Impact of Uncertainty in the Drop Size Distribution on Oceanic Rainfall Retreivals from Passive Microwave Observations

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Present model for passive microwave retrieval uses Marshall Palmer Drop Size Distribution

$N(D) = N_0 \exp(-\Lambda D)$

$N_0 = 8000\ m^3 cm$

$\Lambda = 41 R^{-0.21}\ cm^{-1}$

Sekhon Srivistava DSD same form but

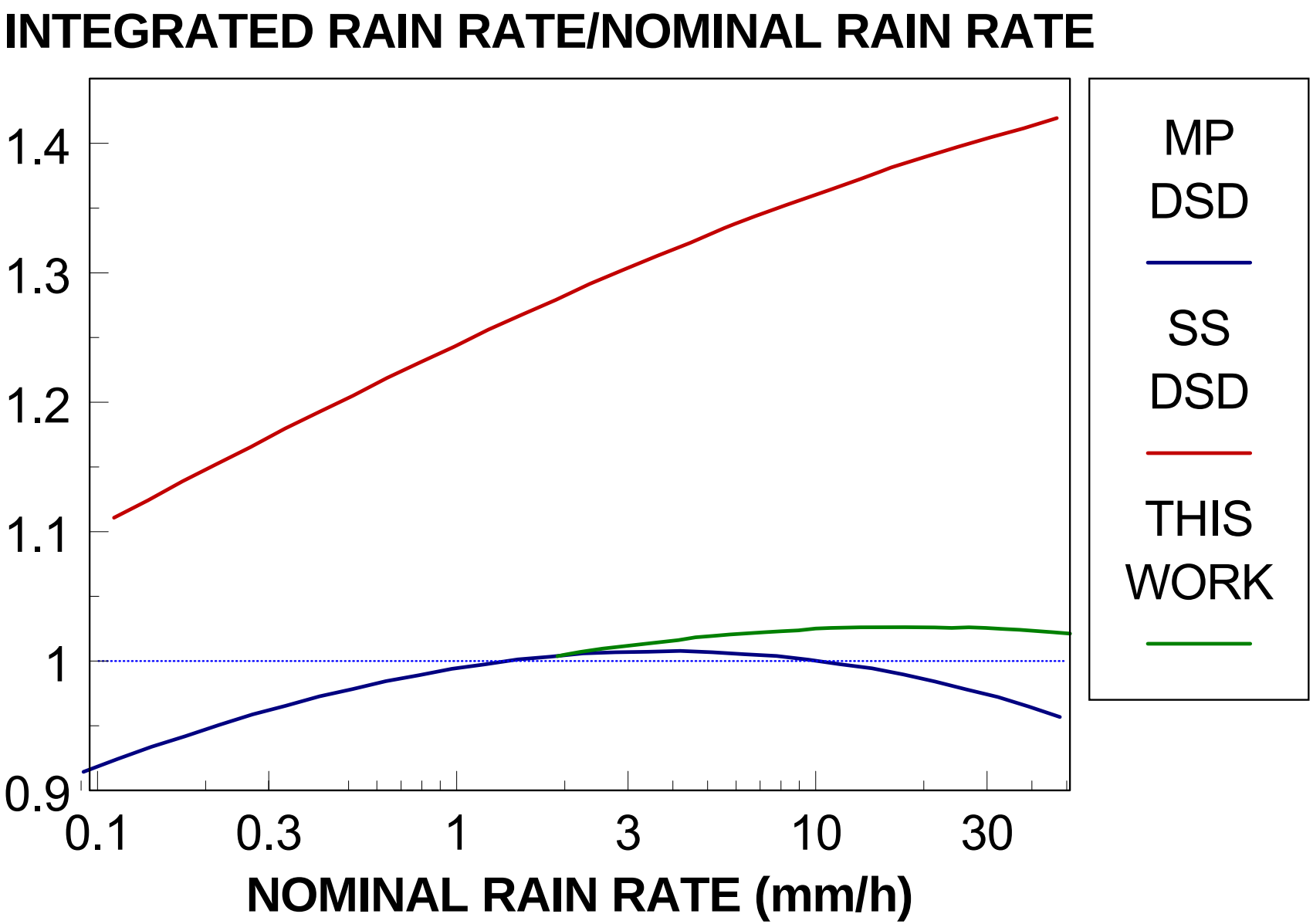
$N_0 = 7000 R^{0.37}\ m^3 cm$

$\Lambda = 38 R^{-0.14}\ cm^{-1}$

Chandrasekar and Li have extracted DSD information in the same form from TRMM PR (SRT) data

