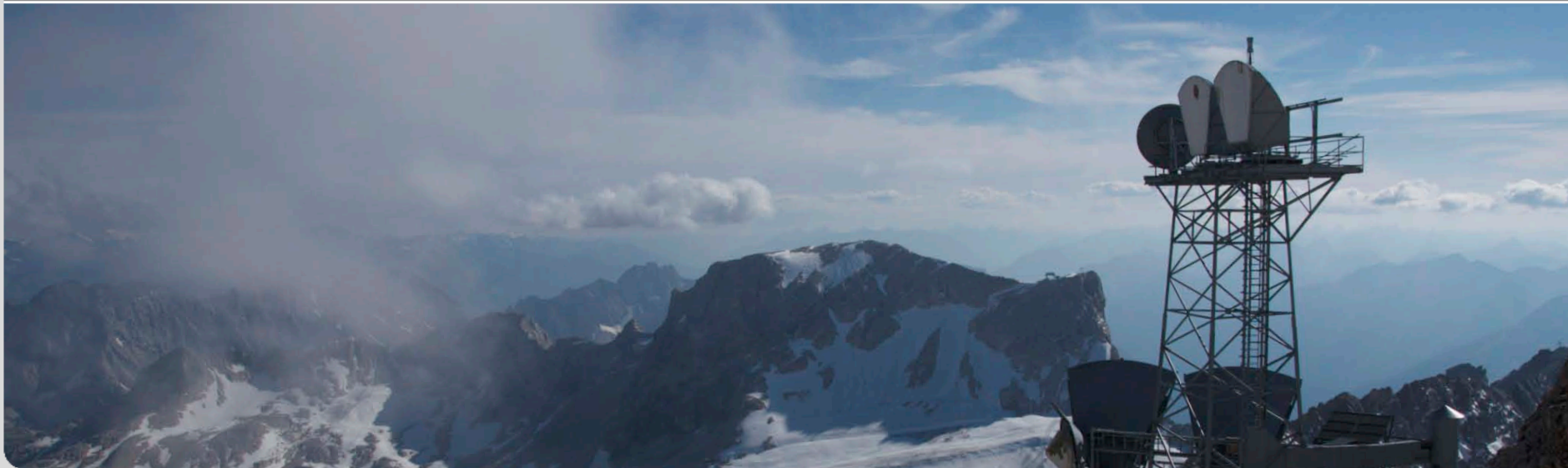


Precipitation observation using microwave backhaul links in the alpine and pre-alpine region of Southern Germany

Christian Chwala

Institute for meteorology and climate research – Atmospheric environmental research (IMK-IFU)

