Validation of GPM DPR Rainfall Products with Long-Term Observations in Palau

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Outline

Objective of this study:

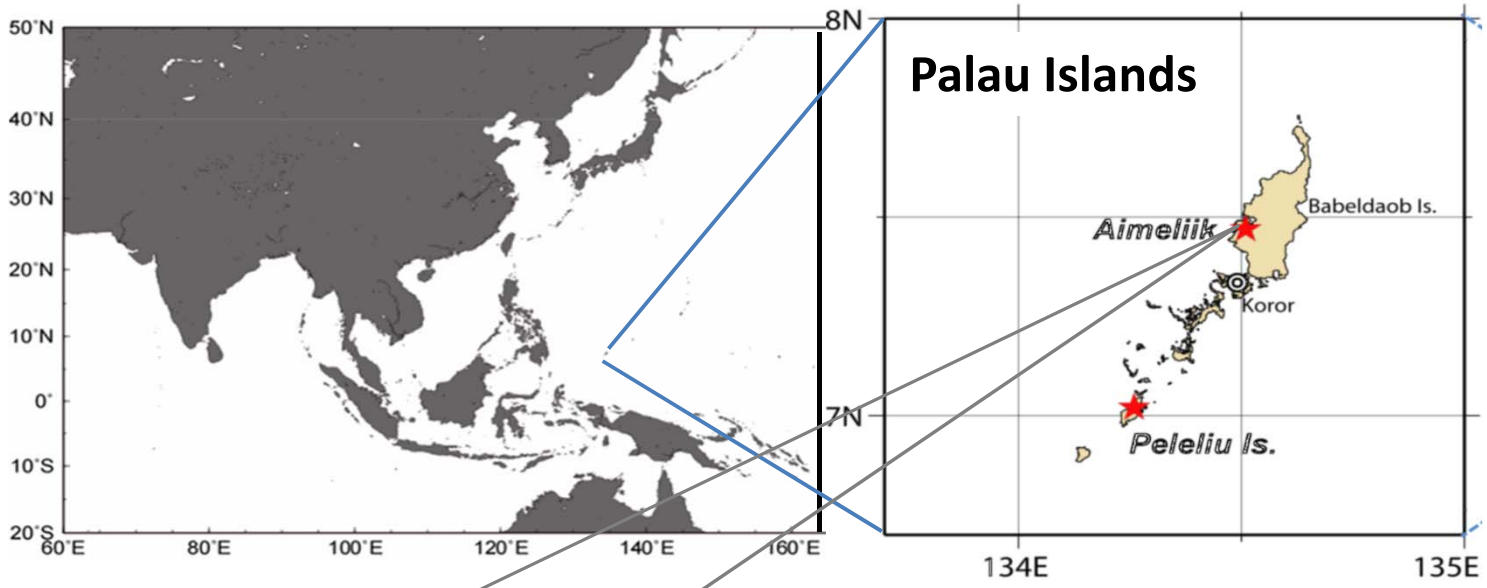
To validate GPM DPR rainfall products by comparing them with observations on precipitation events conducted by the JAMSTEC in Palau.

Contents of this presentation:

- Overview of the observation in Palau
- Validation plan for GPM DPR
- Research work prepared for the validation (FY2013 achievement)

Overview of the observation in Palau

Observational research in Palau has been conducted by the JAMSTEC since 2000.



X-band Doppler radar installed in Aimeliik

Instruments in Aimeliik

X-band Doppler radar
Disdrometer
Lidar
AWS
MRR (to be installed)

Validation plan for GPM DPR

Active convection around Palau, including:

- MJO event;
- Tropical depression and Typhoon;
- Monsoon;
- ITCZ;
- Easterly wave.

Direct validation and quantitative assessment of GPM DPR rainfall products through comparisons with Palau-based observations for various precipitation systems, including:

