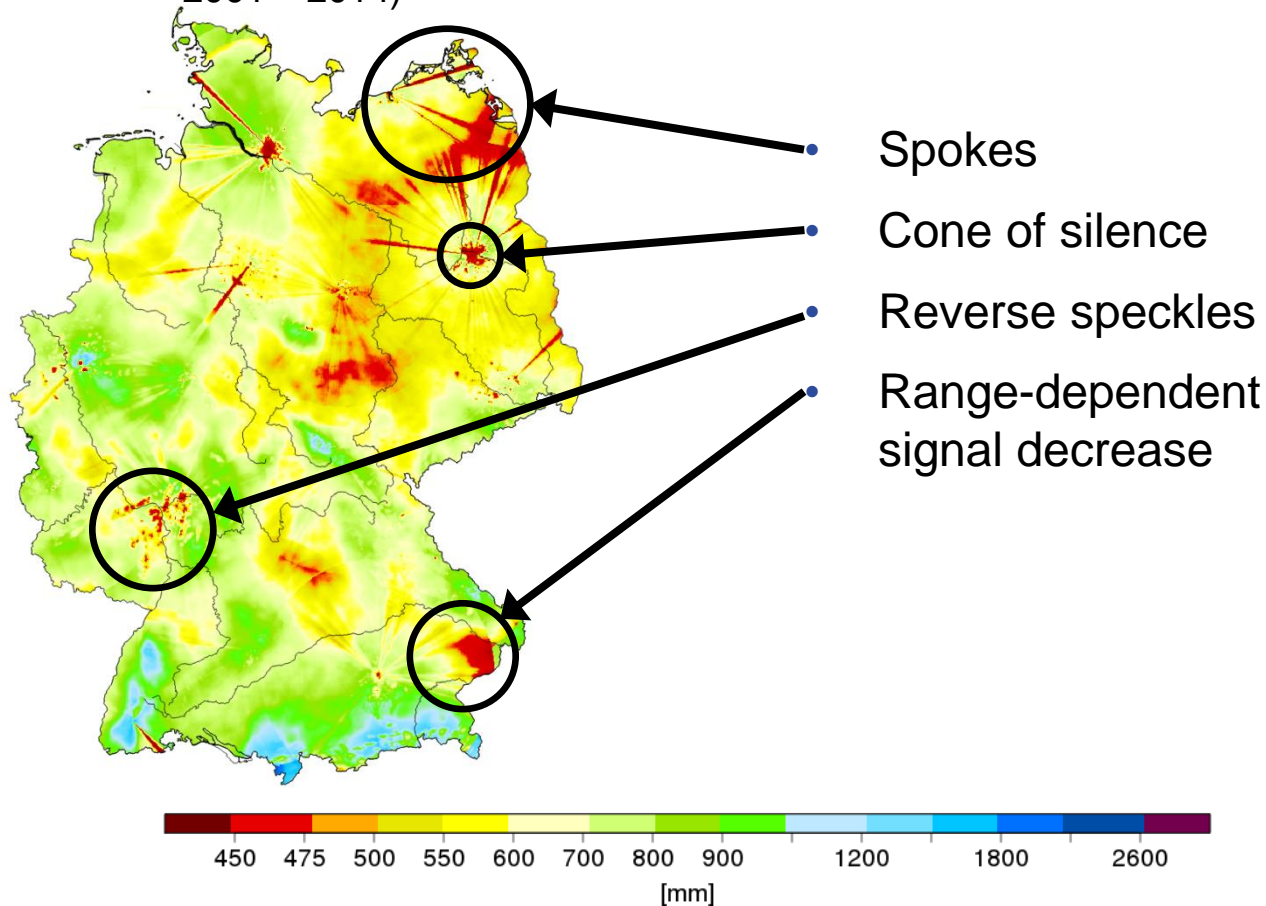
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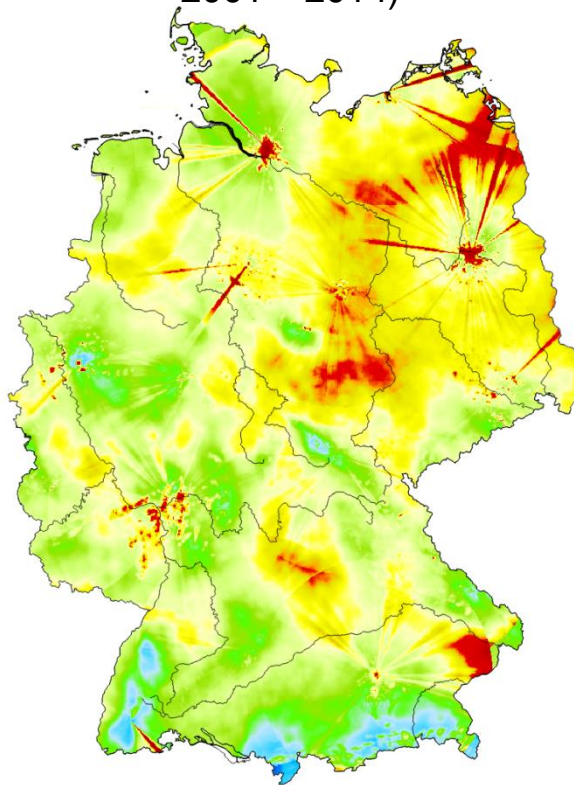
First Results