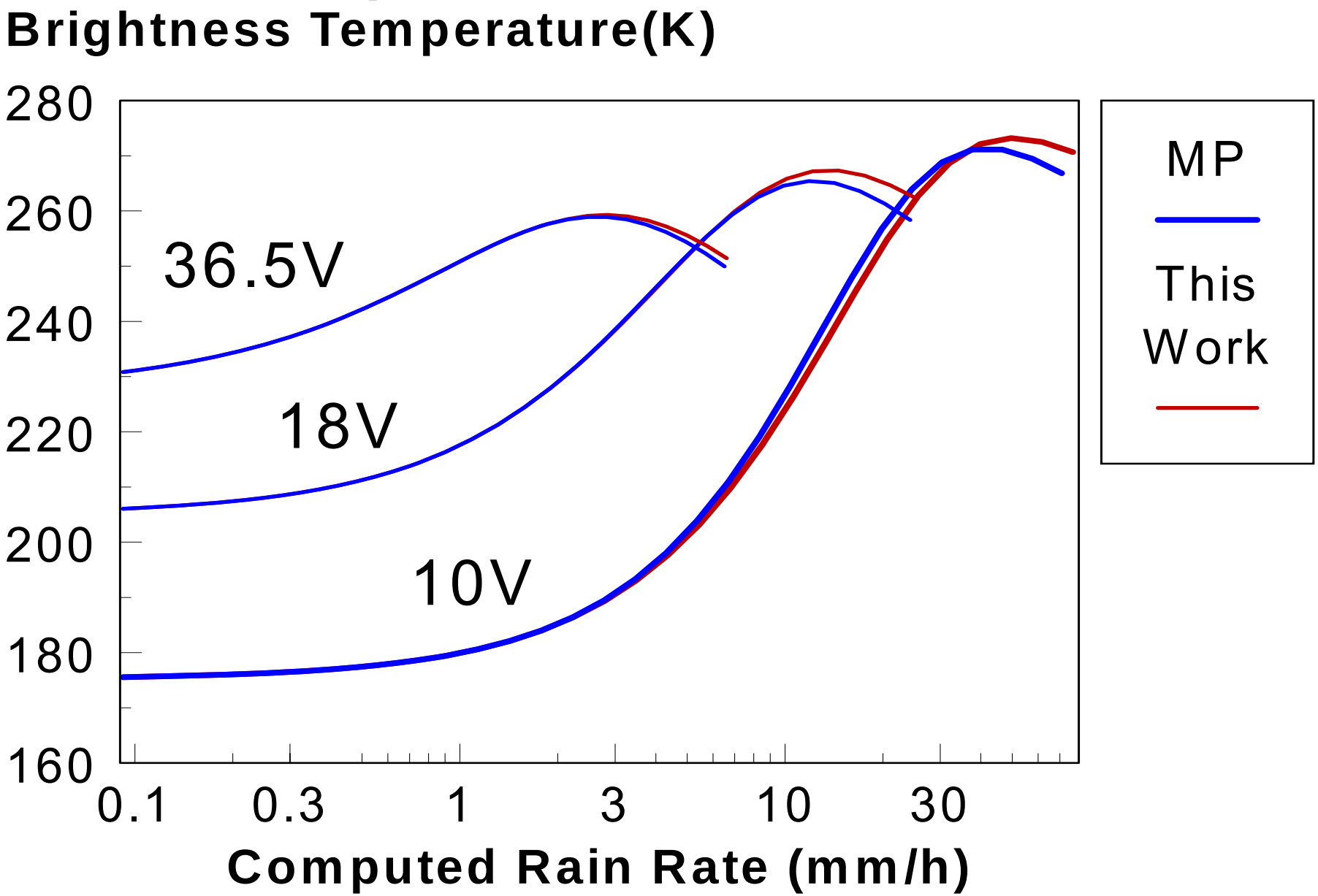
Integrated Rain Rate