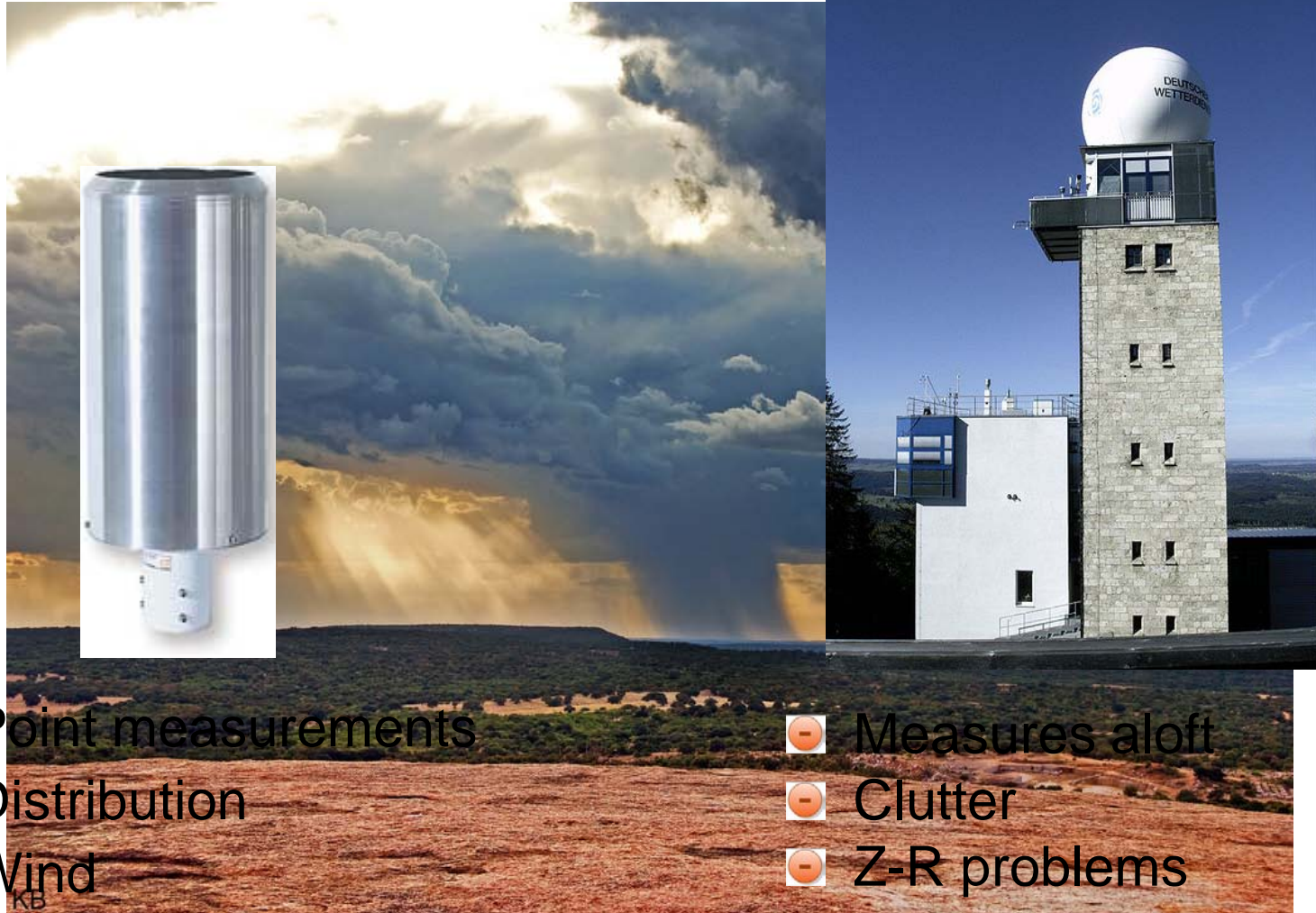


- Motivation
- Test region & MW links
- Data processing & Results
- Conclusion

WHY?
WHAT?
HOW?

Why?

Establishing methods and spatial distribution



- Point measurements
- Distribution
- Wind

- Measures aloft
- Clutter
- Z-R problems

What?

