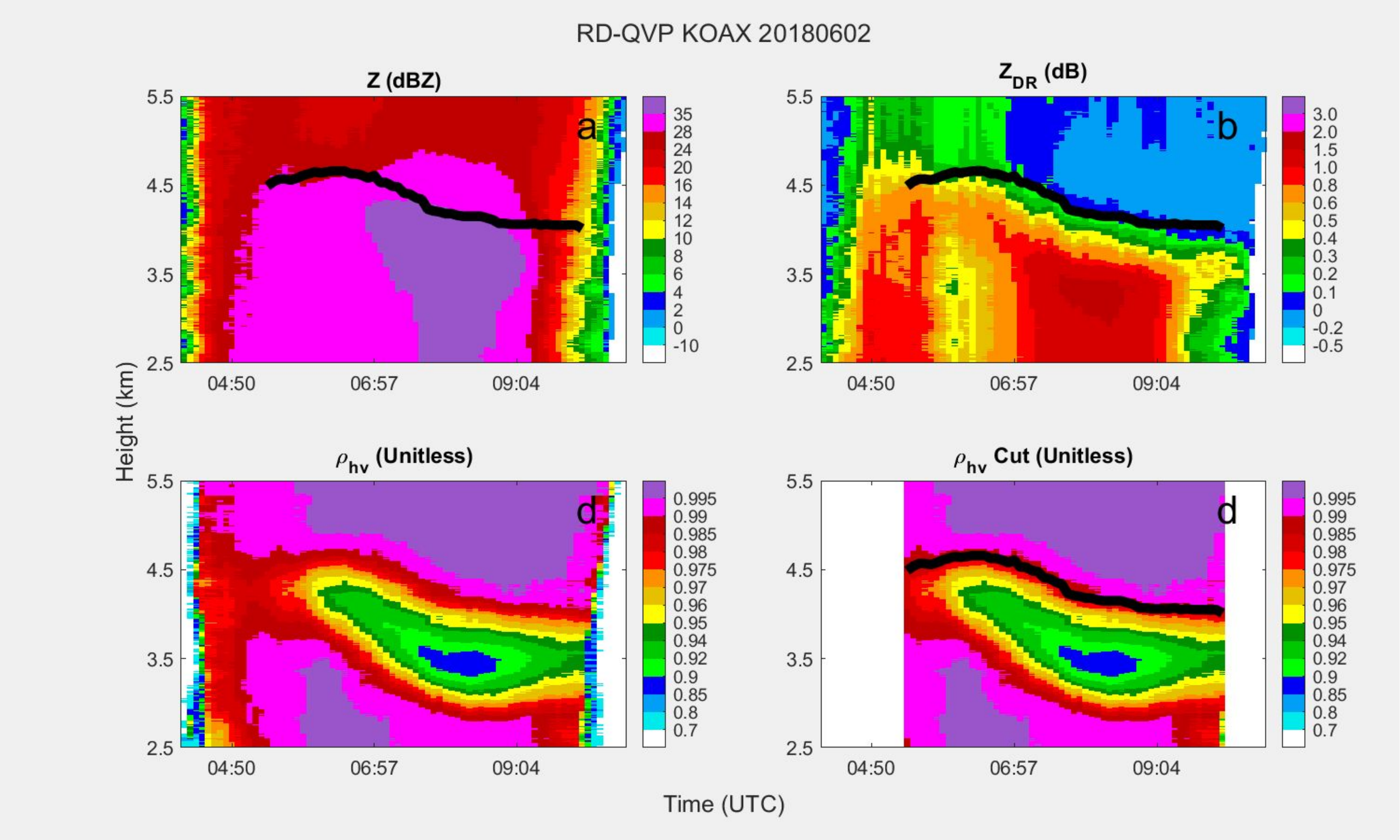
Calibration of Differential Reflectivity Using Dry Aggregated Snow Above the Melting Layer