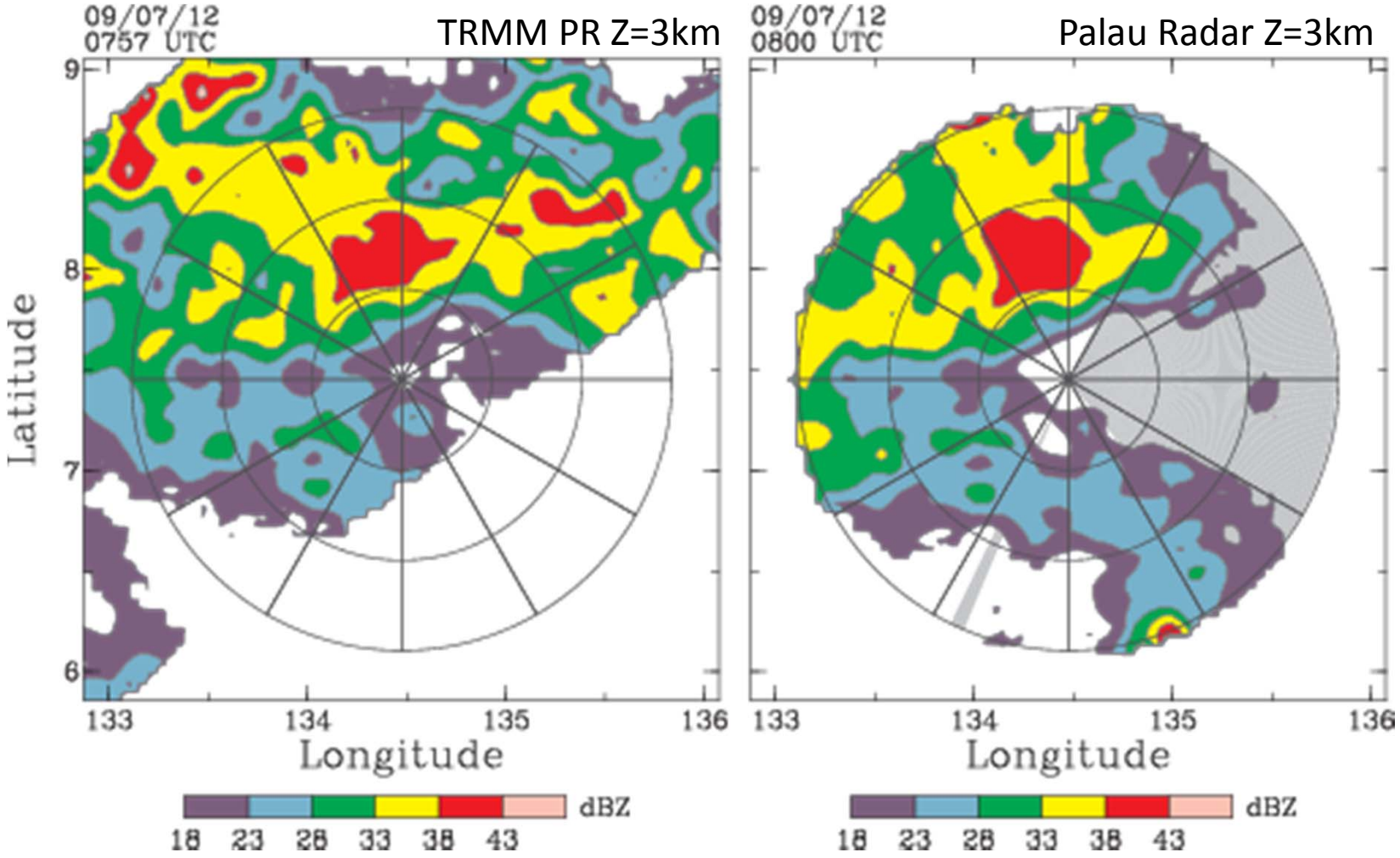
- Three dimensional radar reflectivity;
- Rain rate;
- Drop size distribution near the surface.

Research work prepared for the validation (FY2013 achievement)

Using TRMM PR as an alternative source, research work for the validation of GPM DPR by using the data of Palau radar has been conducted, including:

- Common coordinate interpolation;
- Calibration of Palau radar;
- Comparison between the spaceborne and ground radars.