Mean Annual Precipitation
(radar climatology
2001 – 2014)

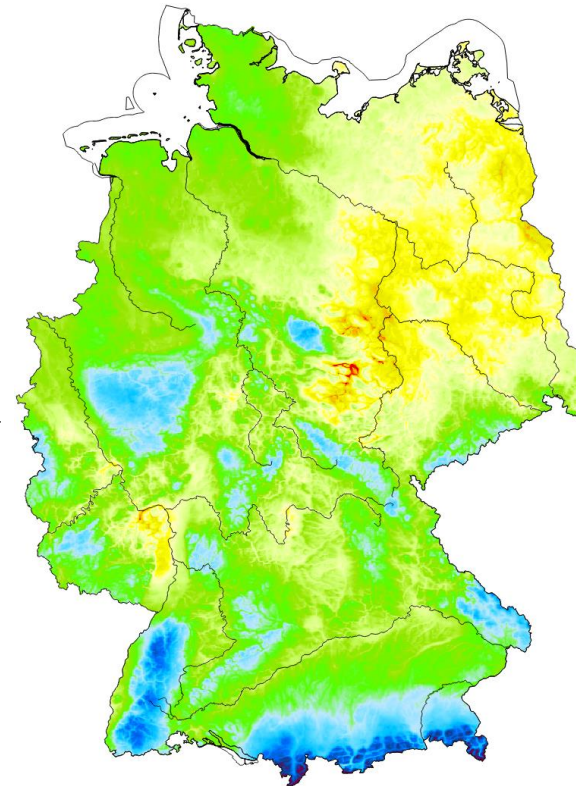


First Results

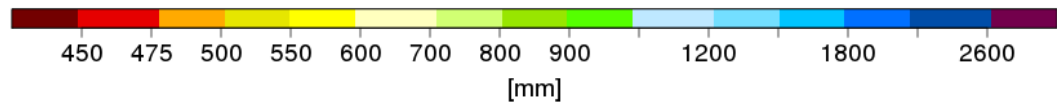
Mean Annual Precipitation
(radar climatology
2001 – 2014)



Mean Annual Precipitation
(station and orography-based
interpolation, 1981– 2010)