▪ Rain gauge

- Point measurement
- At ground
- Direct measurement
- Problematic distribution

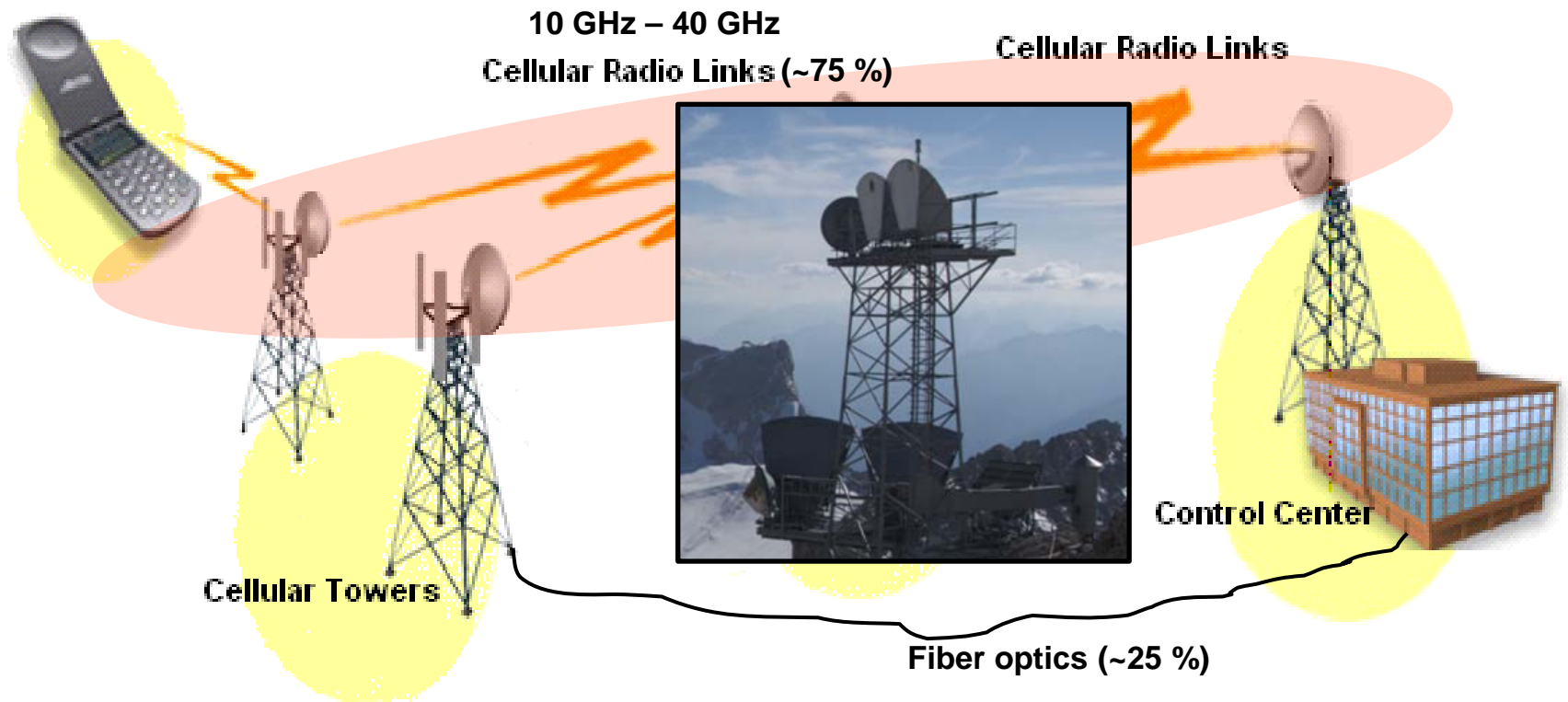


▪ Radar

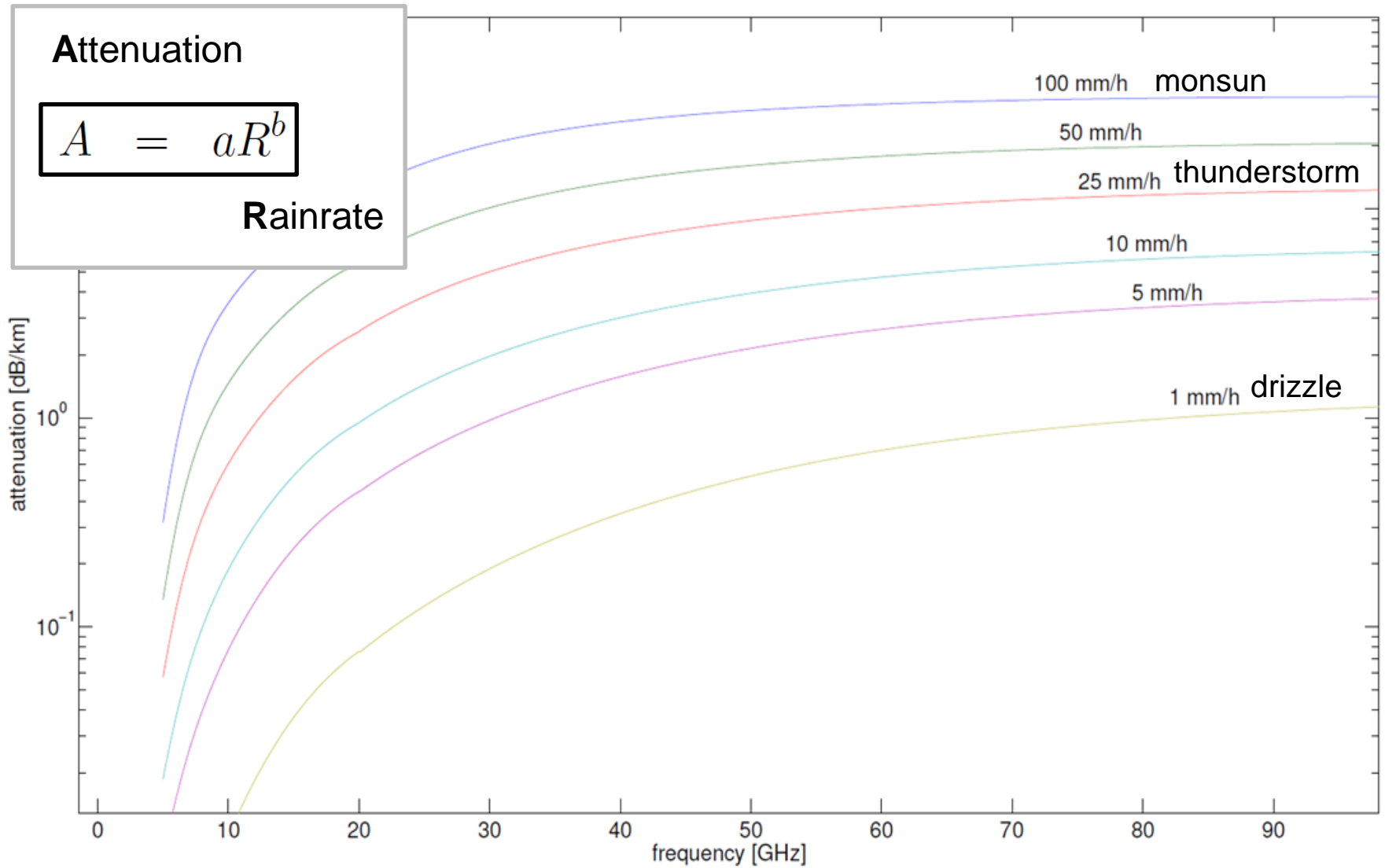
- Volume
- Aloft
- Indirect (reflectivity)
- Volume coverage

How?

Precipitation Observation by Cellular Network Microwave Attenuation



How?



- Motivation
- **Test region & MW links**
- Data processing & Results
- Conclusion

Test region - T-RENO pre-alpine

Met equipment

- DWD rain gauges
- DWD + own X-band radar
- Met station Mnt. Wank
- Gauges Mnt. Wank