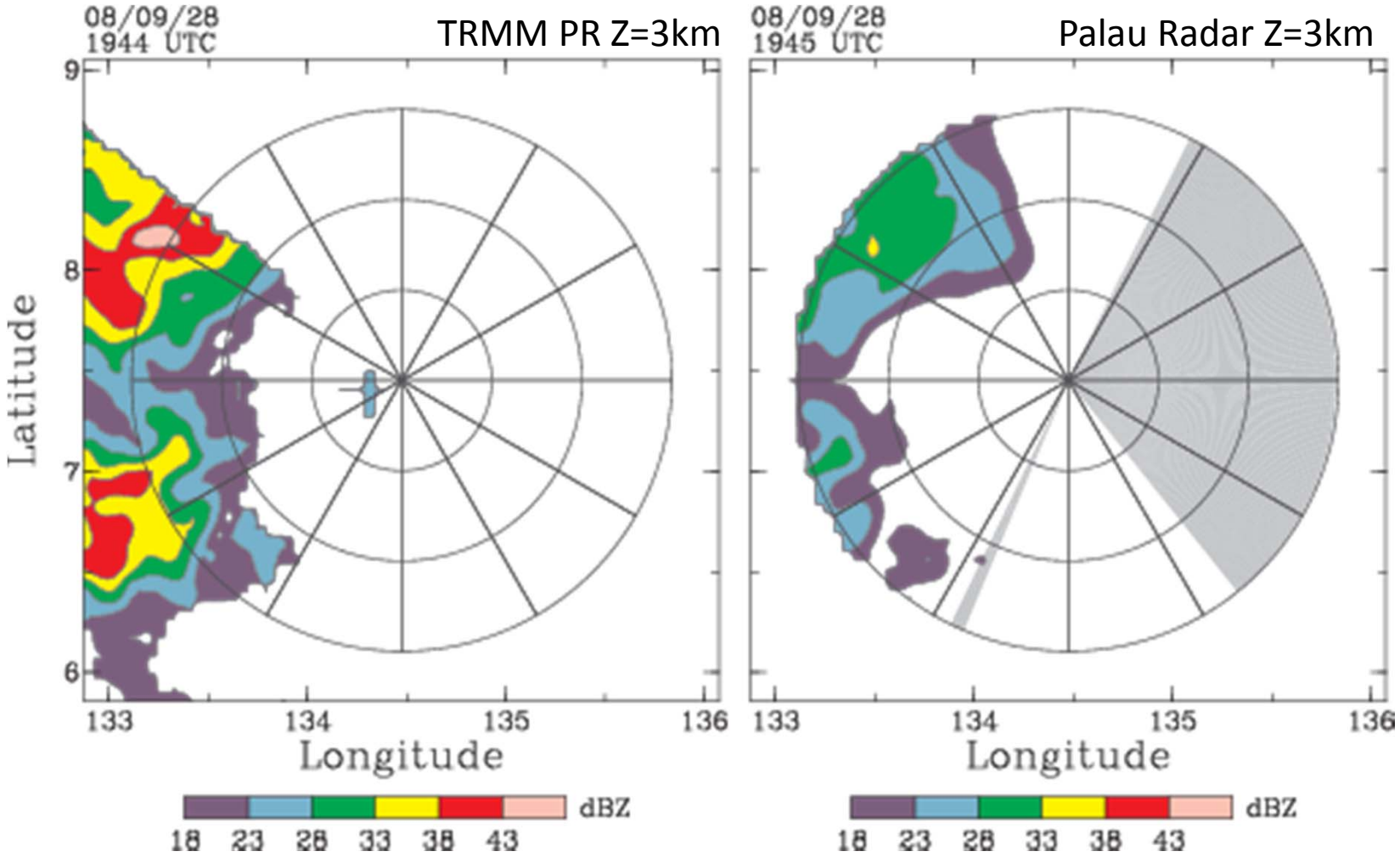
Common coordinate interpolation



Space resolution: 5km x 5km x (0.25km or 0.5 km)