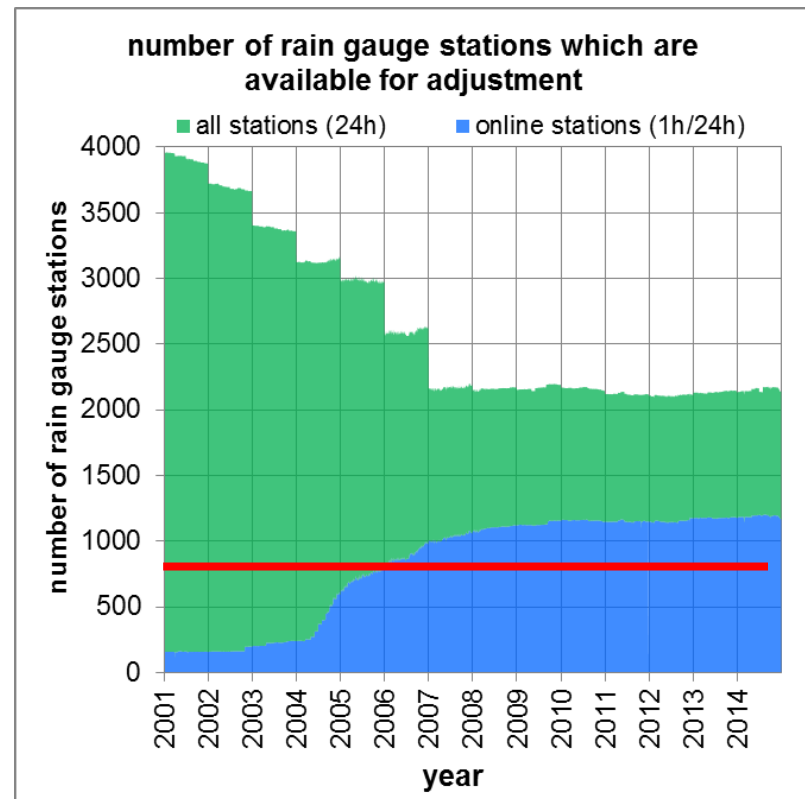
1.3x
→





Next Steps

- Additional rain gauge data



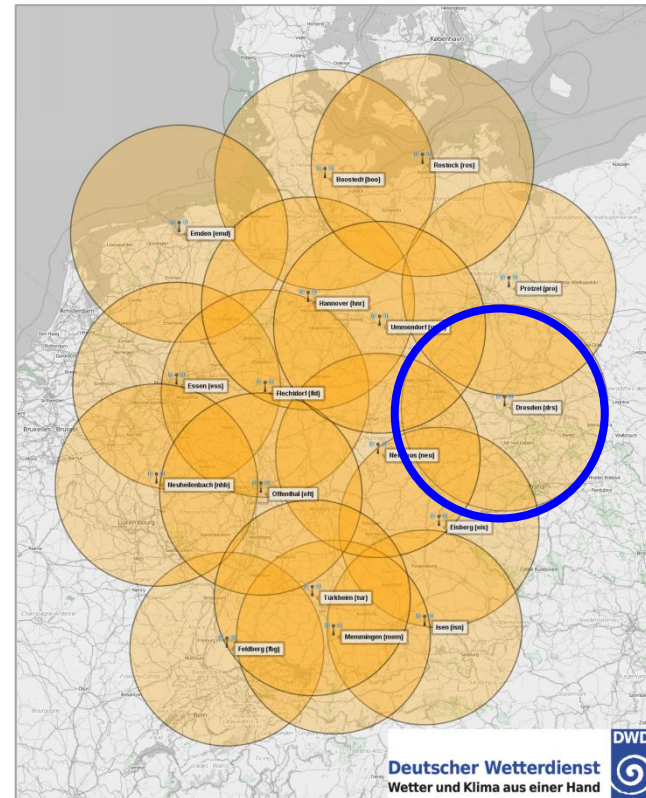
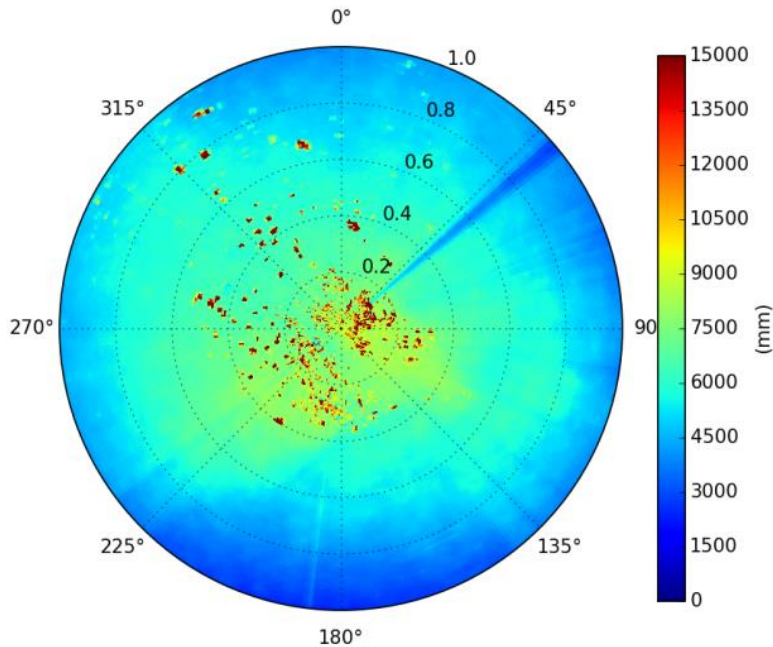
Next Steps

- Additional rain gauge data
- Improved preprocessing
 - Climatological correction



Climatological Radar Correction

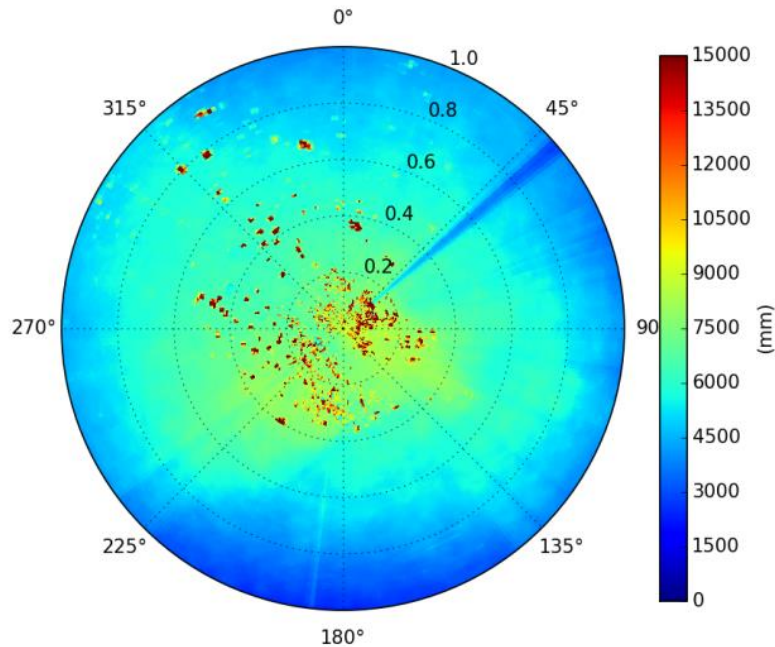
Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * without Correction