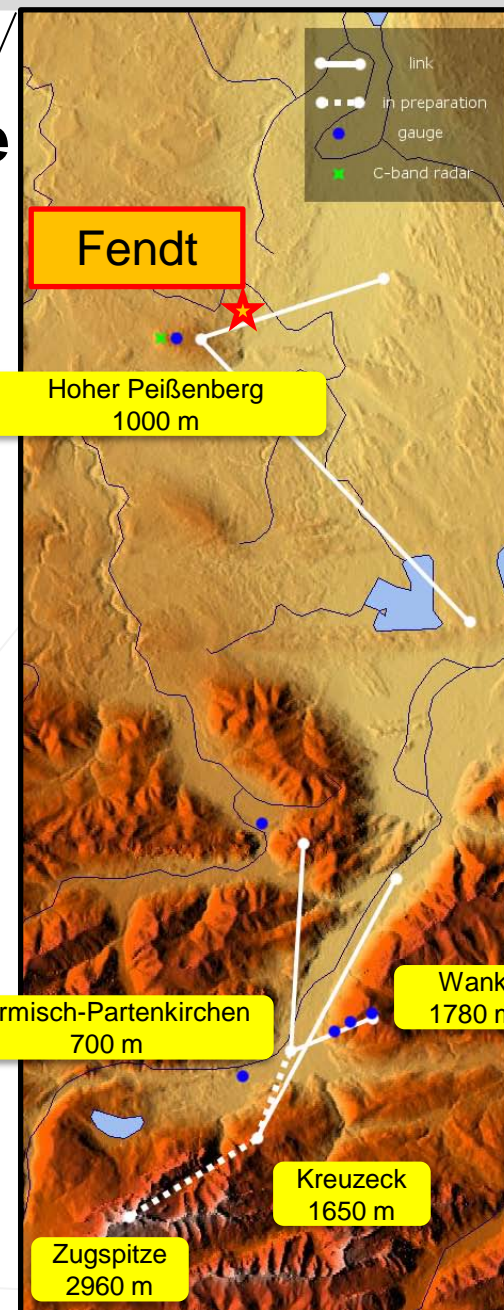
Links

- From Ericsson
- Own DAQ module
- Minutely average
- GSM data transfer

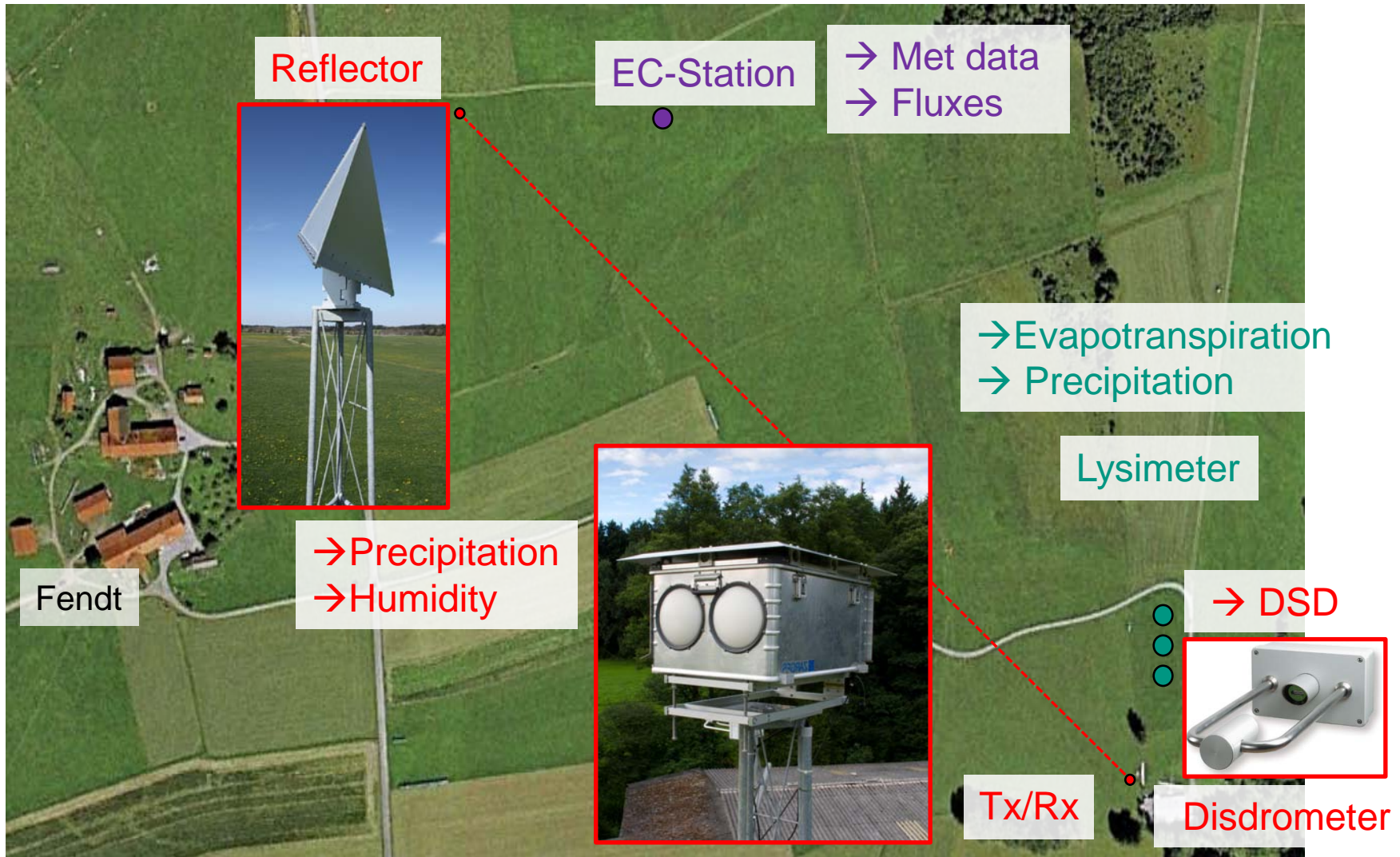


