# The Characteristics of RSDs before and after the Landing Typhoon Meranti

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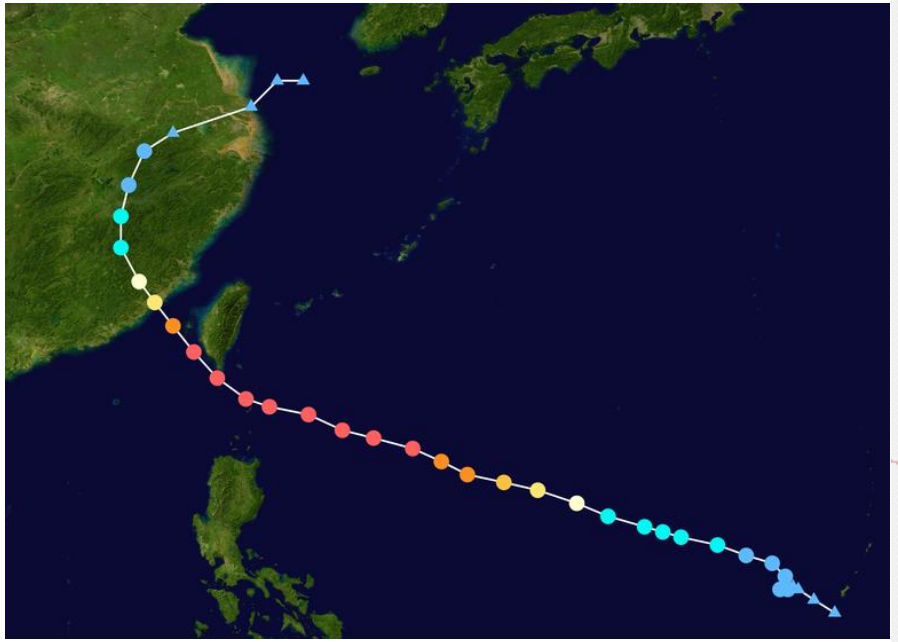
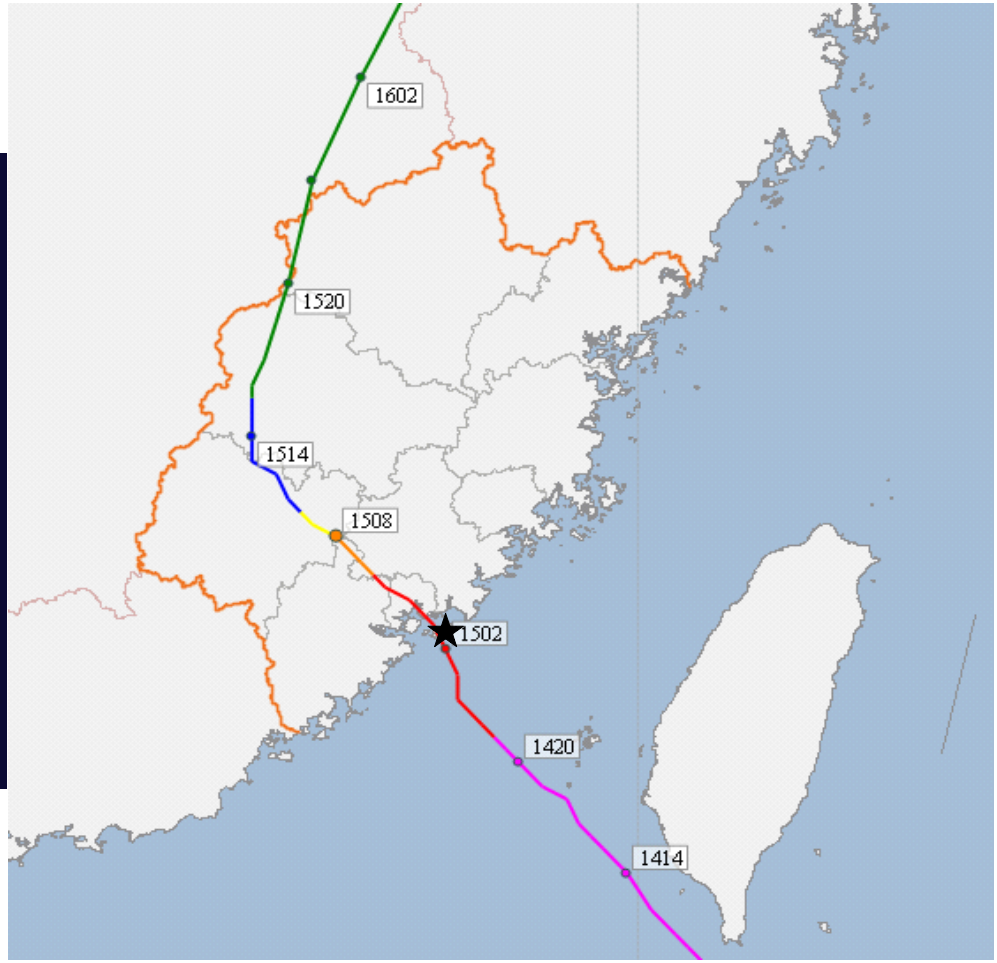
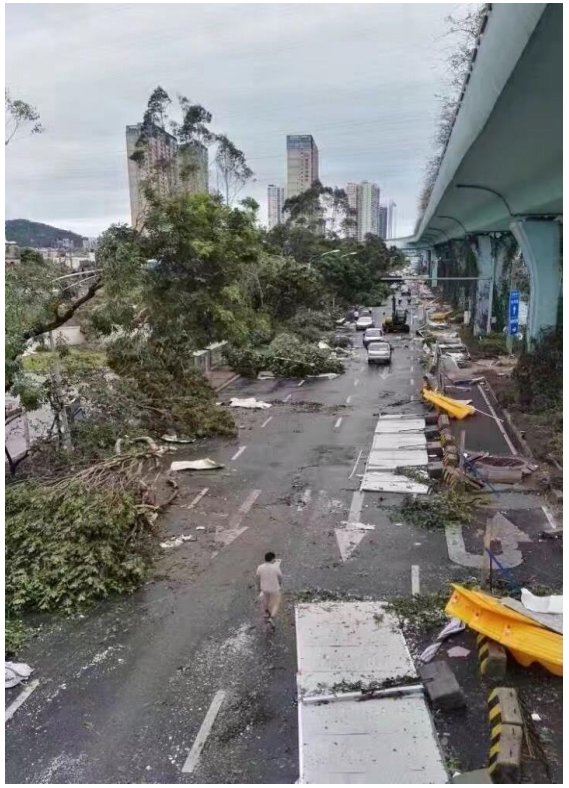
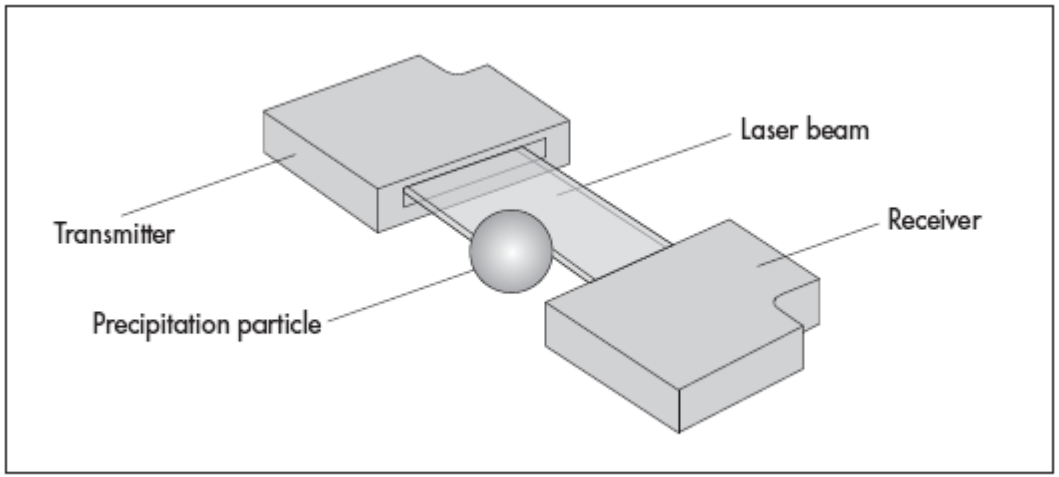
# Track of Meranti （2016）