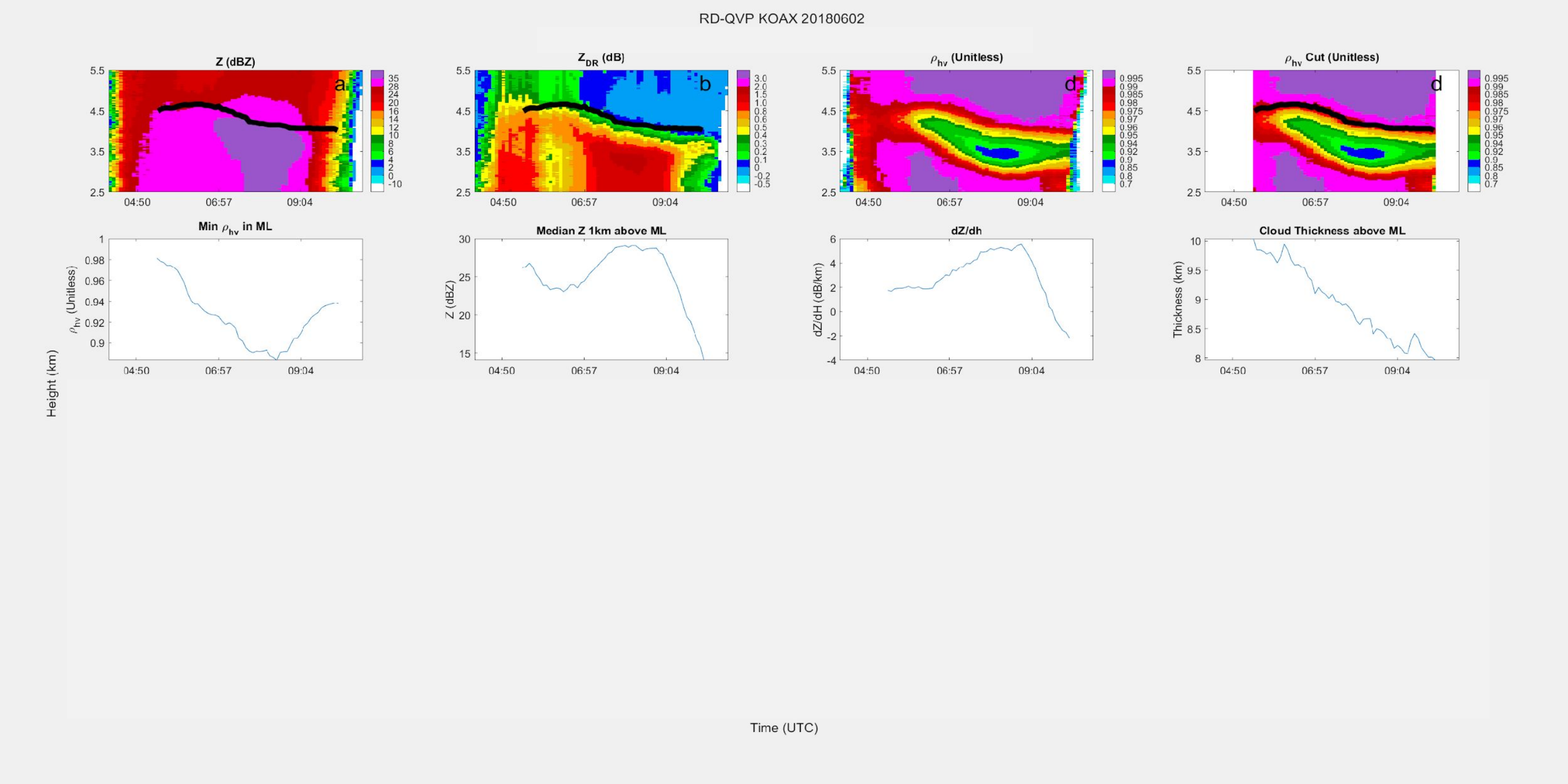
Alexander Ryzhkov, Jiaxi Hu, and John Krause (CIWRO / NSSL)