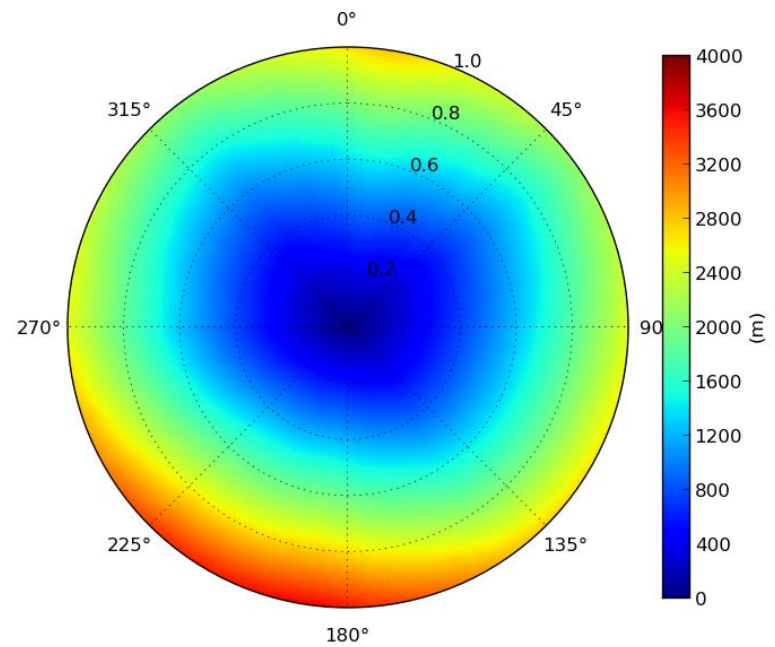


Climatological Radar Correction

Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * without Correction

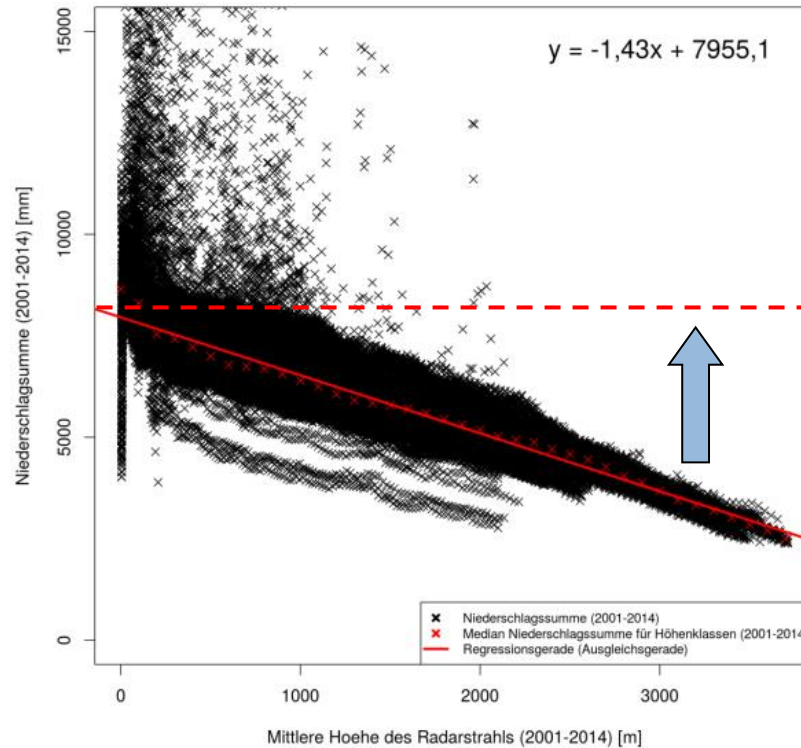
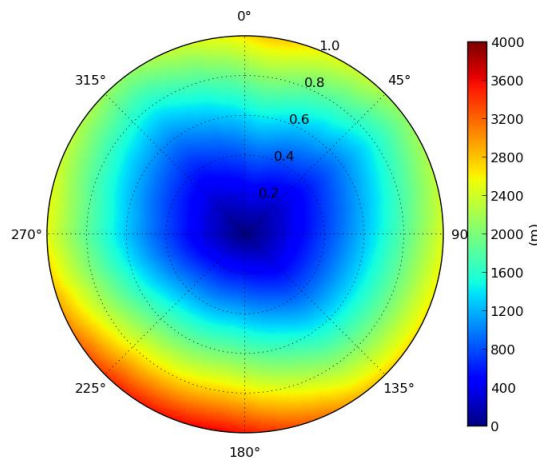
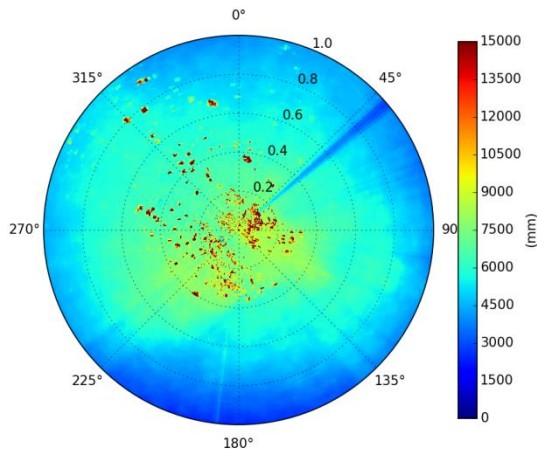