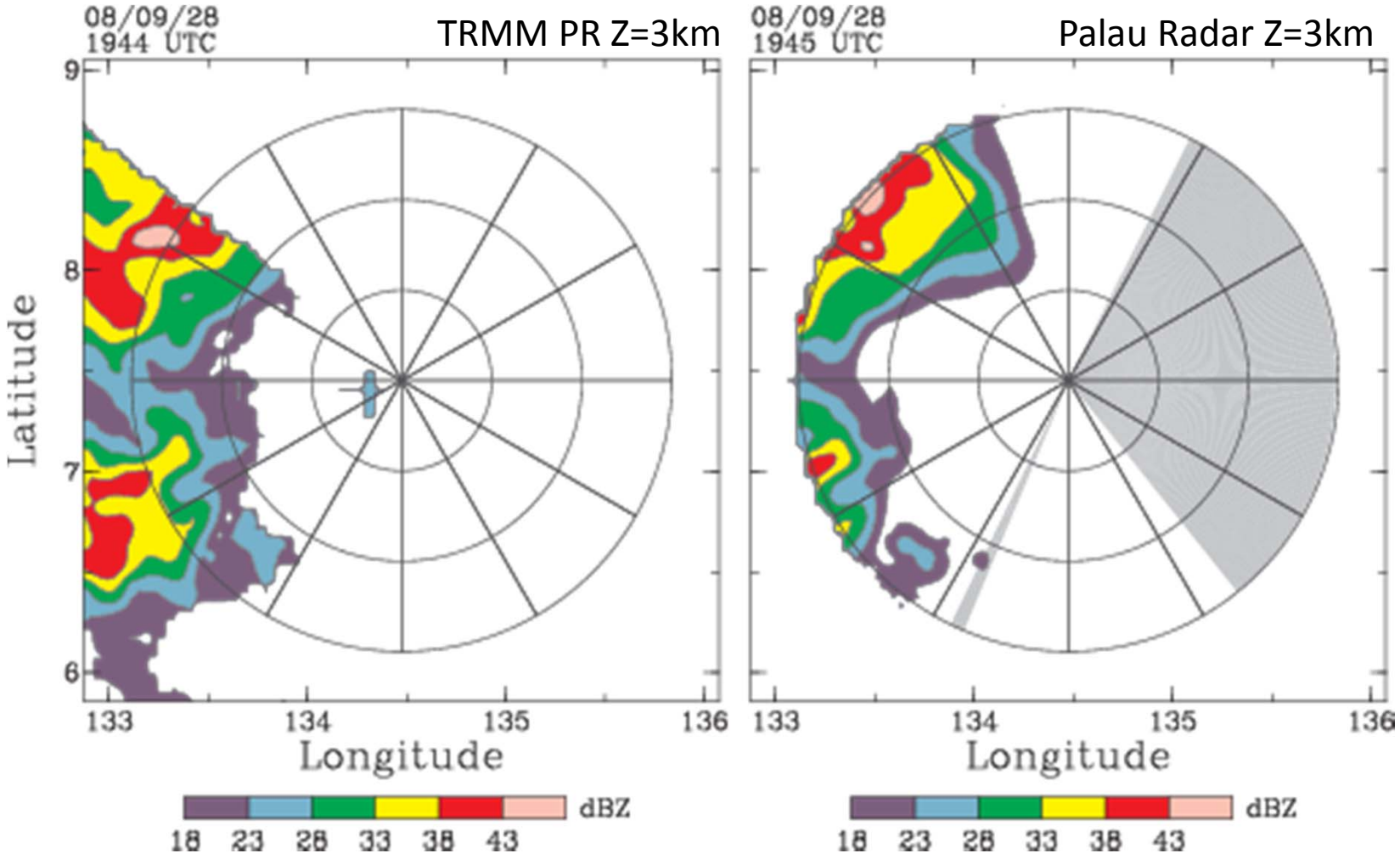
Time difference: within 6 minutes

Calibration of Palau radar



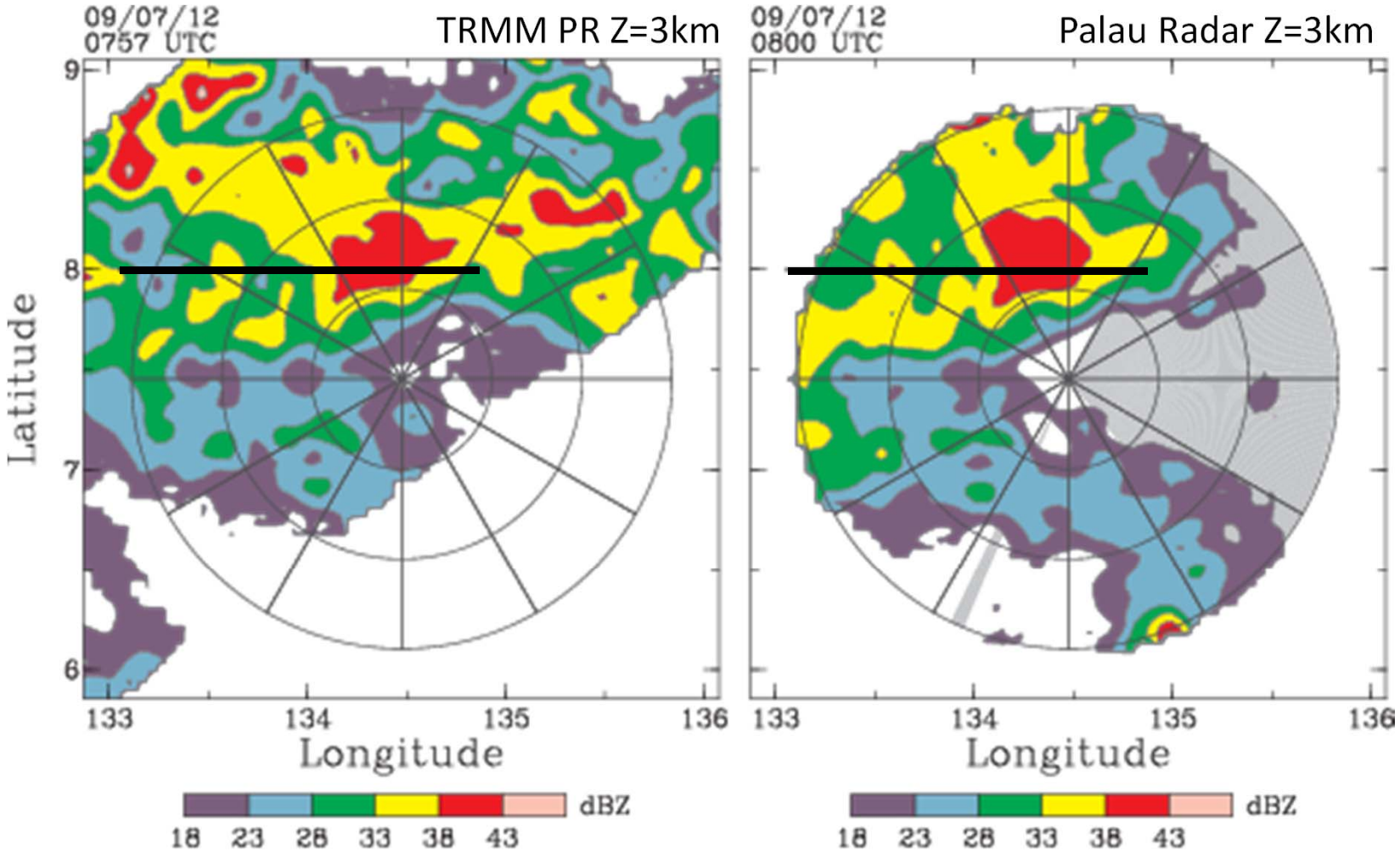
Palau radar: Attenuation due to heavy rains

Calibration of Palau radar



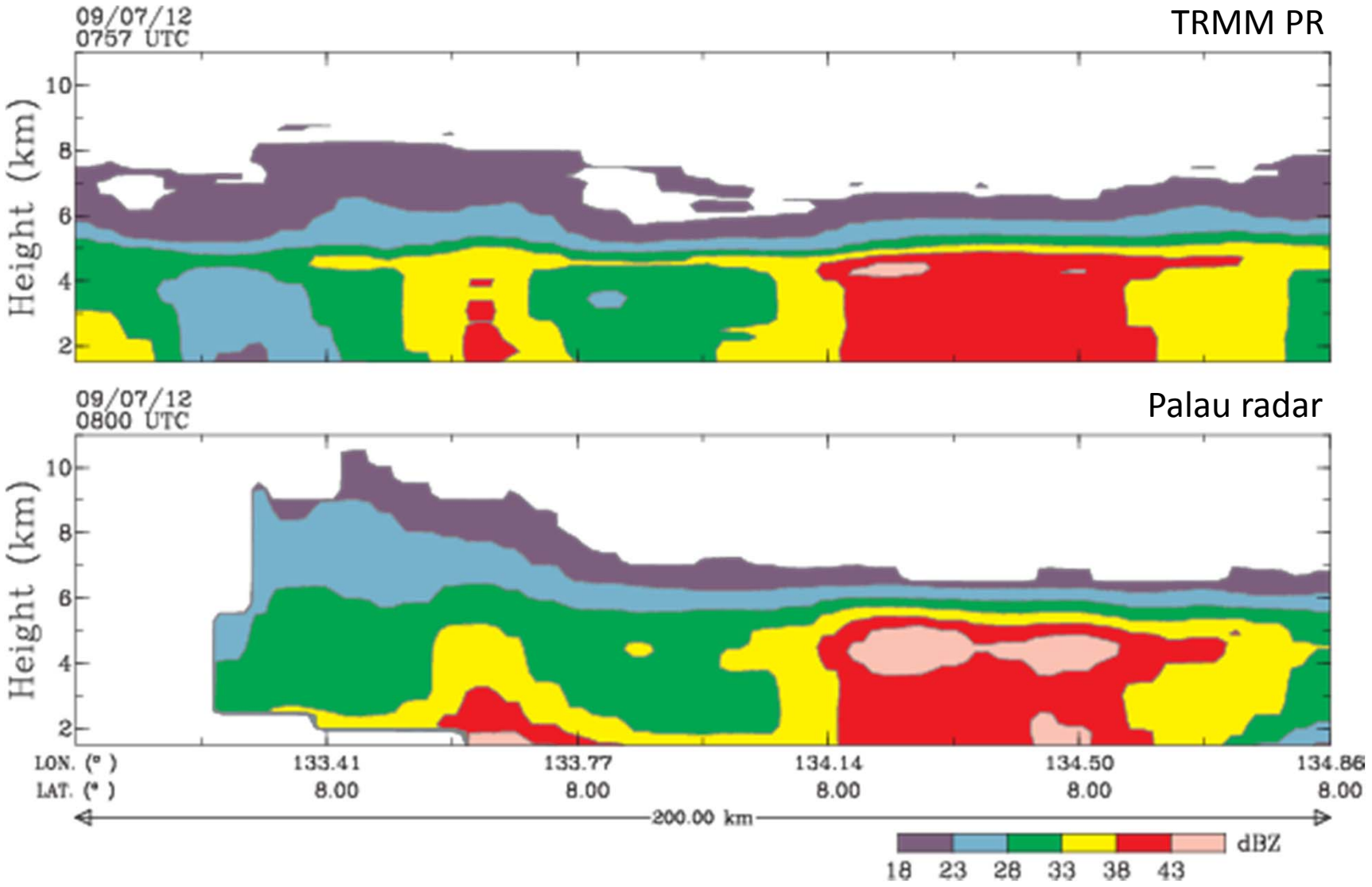
Palau radar: After attenuation correction of heavy rains