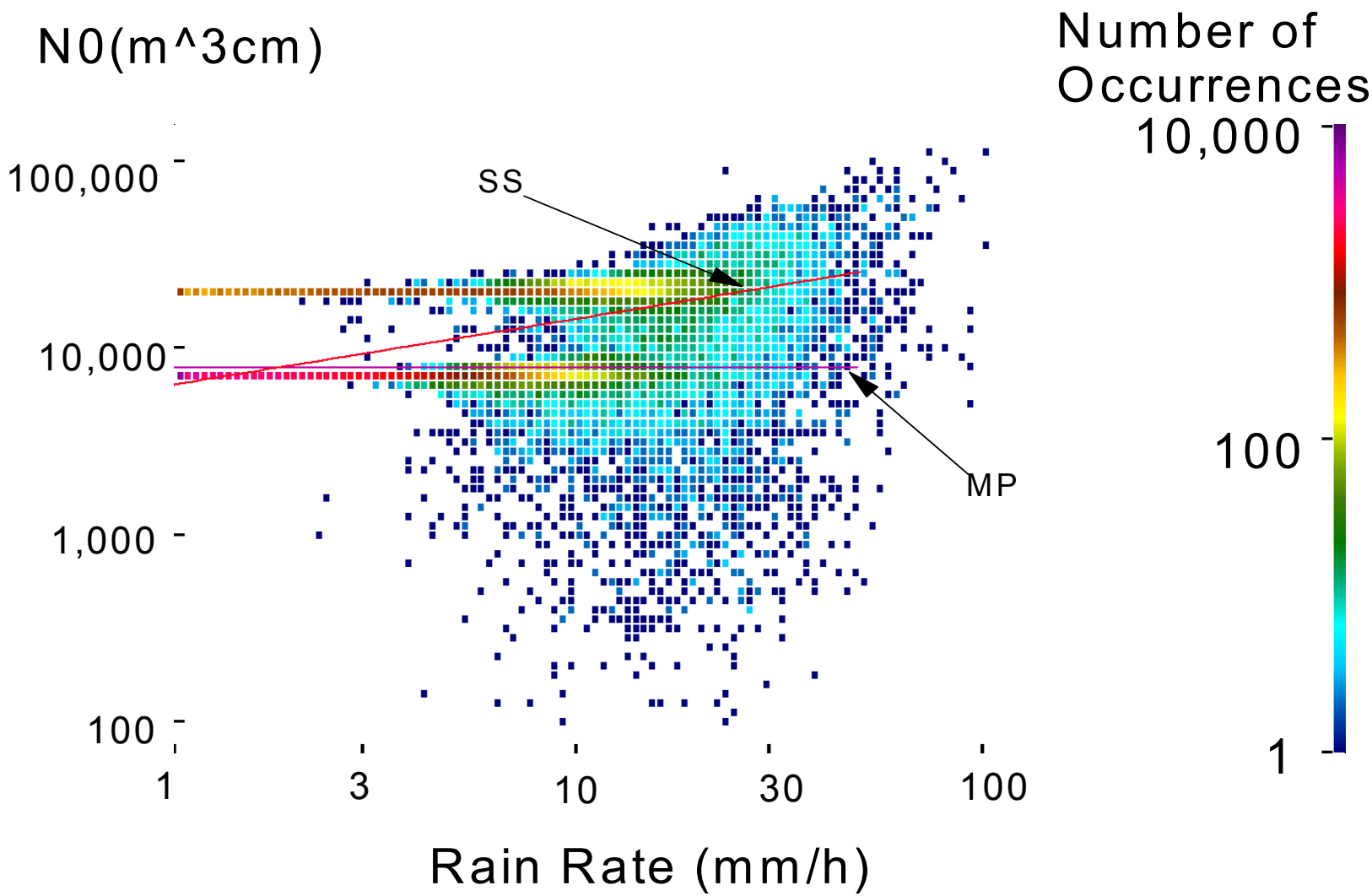
$$IRR = \int \frac{\pi}{6} D^3 V(D) N(D) dD$$