# LPA10 disdrometer




similar to the PARSIVEL disdrometer

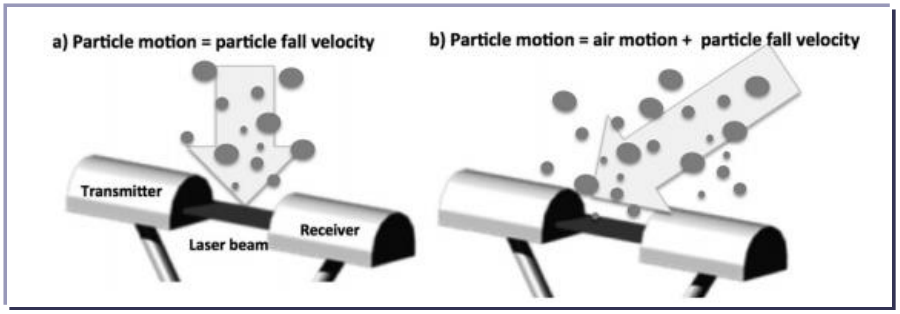
64 drop sizes (0.1-30mm)
32 velocities (0.2-20m/s)
laser measurement area (63cm$^2$)

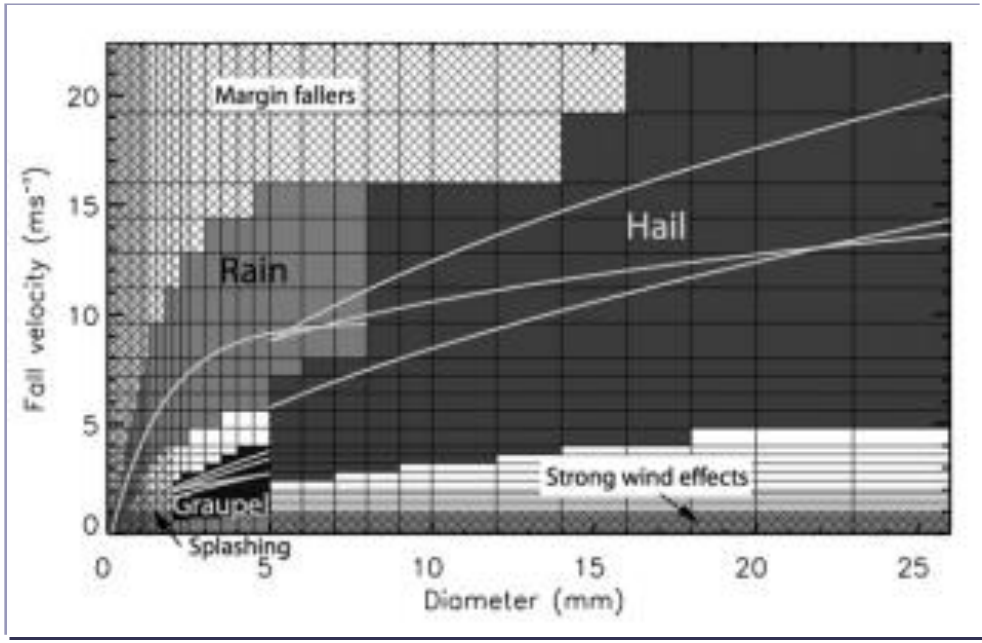
Output data :raindrop size distribution（RSDs）