Comparison: Pattern in horizontal sections



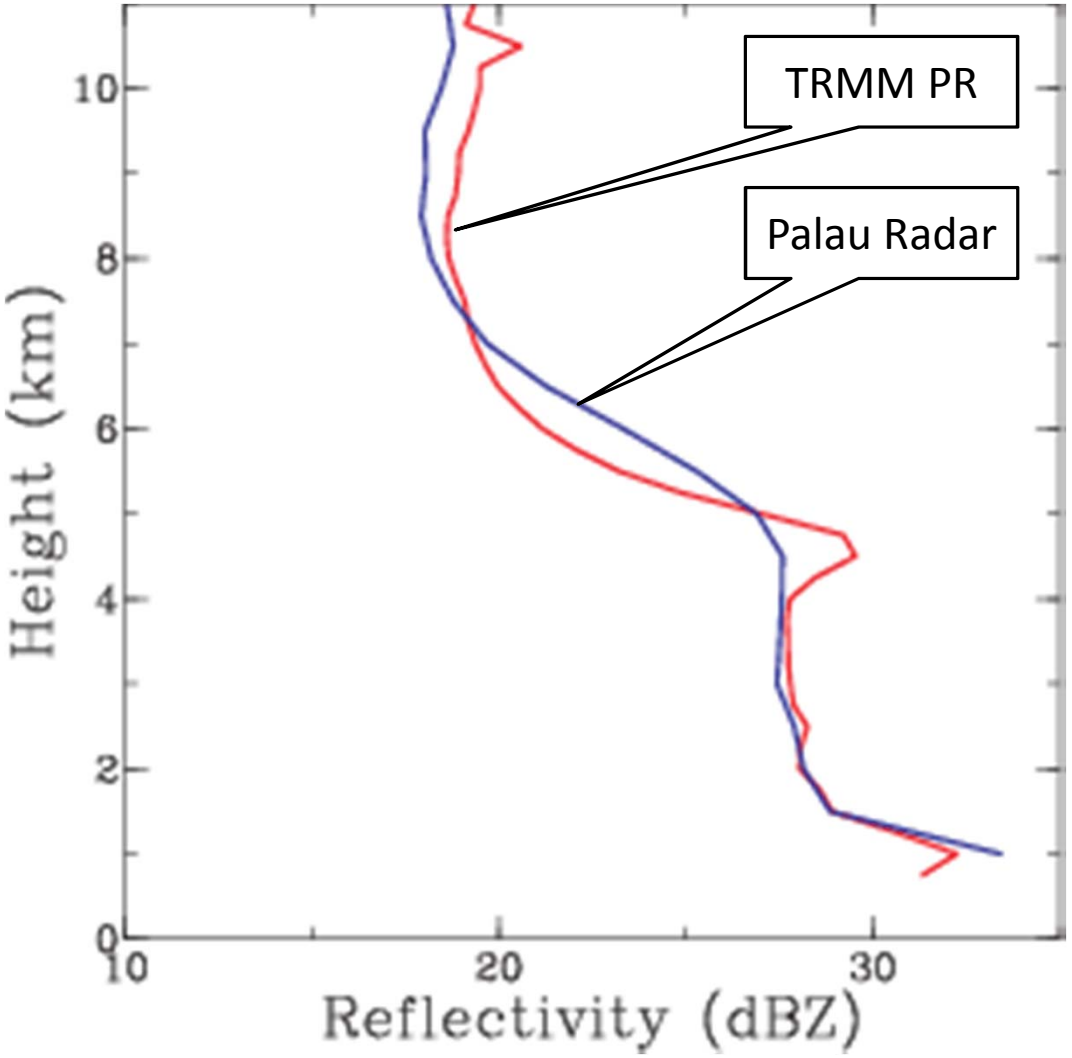
General consistency of horizontal reflectivity patterns