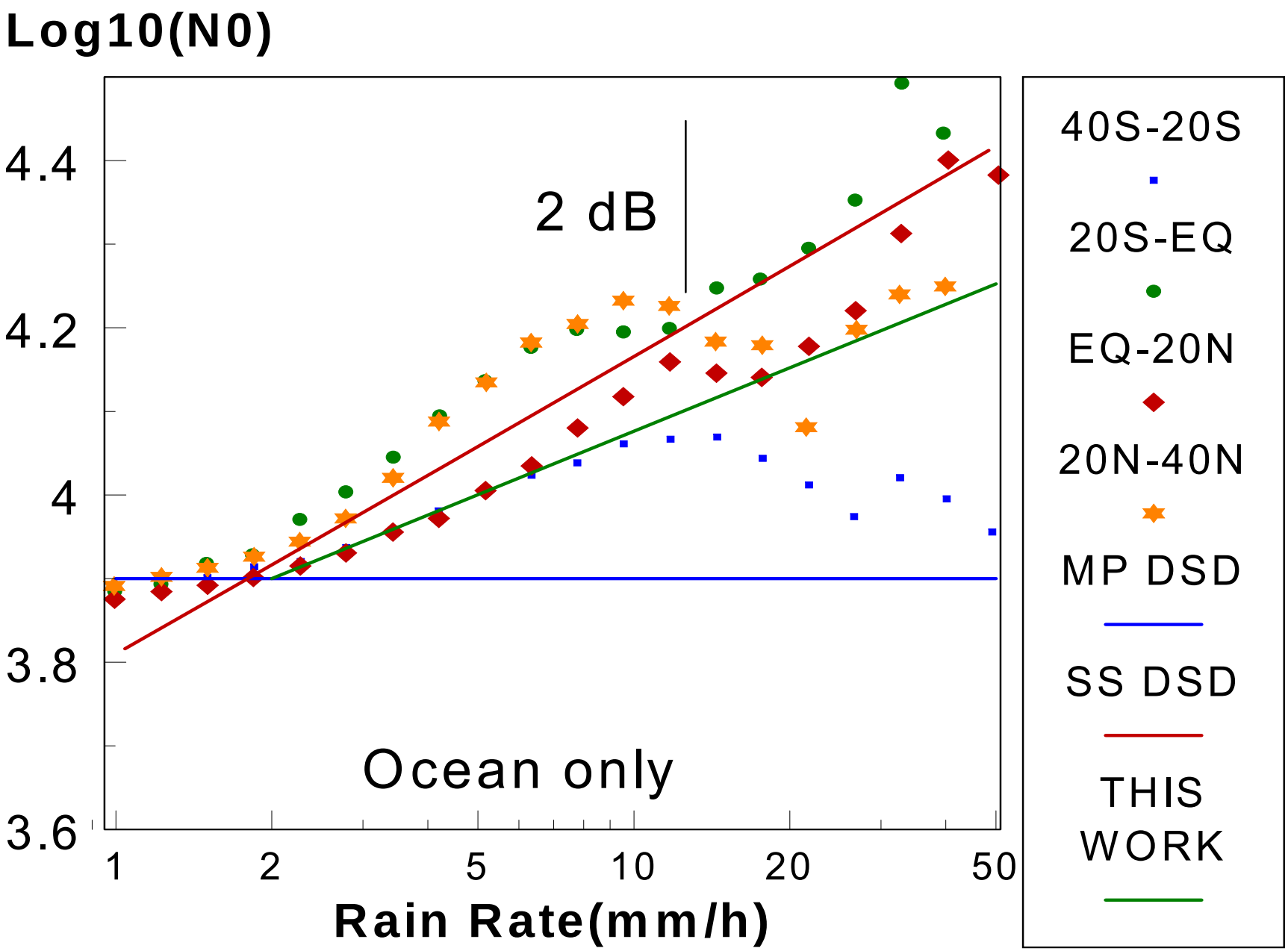


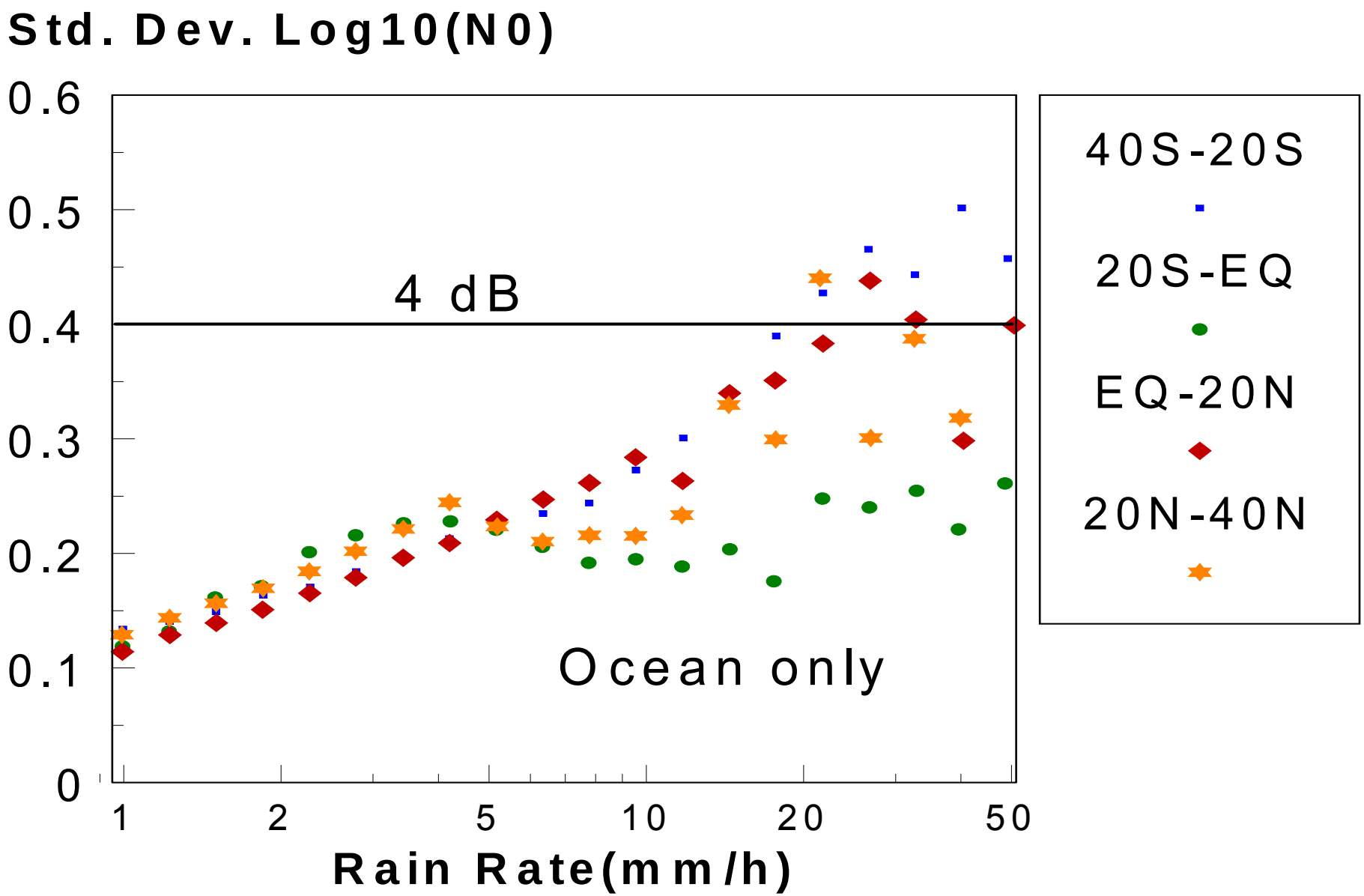
Integrated rain rate calculated for 285K, 1013mb