Step 1: Determine Melting Layer (ML) Top for every QVP



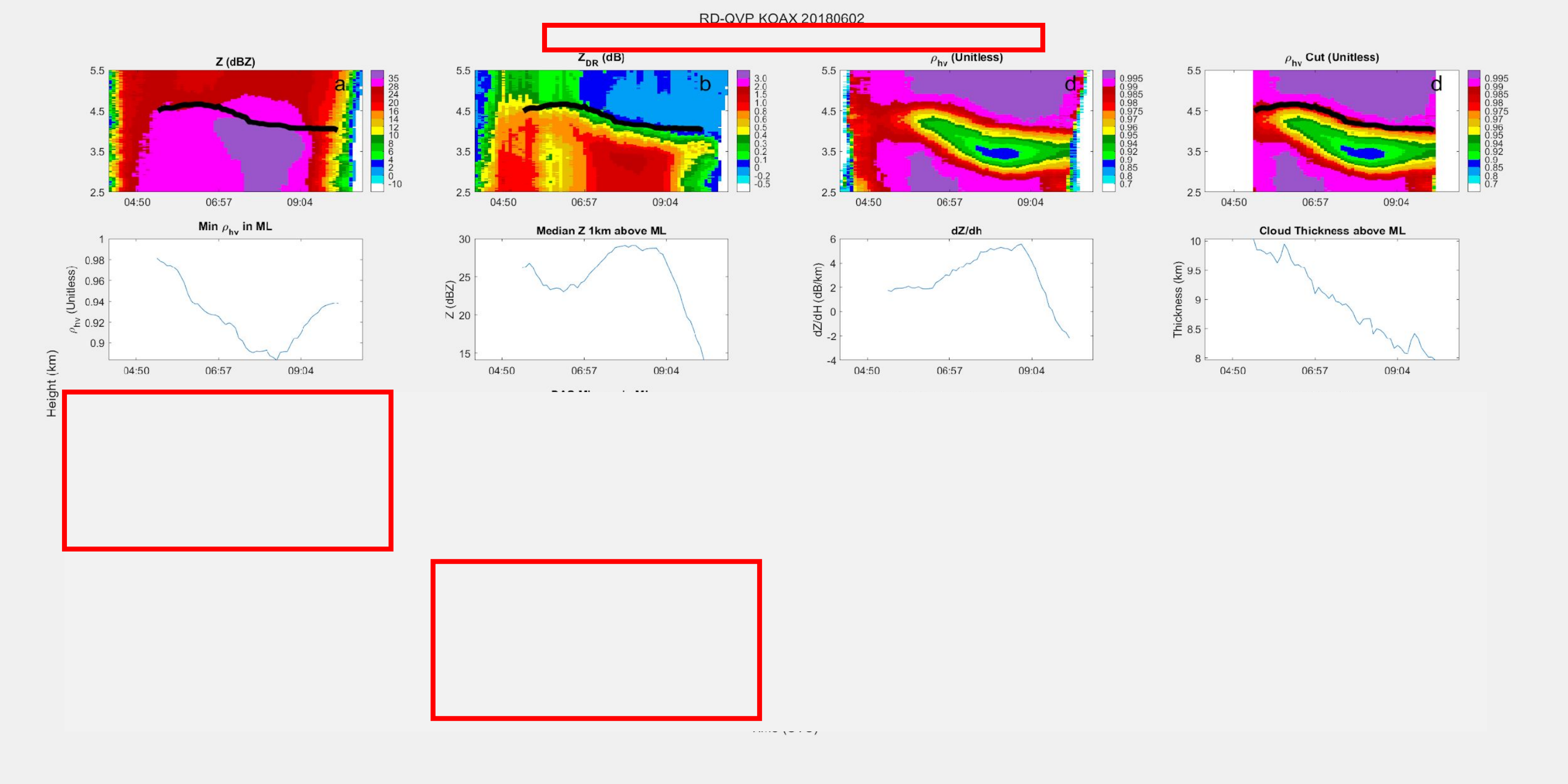
Step 2: Calculate four relevant parameters of each QVP:

- Minimal ρ_{hv} within the ML
- Median value of Z within 1 km above the ML
- Vertical gradient of reflectivity dZ/dh in a 3-km layer above the ML
- Cloud depth ΔH above the ML top



Step 3: Identify QVPs with Dry Aggregated Snow (DAS) above the ML with

- Minimal ρ_{hv} within the ML < 0.95
- Median value of Z within 1 km above the ML > 15 dBZ
- Vertical gradient of reflectivity dZ/dh in a 3-km layer above the ML > 3 dB/km
- Cloud depth ΔH above the ML top > 6 km