Mean Height of Radar Beam (DX) * Dresden-Airport (10488)
01/2001-07/2014



Climatological Radar Correction

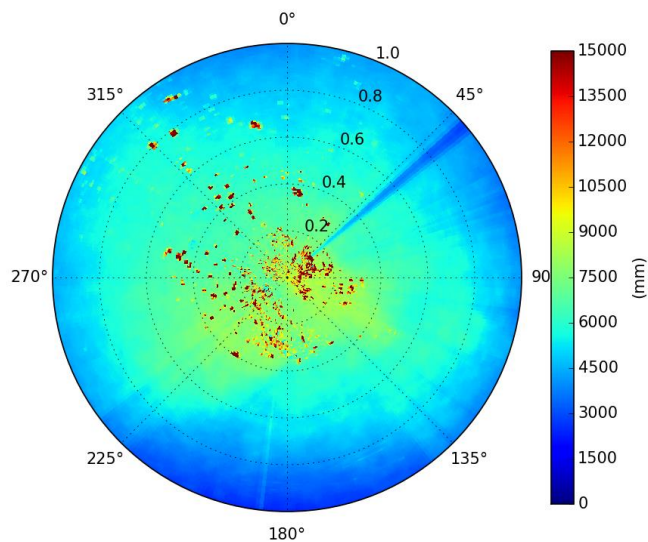
Total Precipitation (DX) * Dresden-Airport (10488)
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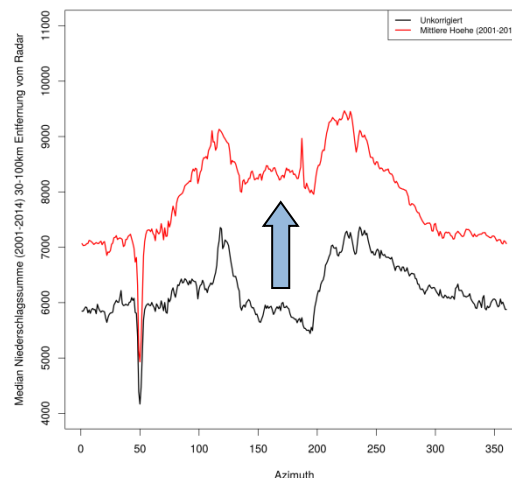
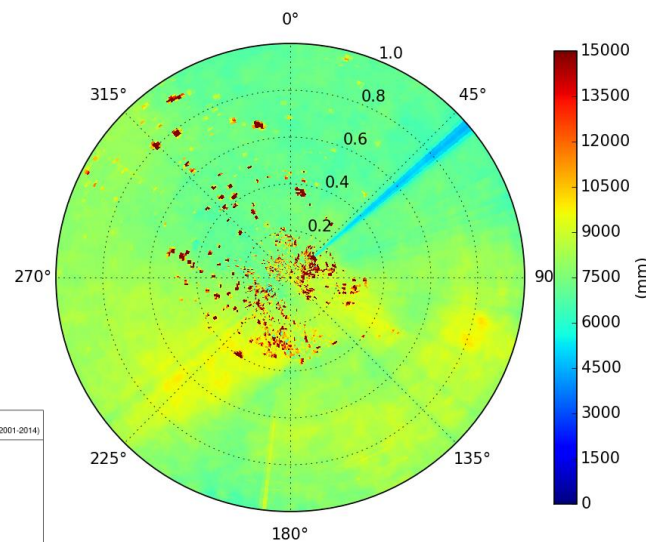
➤ Find correction factor