Modeling

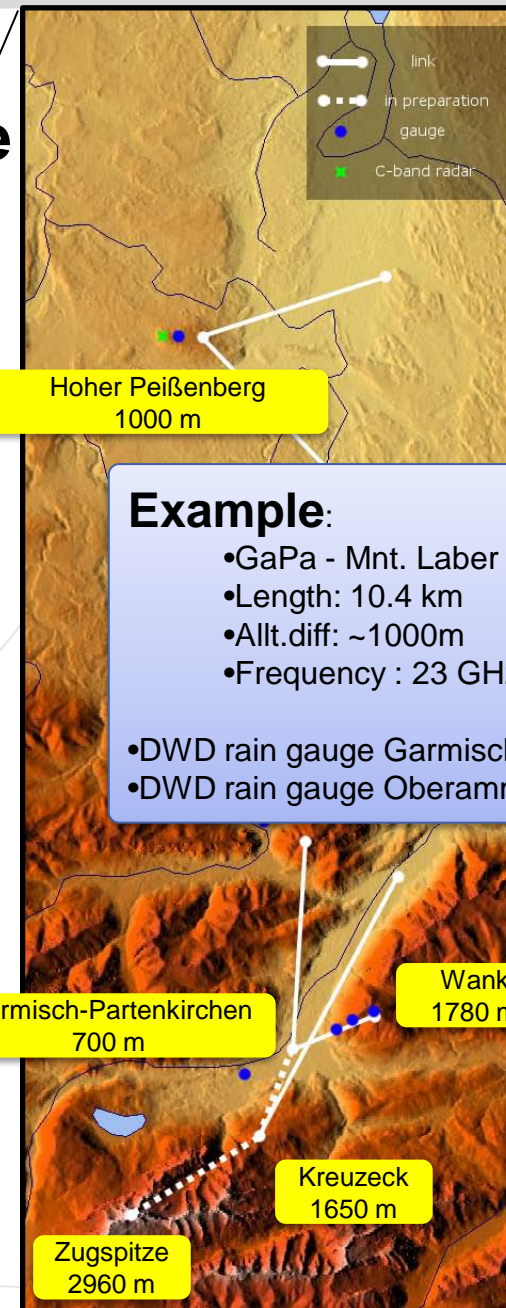
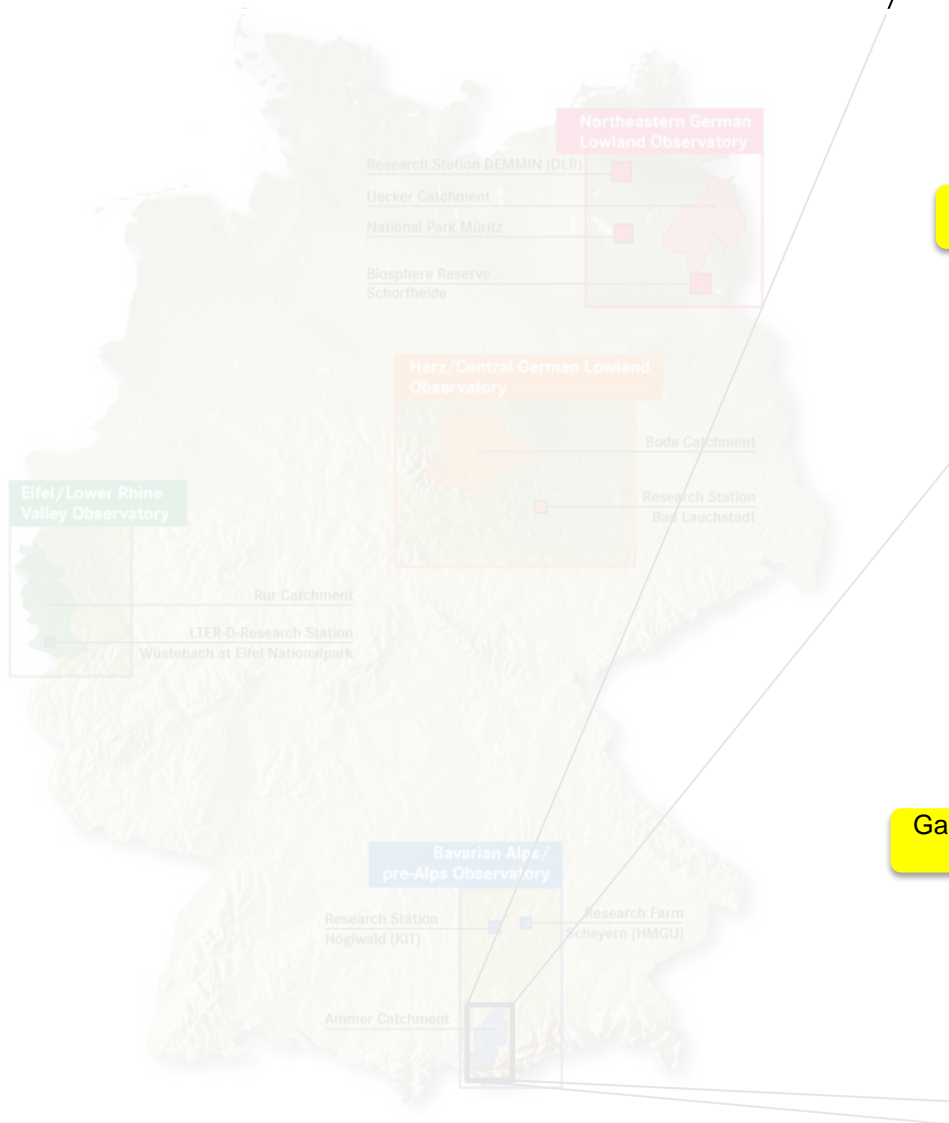
- WRF
- WRF-NDHMS
- GEOtop