Comparison: Pattern in vertical sections



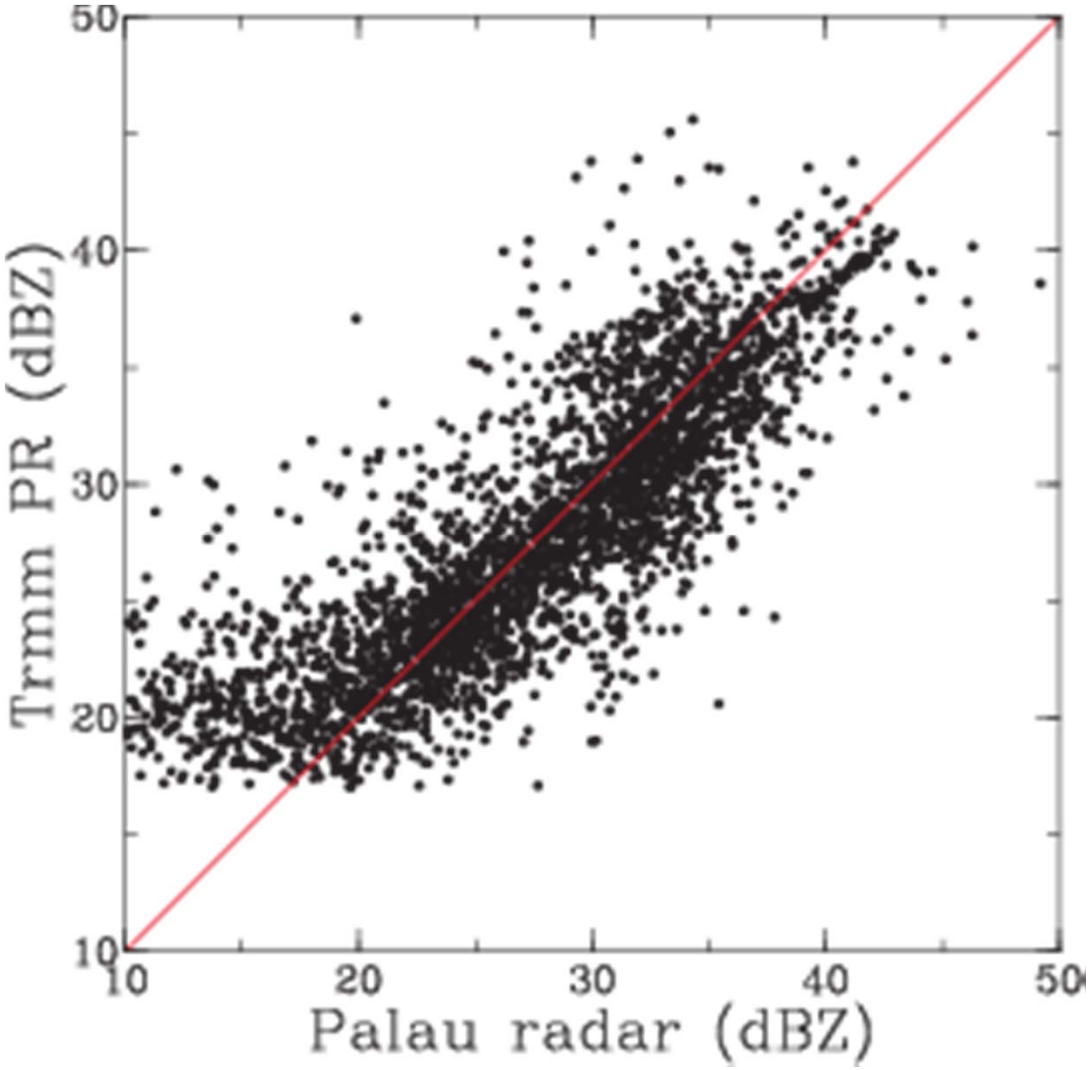
General consistency of vertical reflectivity structures