Climatological Radar Correction

Total Precipitation (DX) * Dresden-Airport (10488)
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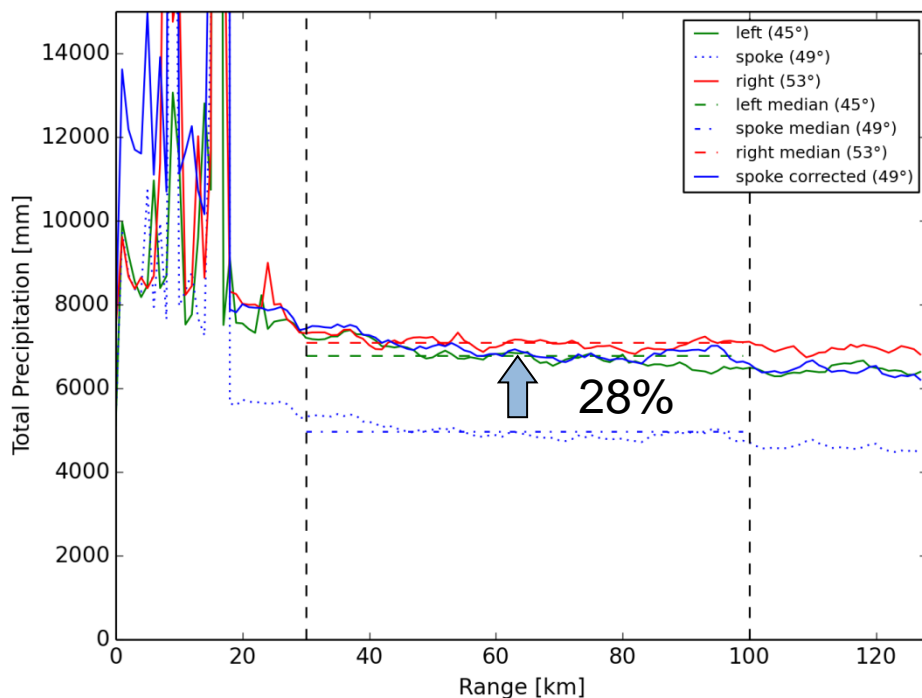


Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * with Range Correction

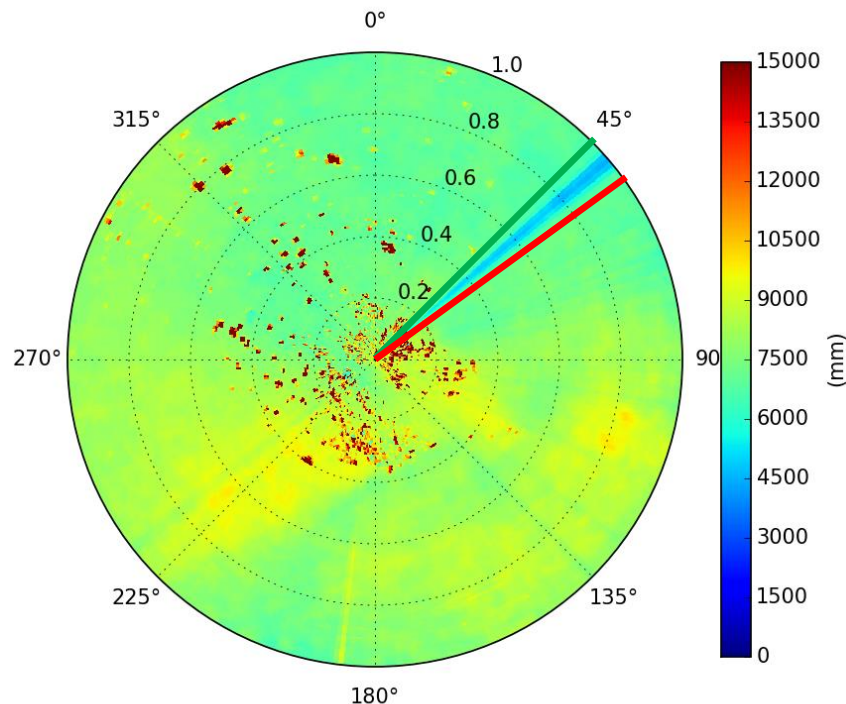


Climatological Radar Correction

Signal Path * Dresden-Airport (10488) * 01/2001-07/2014

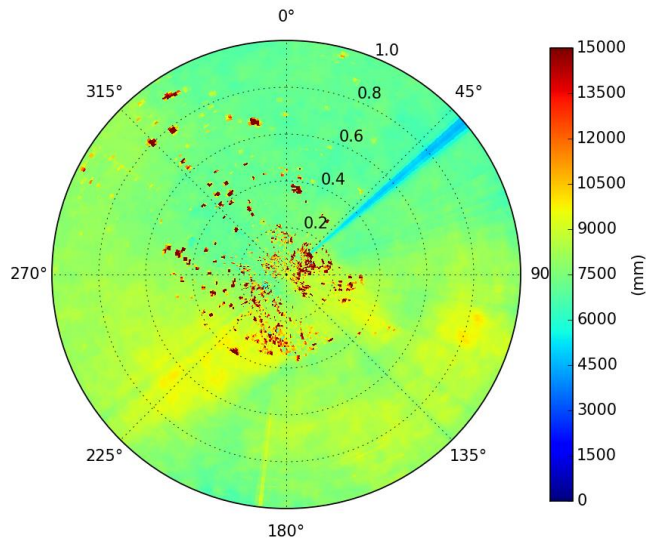


Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * with Range Correction

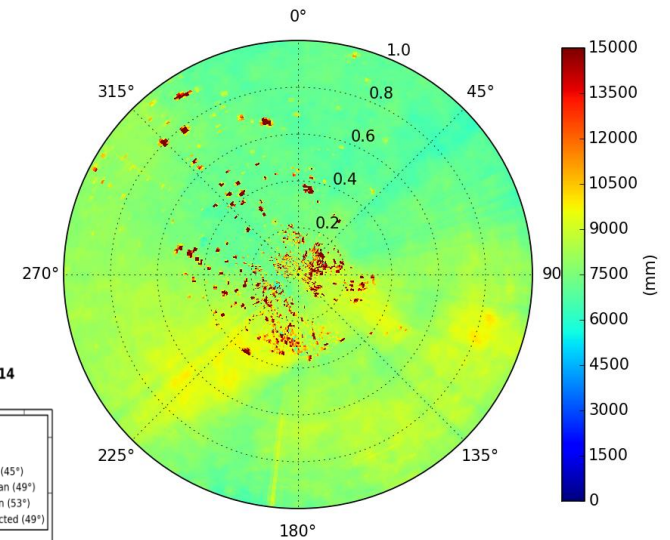


Climatological Radar Correction

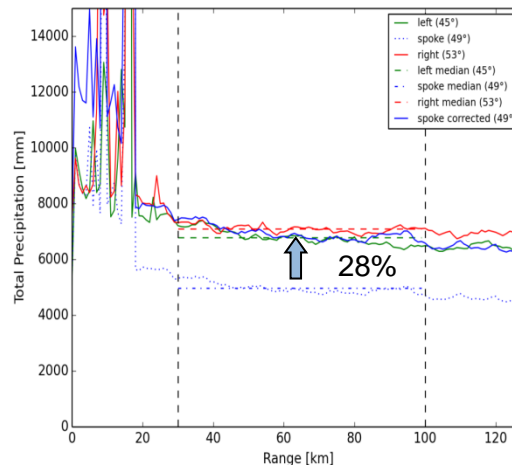
Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * with Range Correction



Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * with Range and Spoke Correction