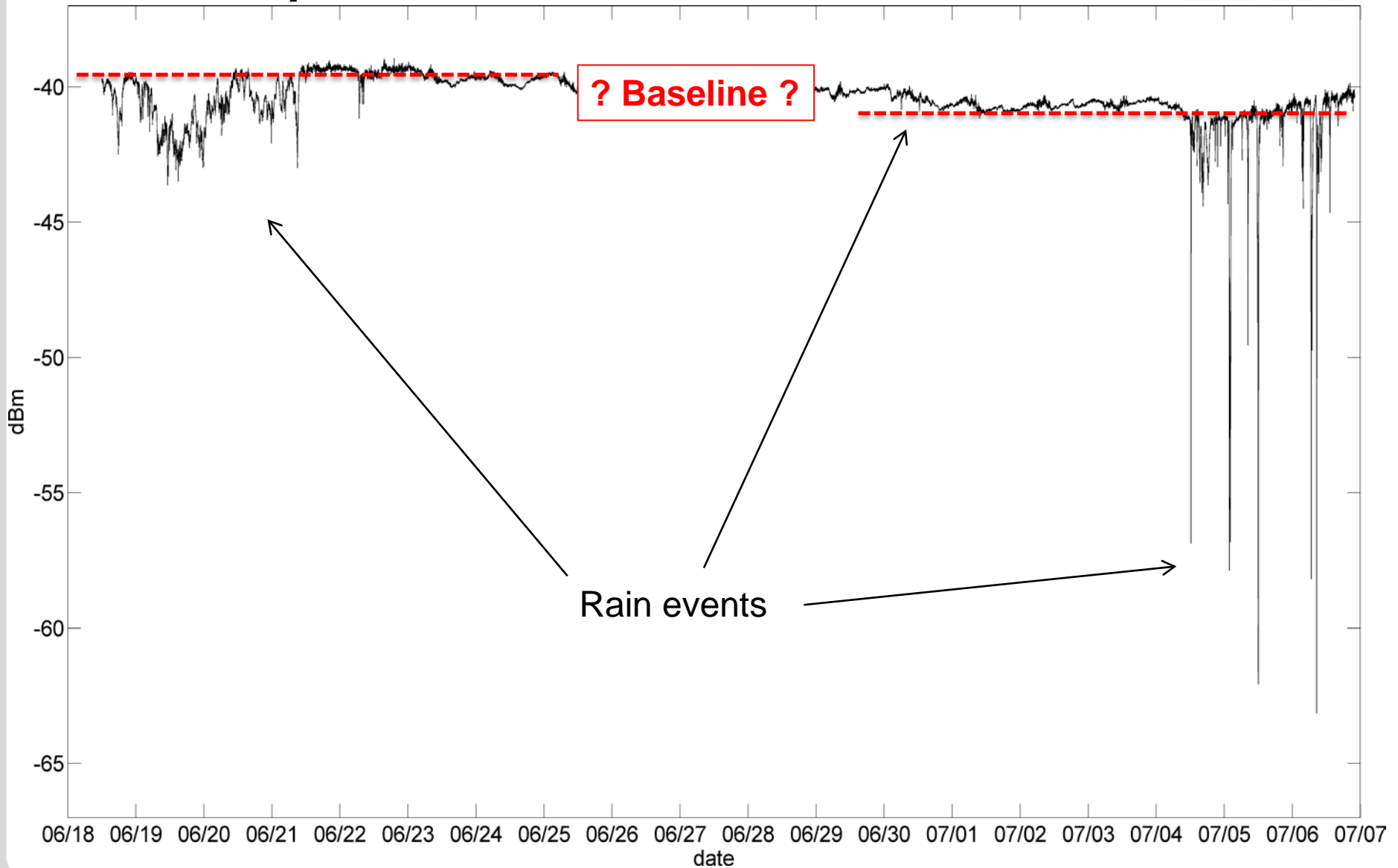
TERENO test site Fendt



Test region - T_ERENO pre-alpine

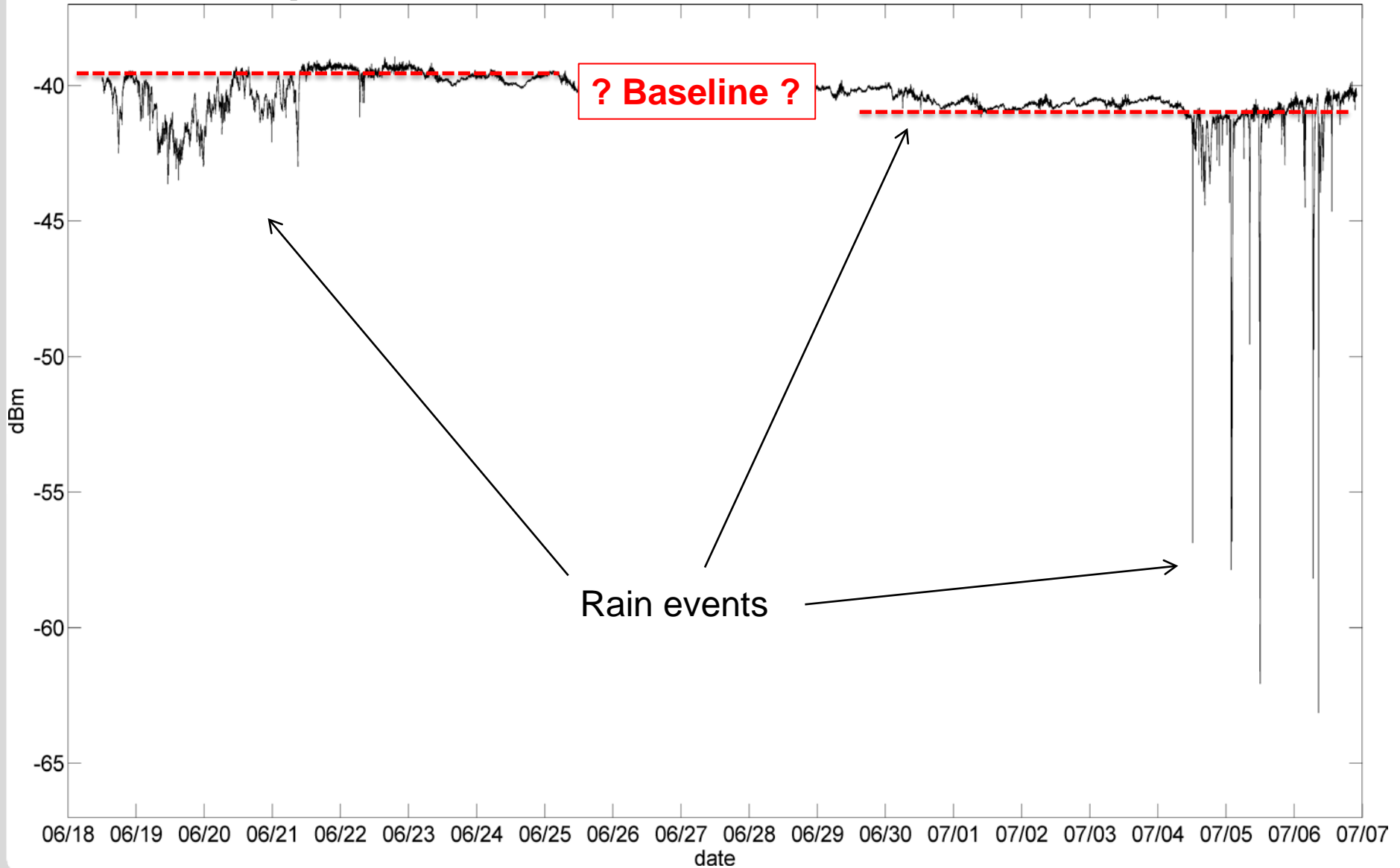