# Quality-control

1.Remove：

- Strong wind effects
- Splashing
- Margin fallers




Friedrich et al. (2013)

# Quality-control

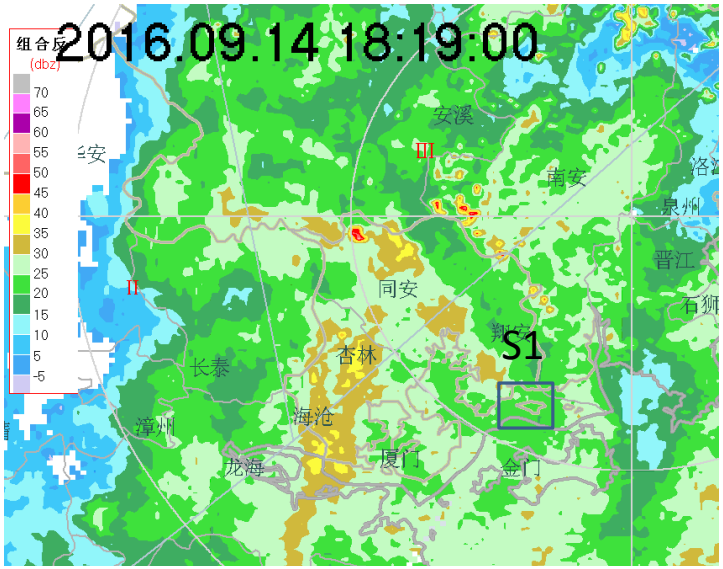
2. minimize instrument error (Battaglia et al ,2009)

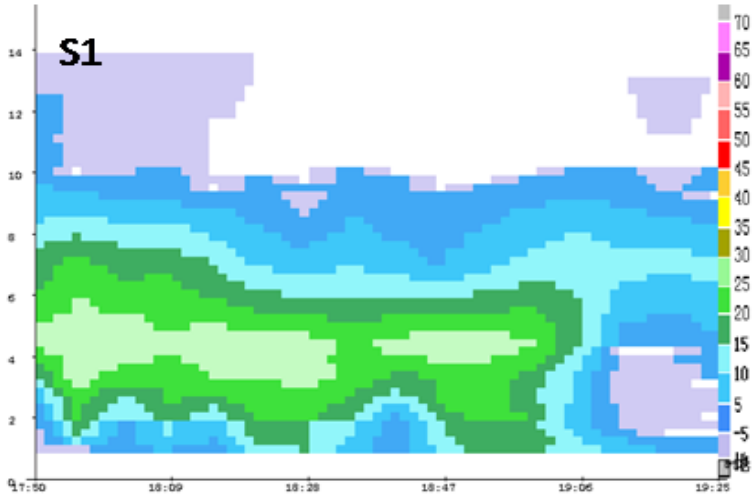
$$D = \begin{cases} D_d \ (D_d \leq 1.00mm) \\ D_d \times (1.075 - 0.075D_d) \ (1.00\text{mm} < D_d \leq 5.00mm) \\ 0.7 \times D_d \ (D_d > 5.0mm) \end{cases}$$

where $D$ is the equivalent sphere diameter and $D_d$ is the diameter measured by disdrometer