Comparison: Vertical reflectivity profile



General consistency below and some discrepancies above the melting layer

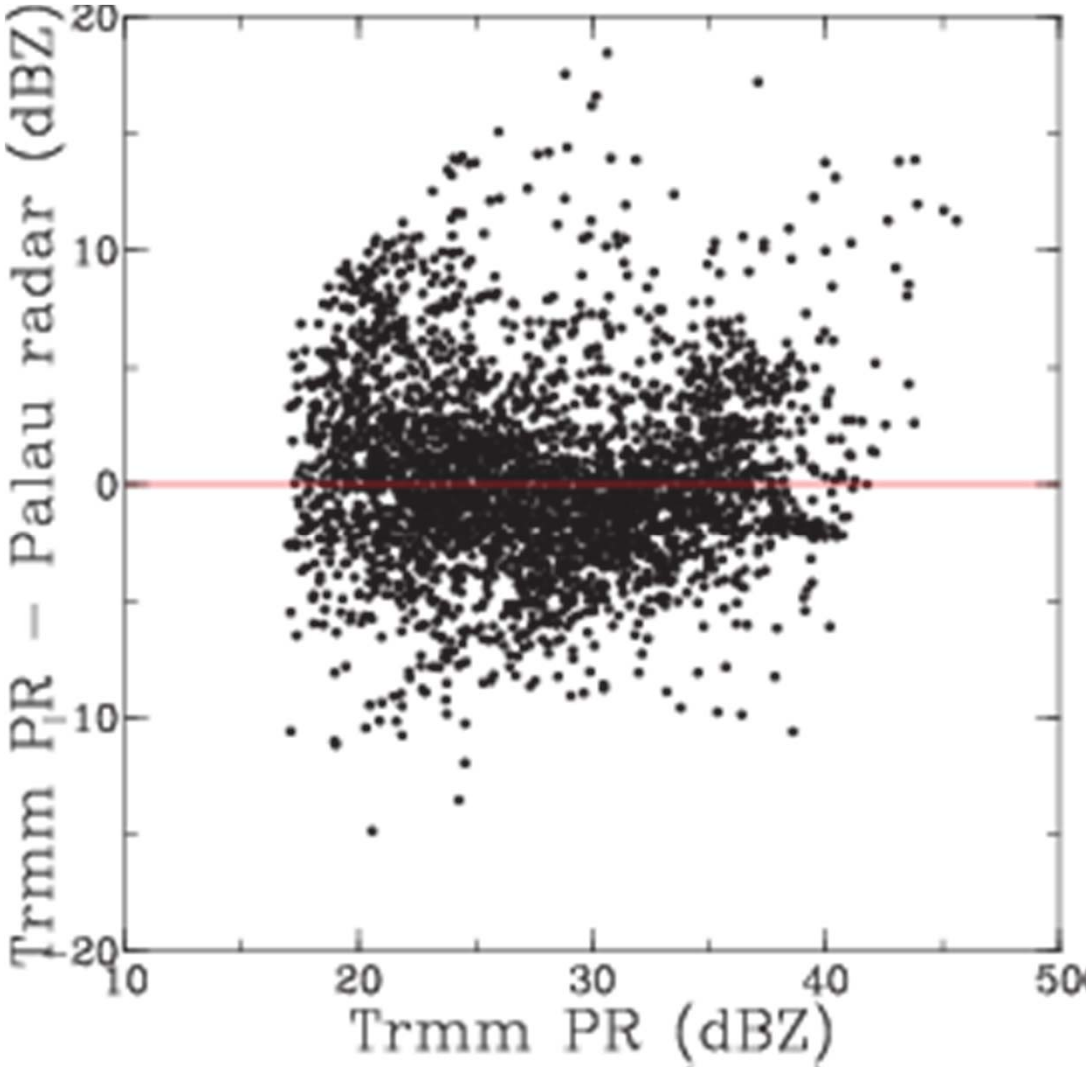
Comparison: grid-by-grid reflectivity



Cross-correlation coefficient: 0.83

Mean dBZ_{palau}/dBZ_{trmm}: 0.98

Comparison: grid-by-grid reflectivity difference



Mean dBZ_{trmm}- dBZ_{palau}: 0.36 dB

Standard deviation of dBZ_{trmm}- dBZ_{palau}: 3.94 dB

Summary

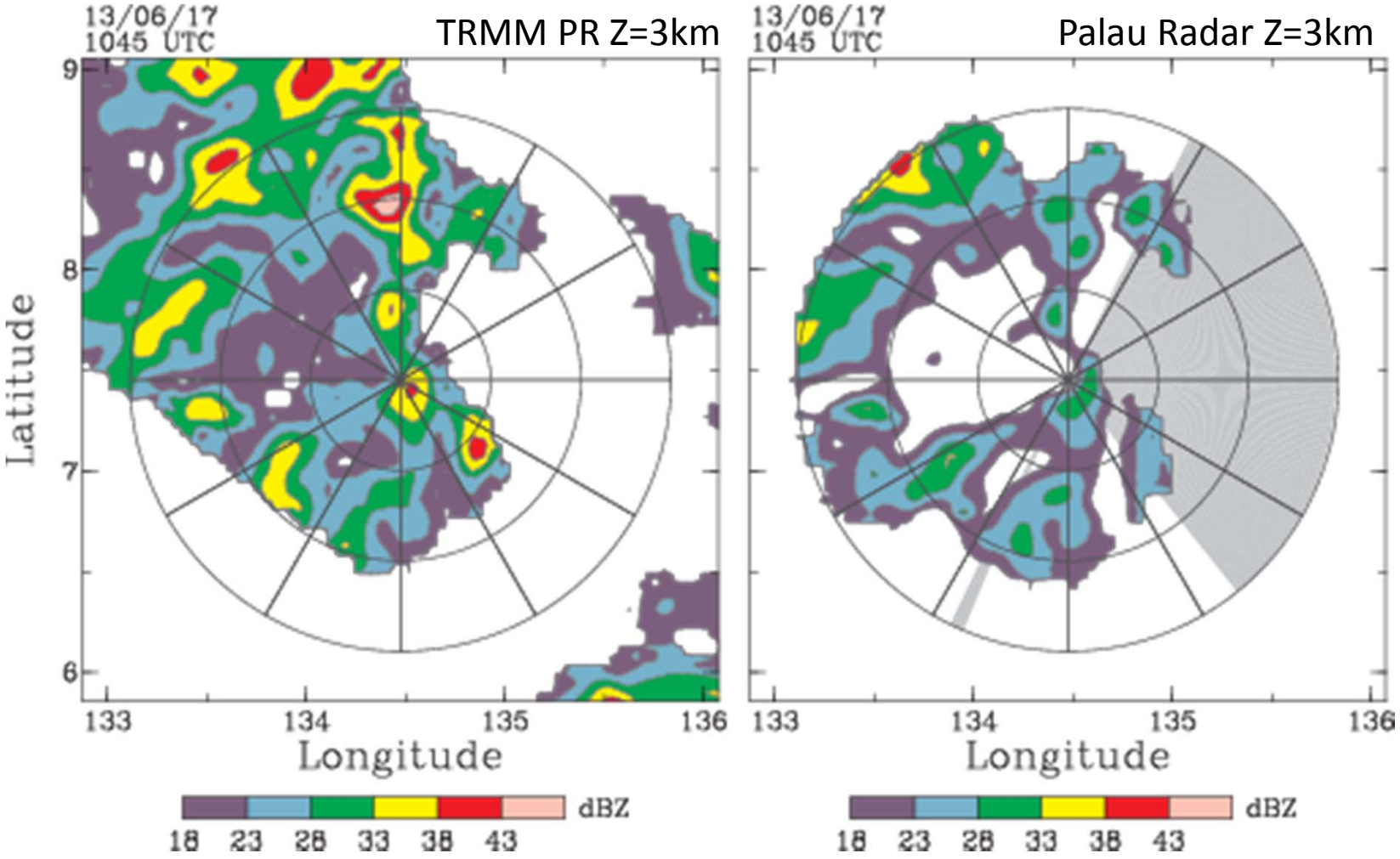
Validation of GPM DPR rainfall products with observations conducted by the JAMSTEC in Palau has been proposed. Research work for the validation of GPM DPR has been conducted by using TRMM PR as an alternative source.