Final steps

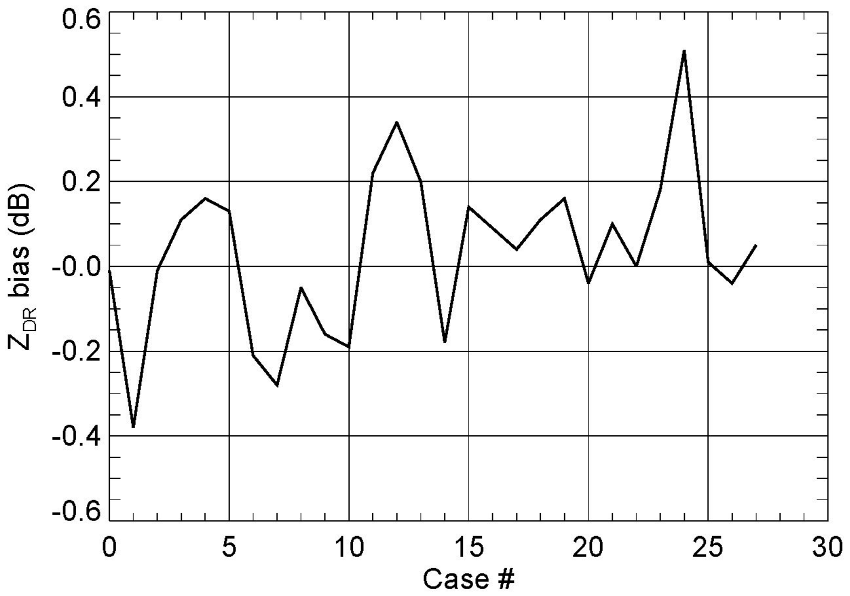
Step 4: Calculate median value of Z_{DR} in a 1-km layer in DAS above the ML for each DAS QVP (DAS Z_{DR})

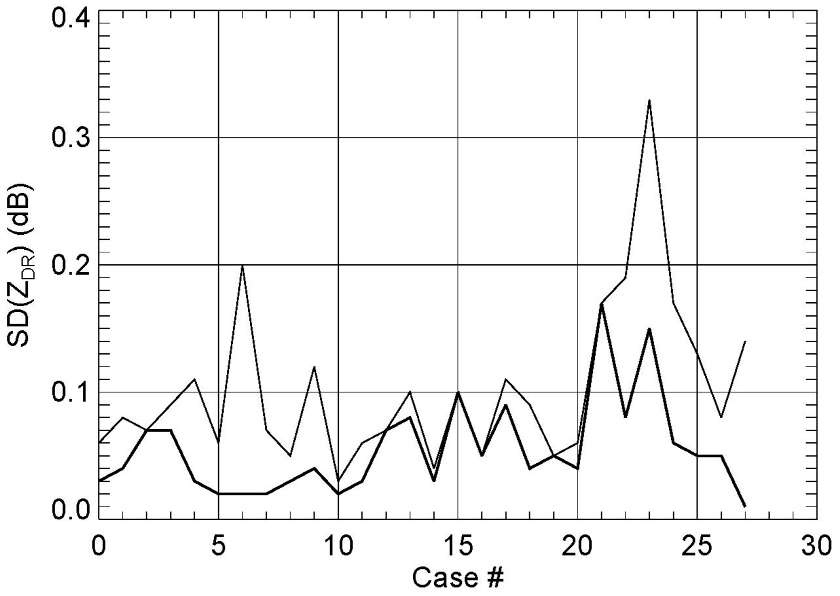
Step 5: Calculate median value of DAS Z_{DR} over the whole QVP duration period <DAS Z_{DR}>

Step 6: Calculate the bias of Z_{DR} as the difference <DAS Z_{DR} > – 0.15 dB

Step 7: Estimate the standard deviation of DAS Z_{DR} (DAS SD(Z_{DR}) as the measure of stability of the estimated Z_{DR} bias

Summary of all storms





For about 20% of cases the Z_{DR} bias exceeds 0.2 dB which is consistent with the statistics of the Z_{DR} bias across the whole WSR-88D fleet

Thick line is for DAS $SD(Z_{DR})$
$SD(Z_{DR})$ = 0.10 dB
DAS $SD(Z_{DR})$ = 0.055 dB

The accuracy of the Z_{DR} bias estimation is 0.05 – 0.06 dB