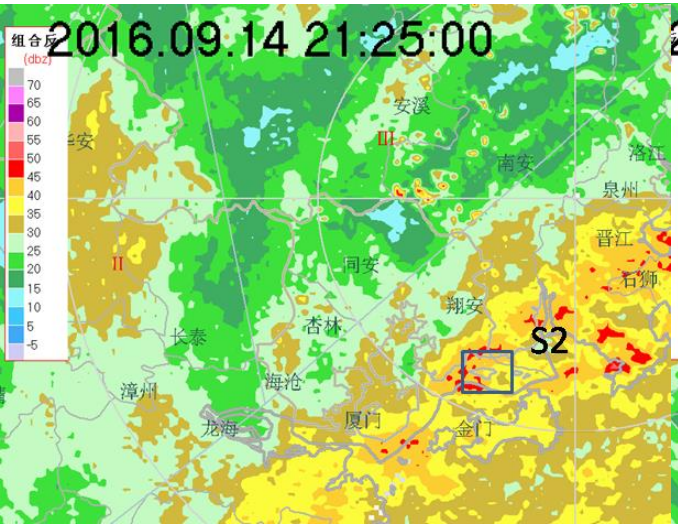
# Characteristics of echo

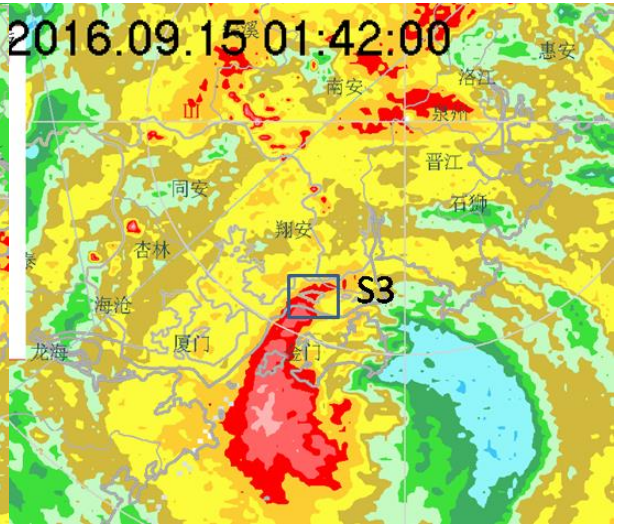
- in the front side of outer rainband

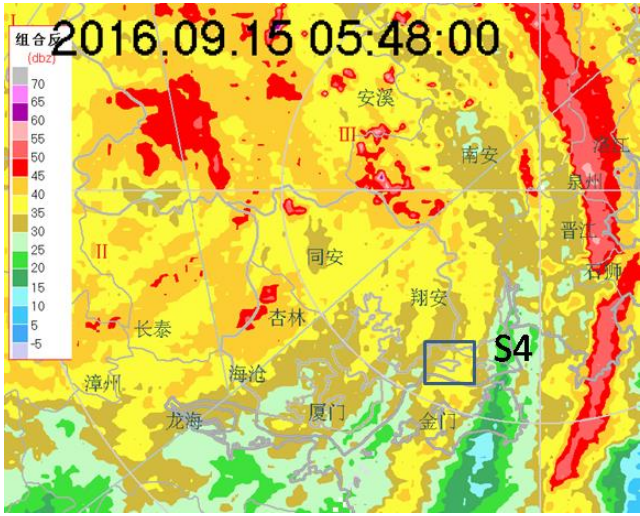


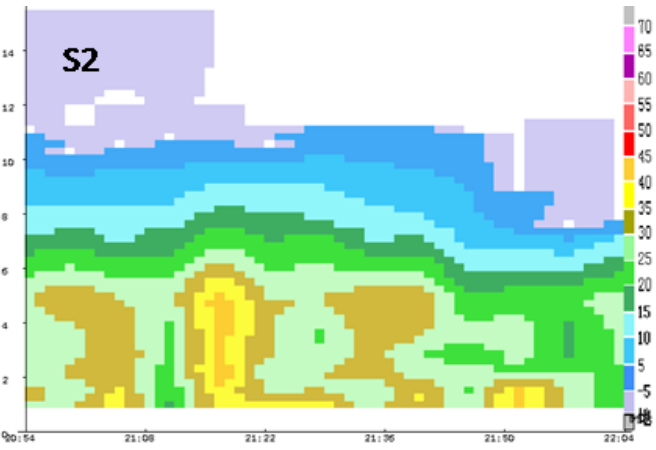



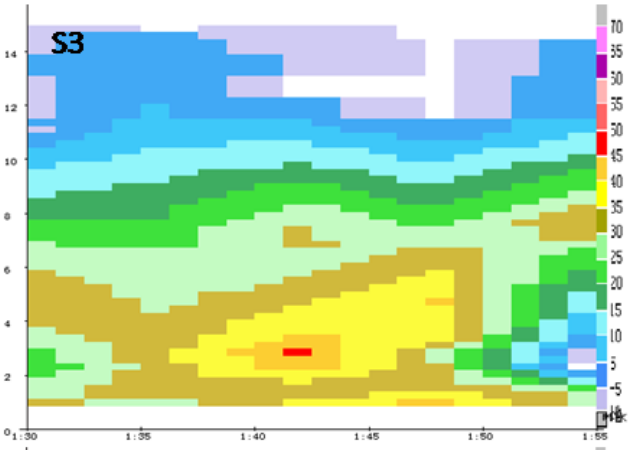
# •major rainband

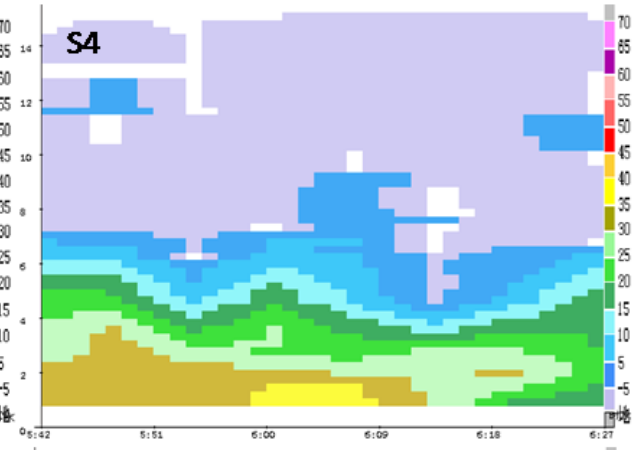