Impact of Modified DSD



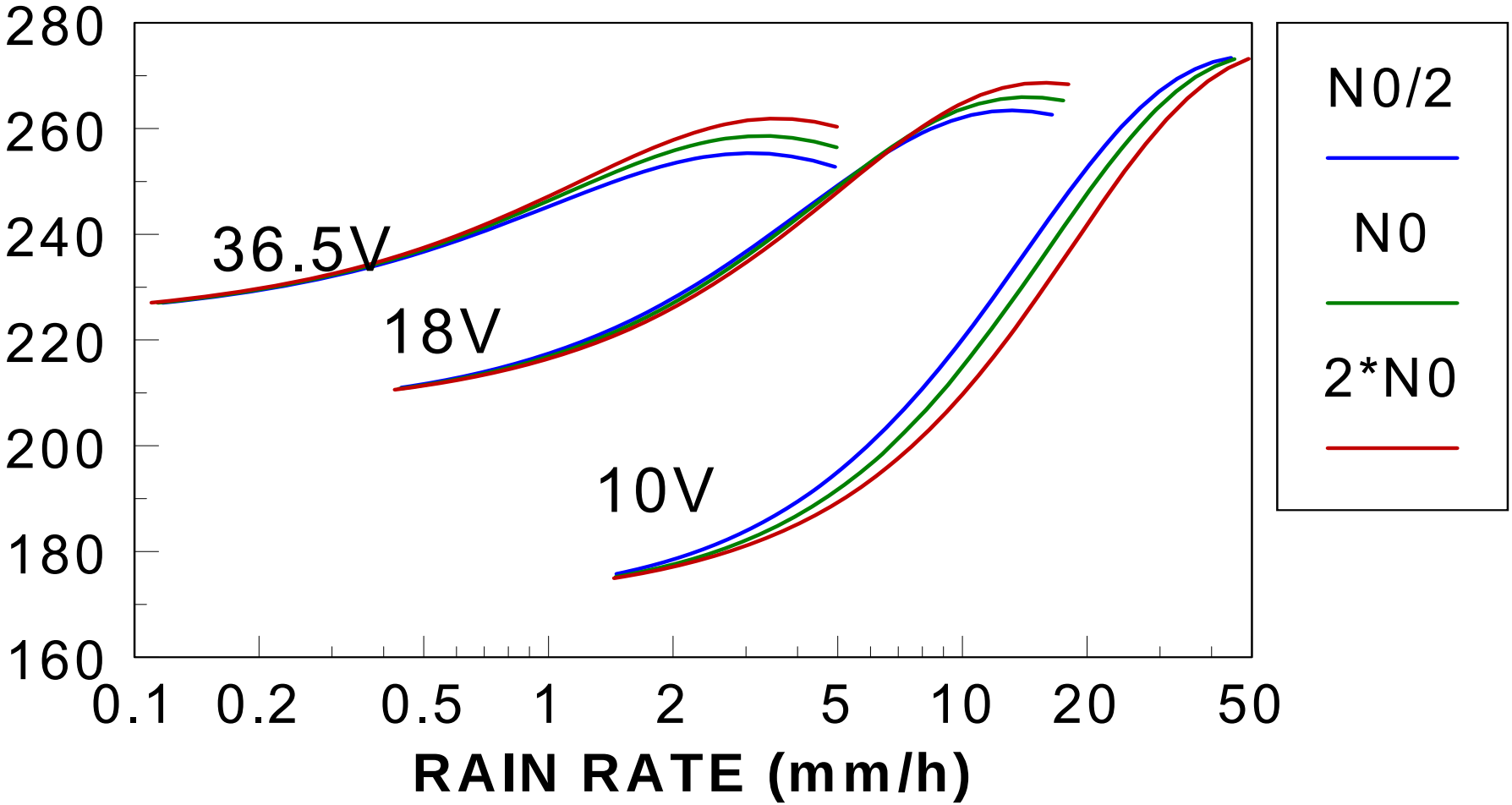

N0(m^3cm)
100,000
10,000
1,000
100
1
3
10
30
100
Rain Rate (mm/h)
SS
MP
Number of Occurrences
10,000
100
1


Log10(N0)
4.4
4.2
4
3.8
3.6
2 dB
Ocean only
1
2
5
10
20
50
Rain Rate(mm/h)
40S-20S
20S-EQ
EQ-20N
20N-40N
MP DSD
SS DSD
THIS WORK


Std. Dev. Log10(N0)
0.6
0.5
0.4
0.3
0.2
0.1
0
4 dB
Ocean only
1
2
5
10
20
50
Rain Rate(mm/h)
40S-20S
20S-EQ
EQ-20N
20N-40N