- A method for interpolating data from both spaceborne and Palau radars into common coordinates has been developed.

- A method for the calibration of Palau radar from TRMM PR observations has also been developed, which needs improvement by using surface observations.

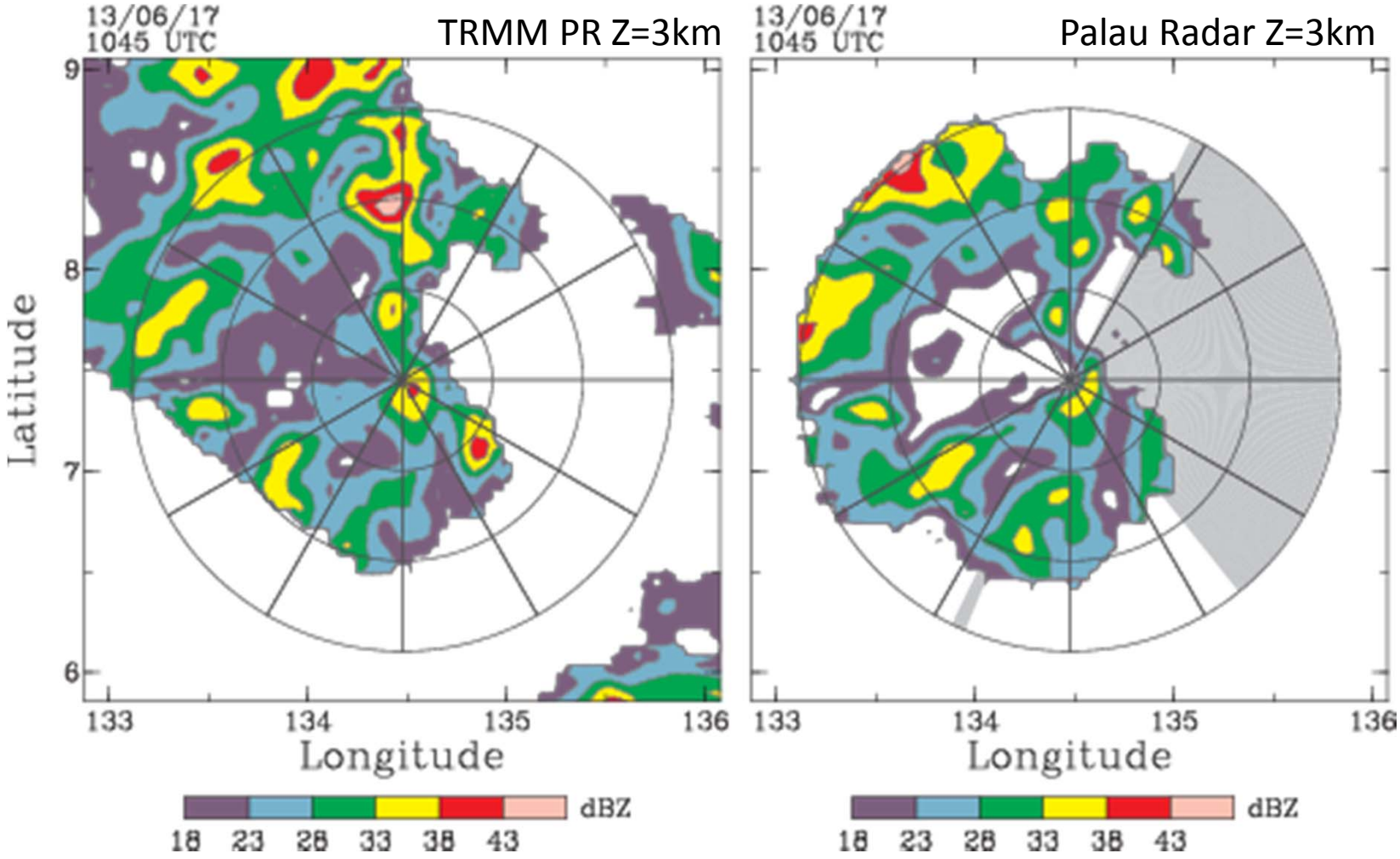
- Instantaneous and statistical comparisons between the spaceborne and ground radars have been performed, which indicates that data from Palau radar are useful for the validation of GPM DPR products.

Calibration of Palau radar



Palau radar: Attenuation due to wet radome

Calibration of Palau radar



Palau radar: After attenuation correction of both heavy rains and wet radome