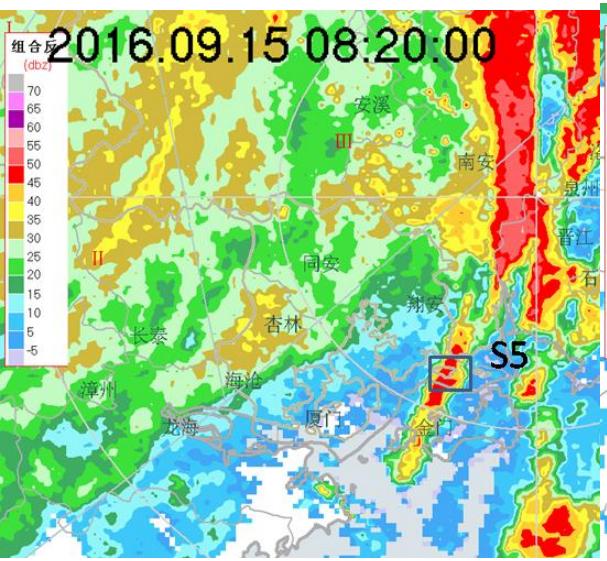



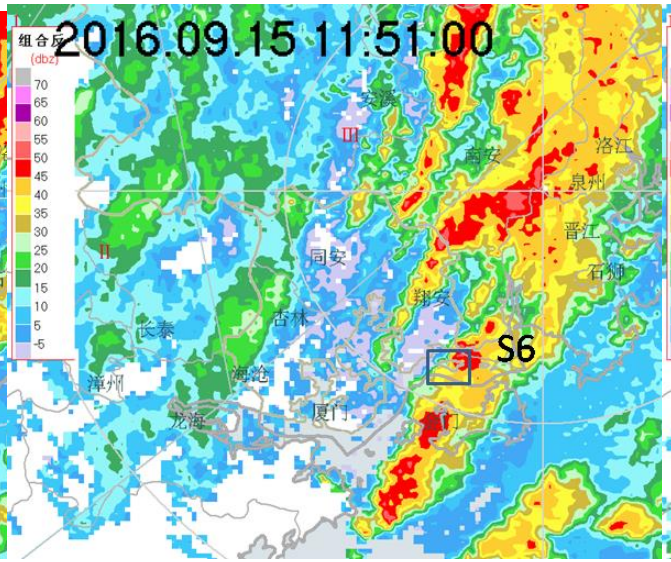



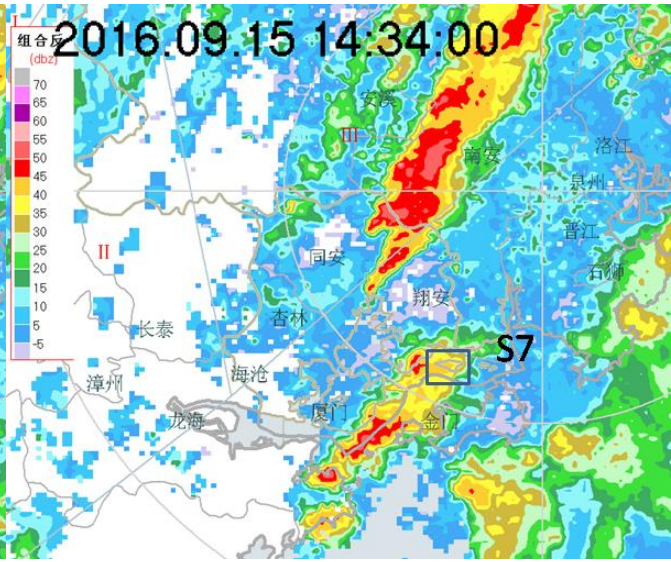



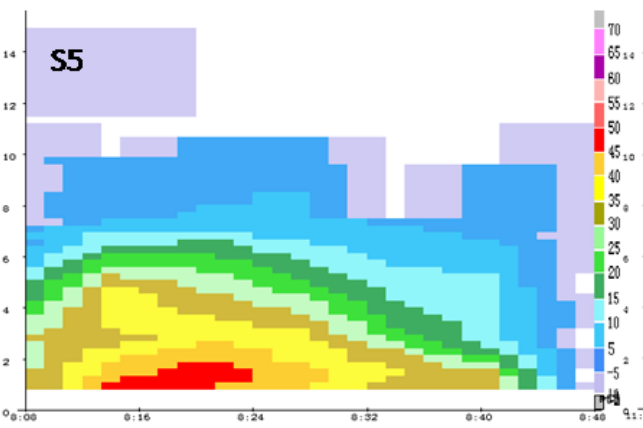



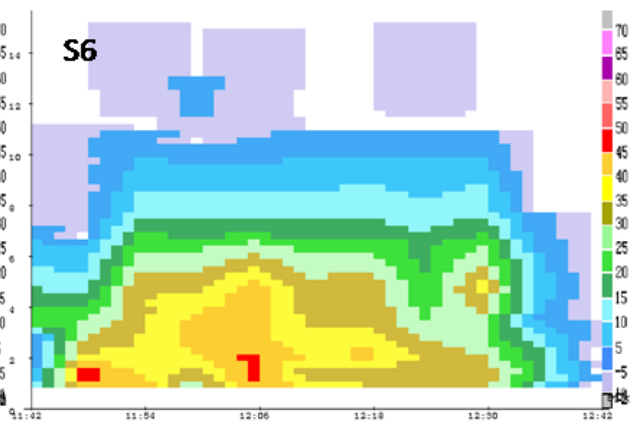
- residual cloud

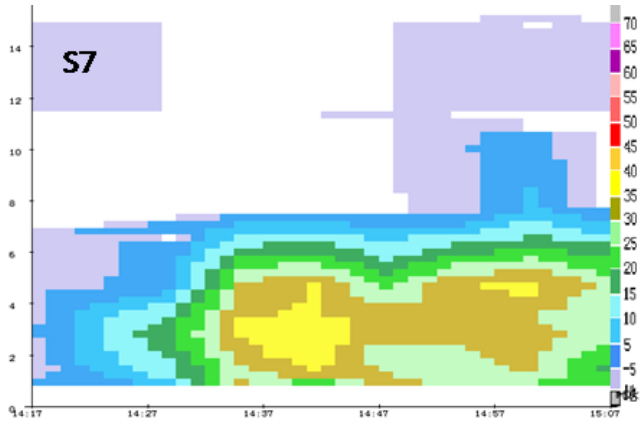


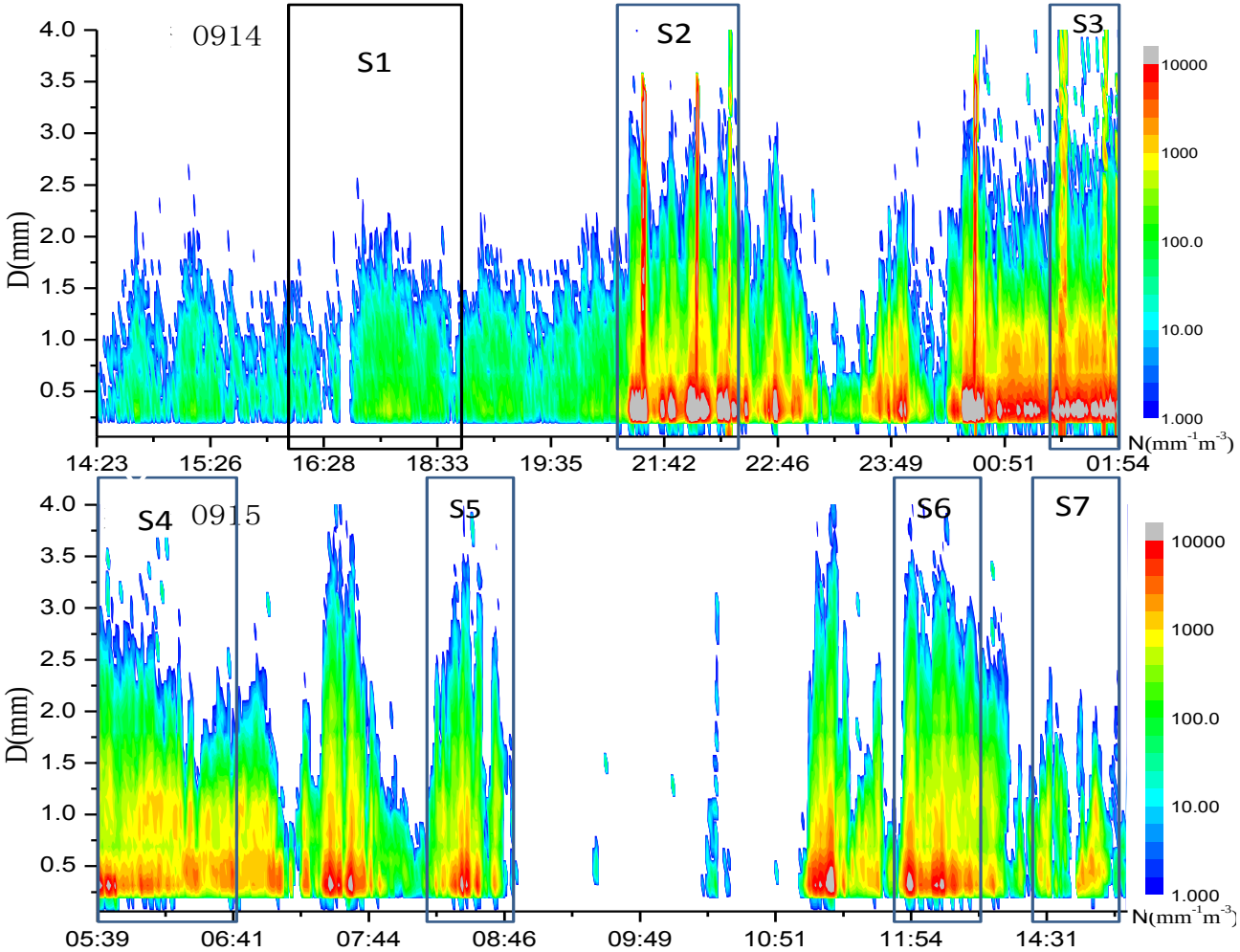



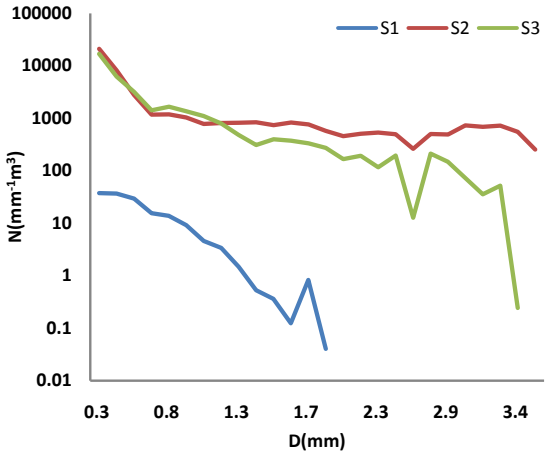