Received power



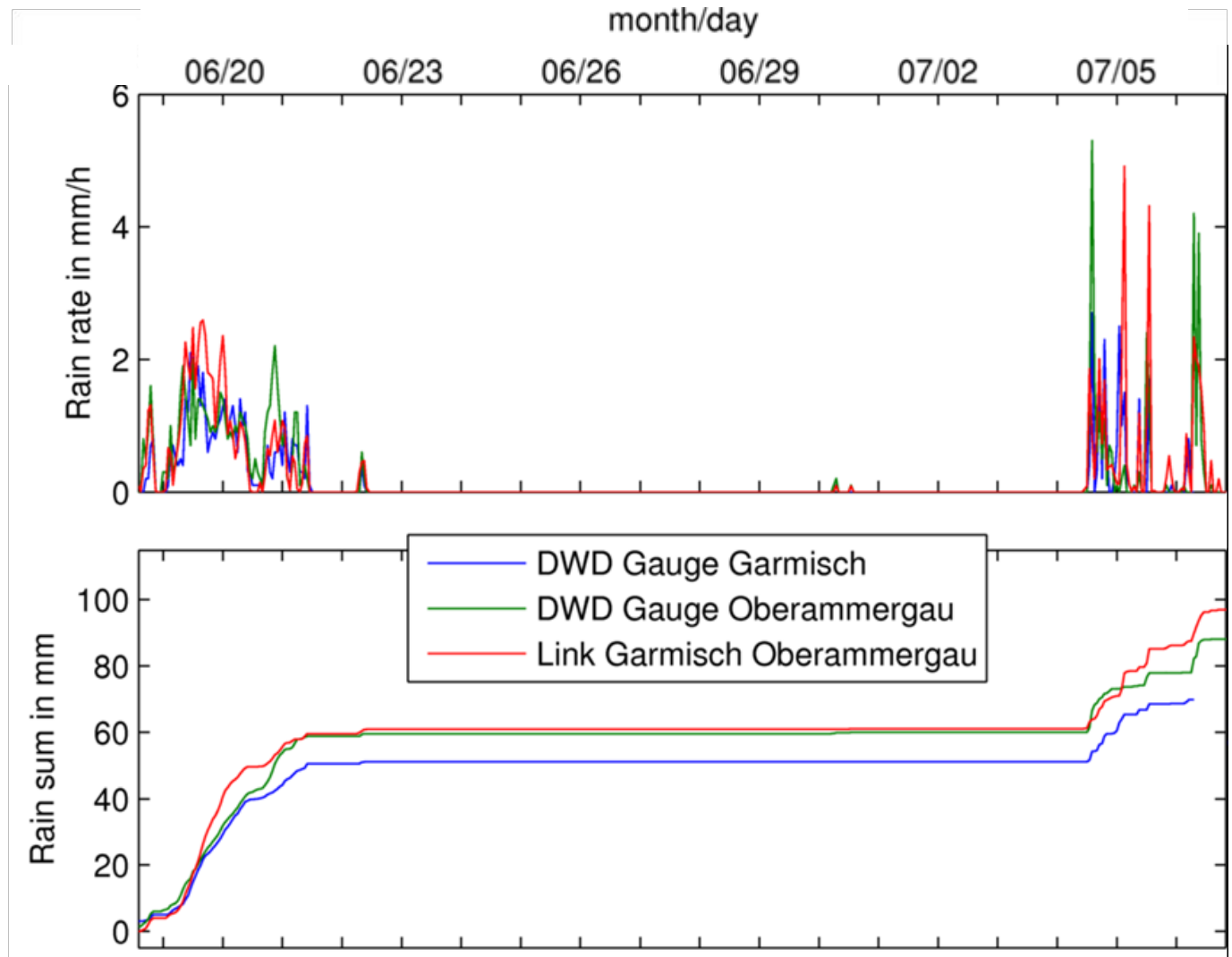
- Motivation
- Test region & MW links
- **Data processing & Results**
- Conclusion

