1. Specification

Instrument	**TEAM-R** (**T**aiwan **E**xperimental **A**tmospheric **M**obile - **R**adar)
Instrument Type	Mobil, X-band dual Doppler polarimetric radar
Measurement	Doppler velocity, spectral width, polarimetric variables
Operated by	National Central University, Taiwan
Platform	Mobile, flatbed truck
Transmitter	Klystron
Transmitter frequency	9.620 GHz
Transmitter Wavelength	3.12 cm
Transmitter Peak Power	50 kW
Transmitter Pulse Width	1μ, 1.5μ, 2μ
Pulse Repetition Frequency	3000 Hz (max)
Polarization Diversity	H, V
Transmitted Pulse Package	Up to 4 pulse width
Antenna Type	Parabolic reflector
Antenna Diameter	1.8 m
Antenna Beam Width	1.4 deg
Antenna Gain	42 dBi
Antenna Scan Rate	Max : 20 deg/sec
Receiver band width	10 MHz
Receiver dynamic range	92~102 dB
Measurement Range	100 km
Range Resolution/Gate Spacing	125 m
Number of Range Gates	2048
Number of Samples	Max : 1024
Data Recording	I, Q
Variables available	Reflectivity at horizontal polarization: Z_{HH} Differential reflectivity: Z_{DR} Differential phase shift: Phidp Co-polar correlation coefficient: RH Doppler velocity: Vr Spectral width: SW

2. Sites during TiMREX 2008

Location name	Dates	Longitude(°)	Latitude (°)	Altitude (m)
Hsin-yuan Levee 新園堤防	May 15 May 27	120.4336	22.5272	49
Golden beach 黃金海岸	May 28	120.1747	22.9217	49
Jou-Ru Levee 九如堤防	May 29 June 28	120.4686	22.7504	53
Da-Jin Levee 大津堤防	June 29	120.6398	22.8811	150

3. Data

A. Data Format :

1. Universal Format File
2. 90 degrees blanking for the front of the truck
3. The scanning strategies include: Surveillance scan, sector scan, RHI scan, and vertical pointing.

B. Quality Control Procedures

- System bias and attenuation correction for Z_{HH} and Z_{DR}.
- True Z_{HH} and Z_{DR} can be written as the following forms:

$$Z_{HH}=Z_{HH}^{obs}+Z_{HH}^{bias}+A_H$$
$$Z_{DR}=Z_{DR}^{obs}+Z_{DR}^{bias}+A_{HV}$$

1. Vertical pointing observational data → Z_{DR}^{bias}
   (Gorgucci et. al., 1999)
   The ZDR system bias of TEAM-R was derived by analyzing the vertical pointing data. During TiMREX, there were 46 available data sets collected under the stratiform precipitation system by TEAM-R.

2. Single coefficient for attenuation correction →A_H, A_{HV}
   (Bringi et al., 1990)

The Z_{HH}-Z_{DR}-K_{DP} equation and coefficients of attenuation correction are calculated from disdrometer data during SoWMEX/TiMREX by T-matrix. The parameters of the Φ_{DP} based single-coefficient attenuation correction is as follows :

$$A_H = 0.30242 \times \Delta\phi_{DP}$$
$$A_{HV} = 0.03696 \times \Delta\phi_{DP}$$

3. Z_{HH}-Z_{DR}-K_{DP} Self-consistency $\rightarrow$ Z_{HH}^{bias}
(Vivekanandan et. al., 2003)

The Z_{HH} system bias of TEAM-R was derived via the self-consistency approach suggested by Vivekanandan et al. (2003). The self-consistency of the dual-polarimetric measurements of TEAM-R can be shown as:

$$K_{DP} = 0.00011323 \times Z_{HH} \times Z_{DR}^{-2.0389}$$

The K_{DP} is immune to the system bias and the attenuation effect, and the Z_{DR} system bias has already been obtained from the vertical pointing data. After the Φ_{DP} based single-coefficient attenuation correction for the Z_{HH} and Z_{DR}, the last unknown is the Z_{HH} system bias. Thus, the Z_{HH} system bias was derived by the calculation of the difference between the attenuation corrected observed Z_{HH} and the self-consistency derived Z_{HH} (from K_{DP} and corrected Z_{DR}).

C. System bias of Z_{DR} and Z_{HH}

Dates	Z_{DR} system bias
May 15 - May 27	0.485
May 29 - June 28	0.398
Dates	Z_{HH} system bias
June 5	5.15
June 14	4.45
June 16	4.05

D. Offset correction

In the early time at Jou-Ru Levee, there was an azimuth angle offset of 5.073° from 1007 UTC May 29 to 0018 UTC May 31. It meant all of the

azimuth angles during this period should add 5.073 degree.

4. Reference:

Bringi, V. N., V. Chandrasekar, N. Balakrishnan, and D.S. Zrnic, 1990: An Examination of propagation effects in rainfall on radar measurements at microwave frequencies. *J. Atmos. Oceanic Technol.*, **7**, 829-840.

Gorgucci, E., G. Scarchilli, and V. Chandrasekar, 1999: A procedure to calibrate multiparameter weather radar using properties of the rain medium, *IEEE Trans. Geosci. Remote Sens.*, **37**, 269–276.

Vivekanandan, J., G. Zhang, S. M. Ellis, D. Rajopadhyaya, and S. K. Avery, 2003: Radar reflectivity calibration using differential propagation phase measurement. *Radio Sci.,* **38**, 8049, doi: 10.1029/2002RS002676.

If the users have further questions, please contact Prof. Yu-Chieng Liou(tyliou@atm.ncu.edu.tw) of NCU.