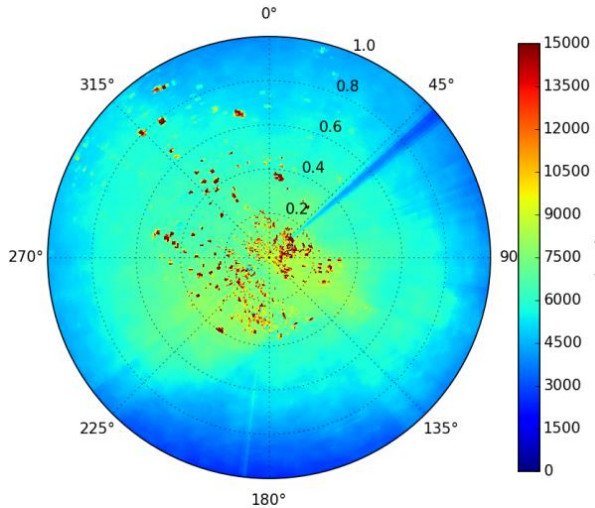


Signal Path * Dresden-Airport (10488) * 01/2001-07/2014

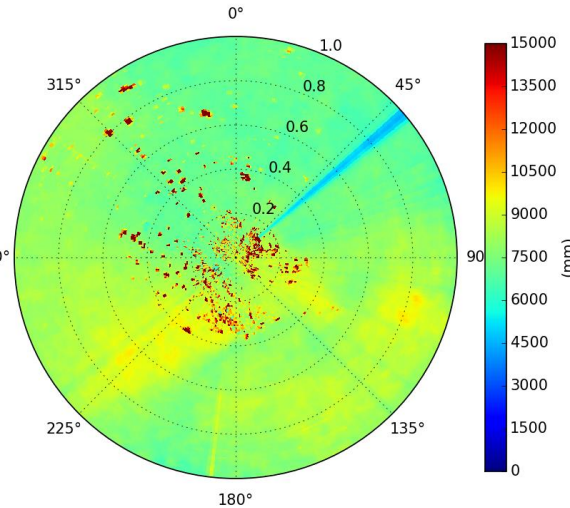


Climatological Radar Correction

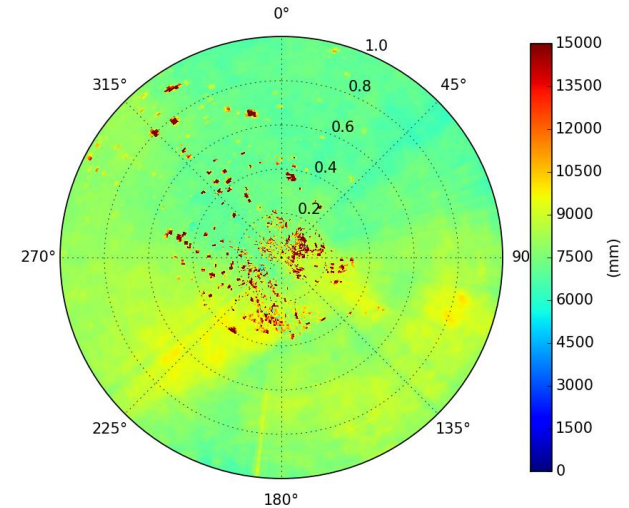
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Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * with Range Correction



Total Precipitation (DX) * Dresden-Airport (10488)
01/2001-07/2014 * with Range and Spoke Correction



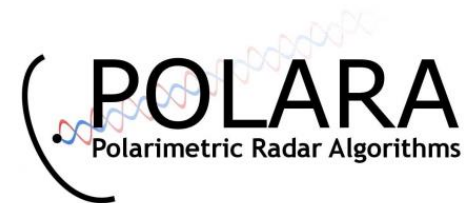
Range/height
correction



Spoke
correction

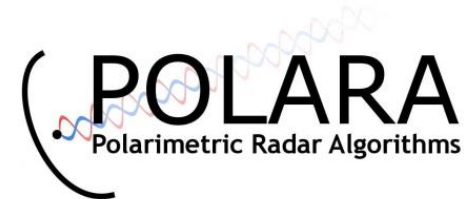
Next Steps

- Additional rain gauge data
- Improved preprocessing
 - Climatological correction
 - POLARA



Improved Preprocessing with POLARA

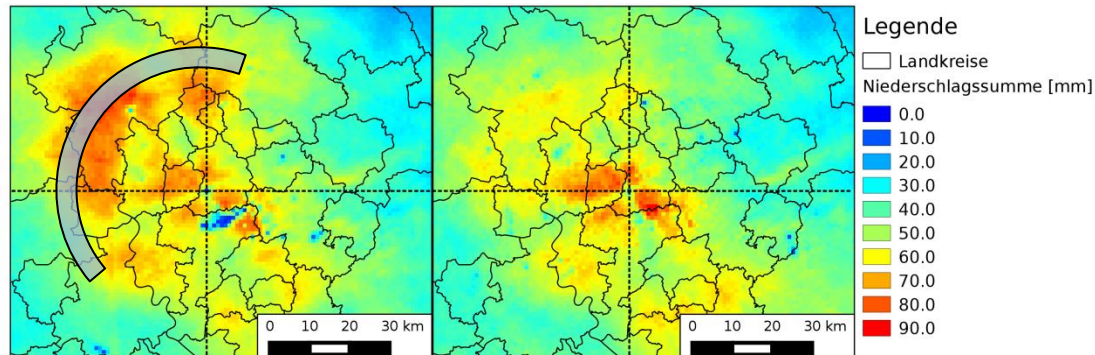
- Advanced software environment for real-time preprocessing



only RADOLAN

POLARA+ RADOLAN

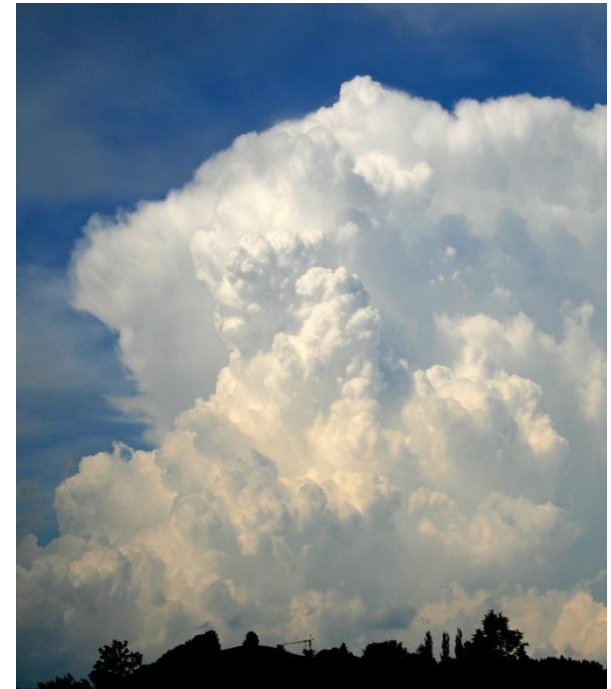
Influence of bright band





Summary

- Need for a high-resolution precipitation data set
- Combination of radar and rain gauge data (RADOLAN)
- First reprocessing: still radar artifacts but expected spatial distribution
- Next Steps: including additional rain gauge data and improving preprocessing





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