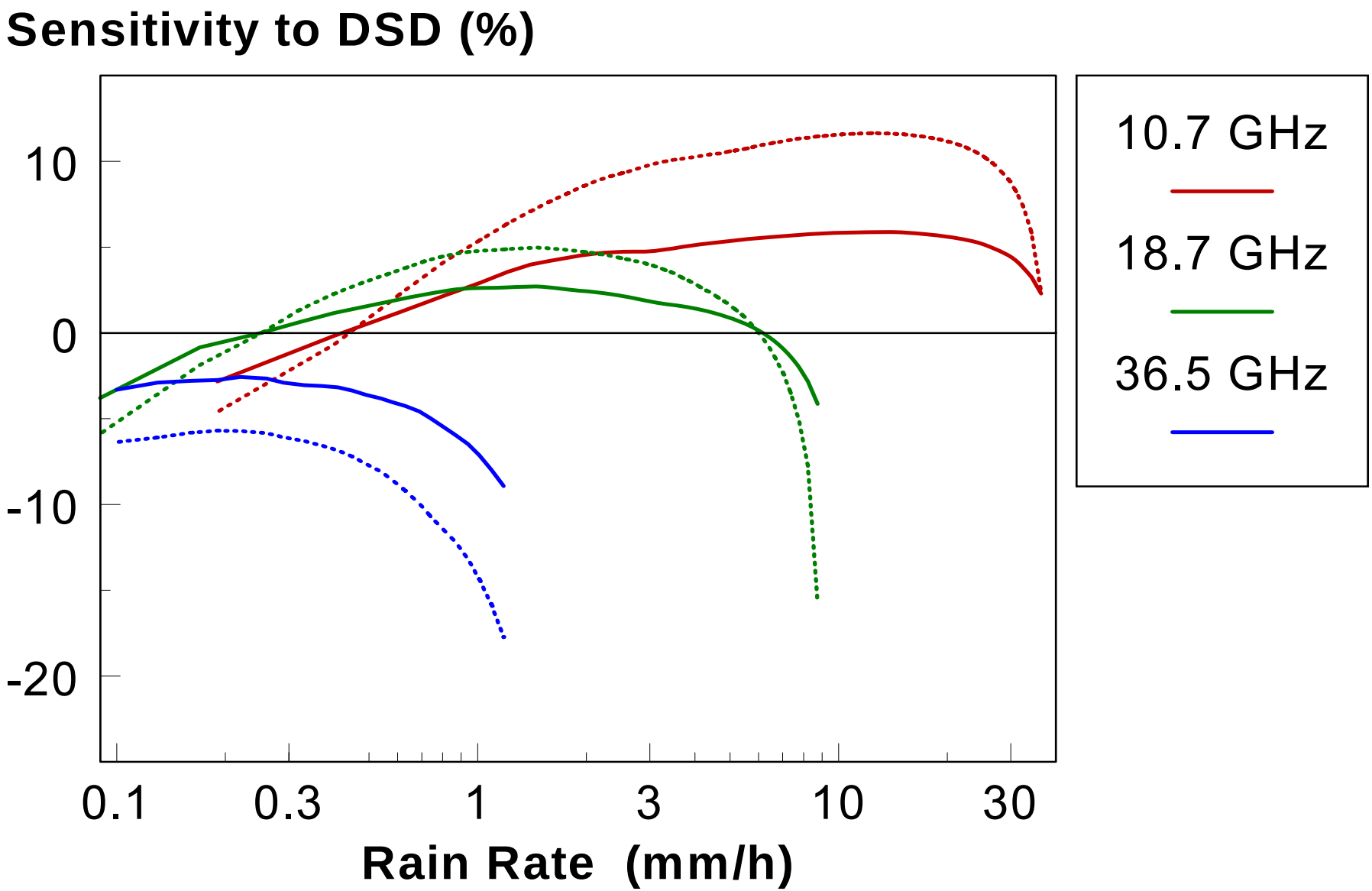
SENSITIVITY TO DROP SIZE DISTRIBUTION

BRIGHTNESS TEMPERATURE (K)



4km FREEZING LEVEL

AMSR-E FREQUENCIES/ VERT. POL.



Solid Lines: Correlated Dashed Lines: Random

Conclusions

- Modified DSD
  - Intermediate between MP and SS
- Helps explain high 18 GHz TBs
- Total uncertainty close to previous estimates
  - More random error
  - Less correlated error
- Need to extend measurements to lower rain rates
- 2 frequency radar will help
- Coincident radiometric measurement would also help