Received power

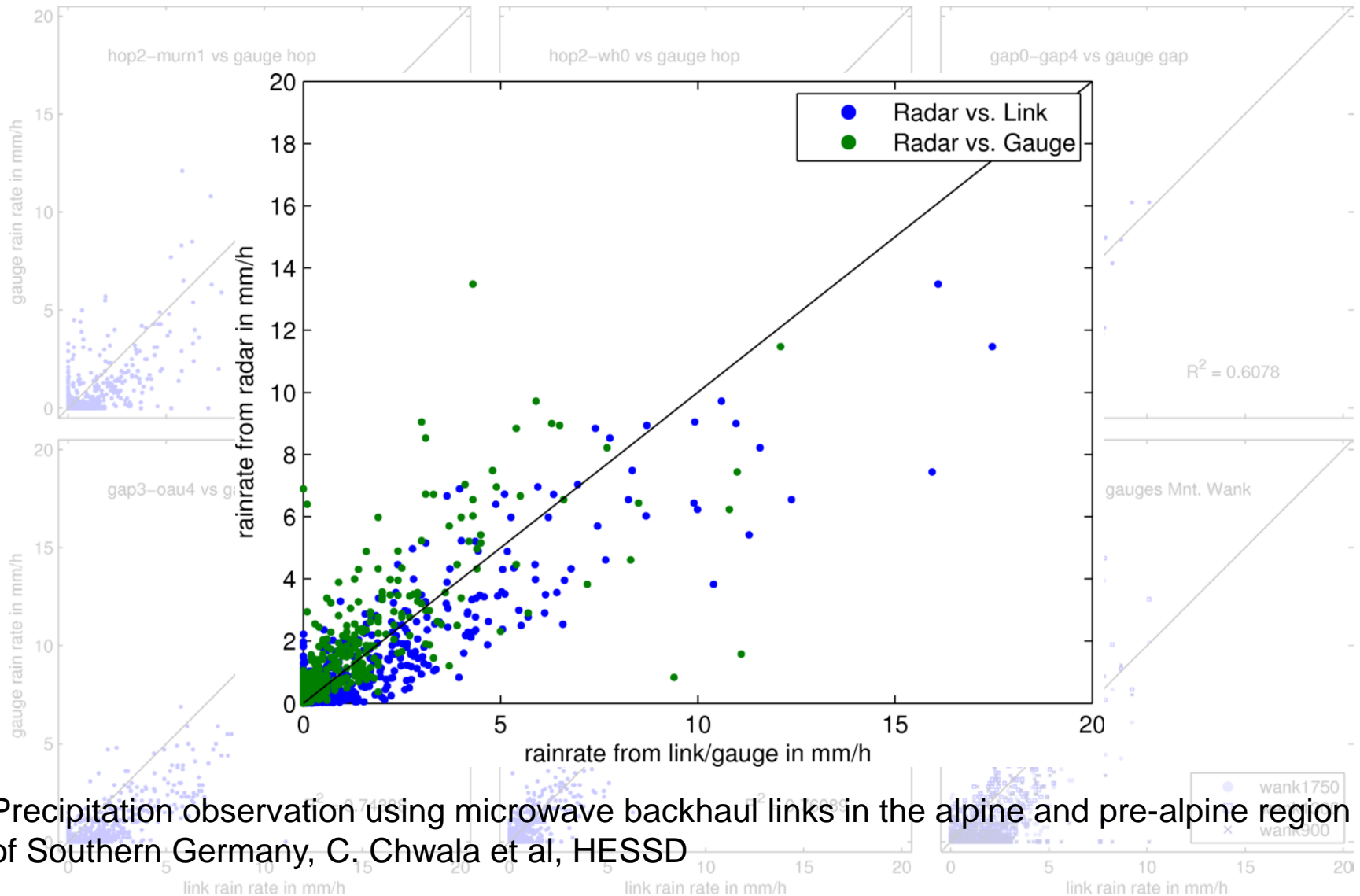


Wet/dry estimation

- STFT
- f_low vs. f_high
- Threshold
- Baseline
- Rain rate



Rain rates 06/2010-10/2010



Precipitation observation using microwave backhaul links in the alpine and pre-alpine region of Southern Germany, C. Chwala et al, HESSD

- Motivation
- Test region & MW links
- Data processing & Results
- **Conclusion**

A good complement

▪ Rain gauge

- Point measurement
- At ground
- Direct measurement
- Problematic distribution

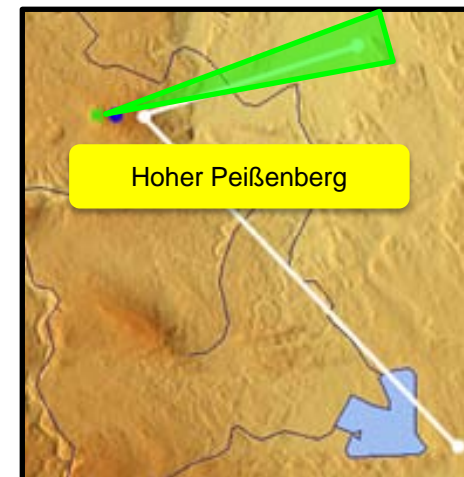


▪ Radar

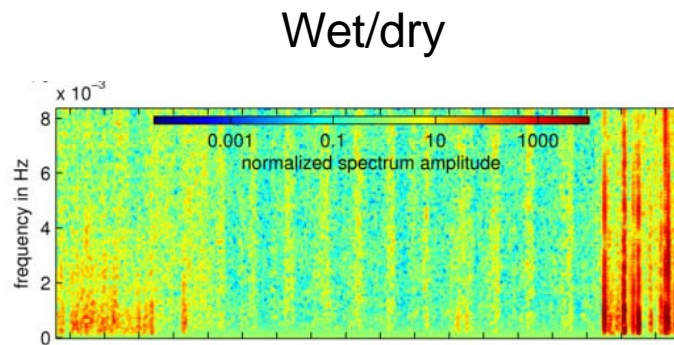
- Volume
- Aloft
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- Volume coverage

Potential

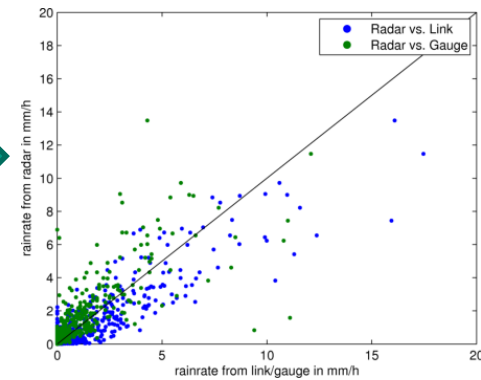
- More than 100.000 links in Germany
- High density in
 - Urban areas
 - Alpine regions (hubs on high peaks)
- Available in developing countries
- Usage:
 - Standalone
 - Complementing radar & gauge



Summary



Robust rain rate estimation



Thank you!