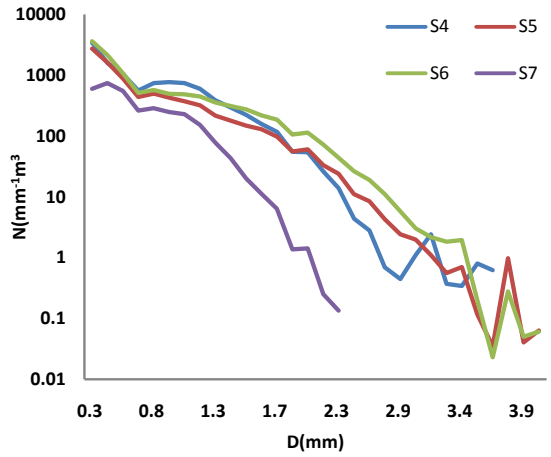



# Characteristics of RSDs



# Gamma distribution :

$$N(D) = N_0 D^{\mu} \exp(-\lambda D)$$

$\mu$ : shape

$\lambda$ : slope

$N0$ : Intercept , depend on $\mu$

Widely used in:

cloud-model

Dual polarization radar measure precipitation

# Gamma distribution

$$N(D) = N_0 D^{\mu} \exp(-\lambda D)$$

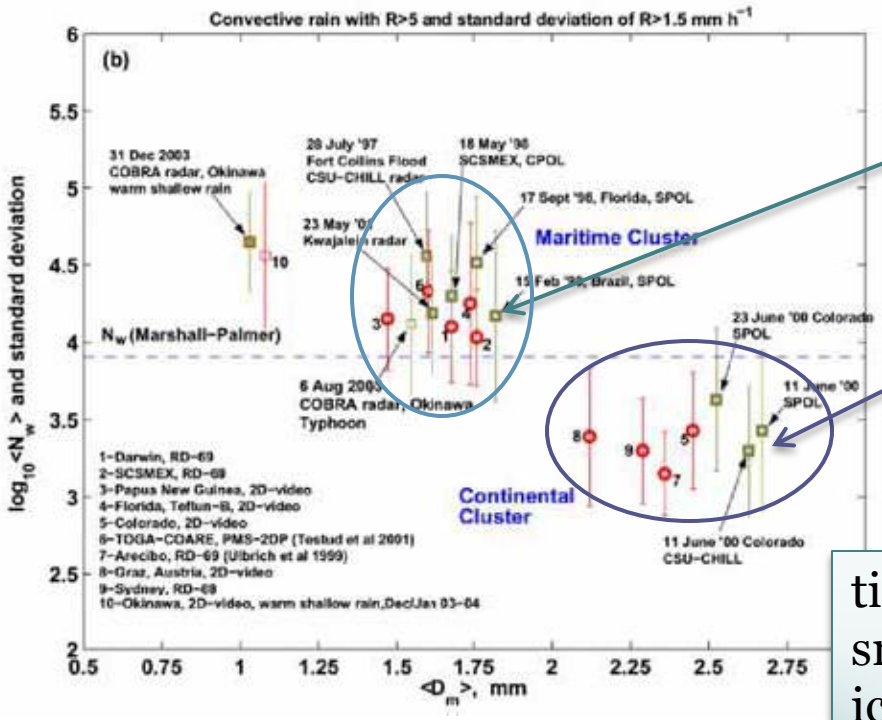
- *Weakness:* $N_o$ not independent

Normalized Gamma distribution（Bringi et al. (2003)）

$$N(D) = N_w \left( \frac{D}{D_m} \right)^{\mu} \exp[-(4+\lambda)\frac{D}{D_m}]$$

$D_m$ : *mass mean diameter*
$N_w$ *only depend on* $D_m$ *and LWC*
Normalized Gamma distribution *described by* $\mu, N_w$ *and* $D_m$

# Statistical Results by Bringi et al. (2003)



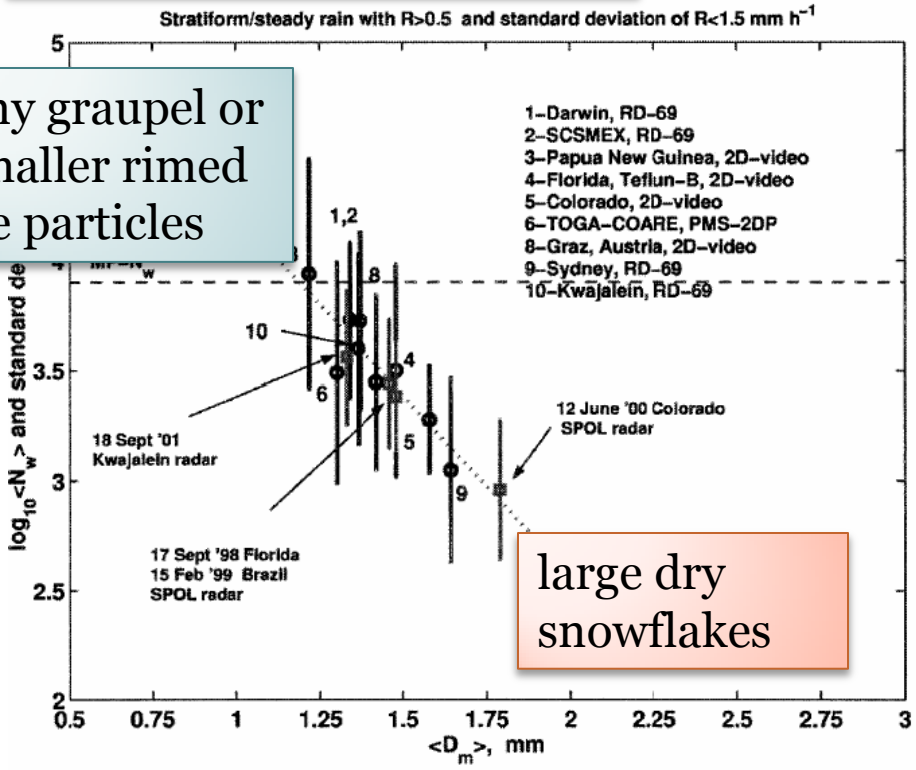

oceanic convection:
$D_m$=1.5 - 1.75 mm
log10（$N_w$）= 4 -4.5

mples:

Oceanic

continental convection:
$D_m$=2-2.75 mm
log10（$N_w$）= 3 -3.5

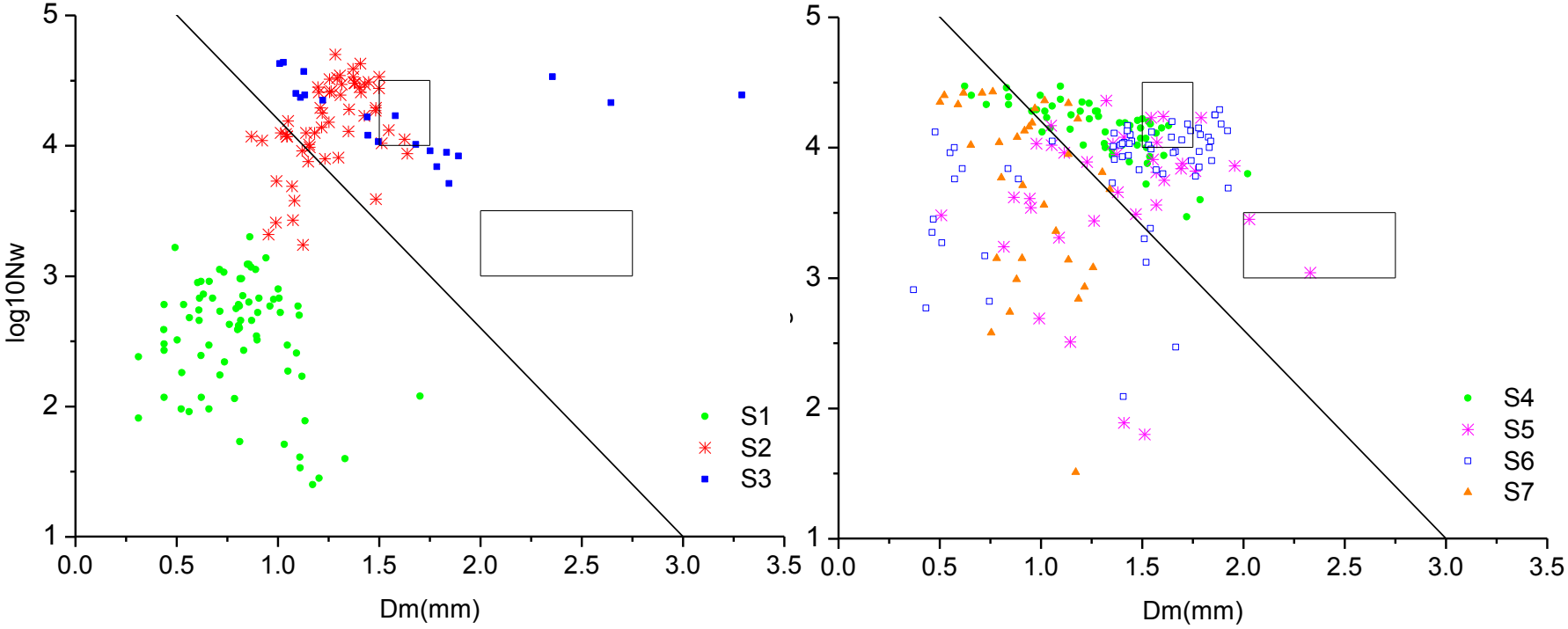
tiny graupel or smaller rimed ice particles




large dry snowflakes

stratiform rain samples :
approximate linear distribution

# In Meranti




- Stratiform(S1) → oceanic convective-stratiform mix clouds (S2)→ oceanic convective(S3) → oceanic convective-stratiform mix clouds (S4-6)→ stratiform(S7)

# outcomes

From the front side of rainband to the central region then to the rear side or residual cloud of Typhoon Meranti:

- The top of radar echo and reflectivity both increased when the Meranti moving closely, and then decreased during its moving away.
- Meanwhile, the number concentration and spectrum width of RSDs also exhibited the same features as the top of radar echo and reflectivity.
- Moreover, the precipitations were produced by stratiform → oceanic convective-stratiform mix clouds → oceanic convective → oceanic convective-stratiform mix clouds → stratiform.

Thank you