Backscatter Measurement Error Analysis of CFOSAT Scatterometer

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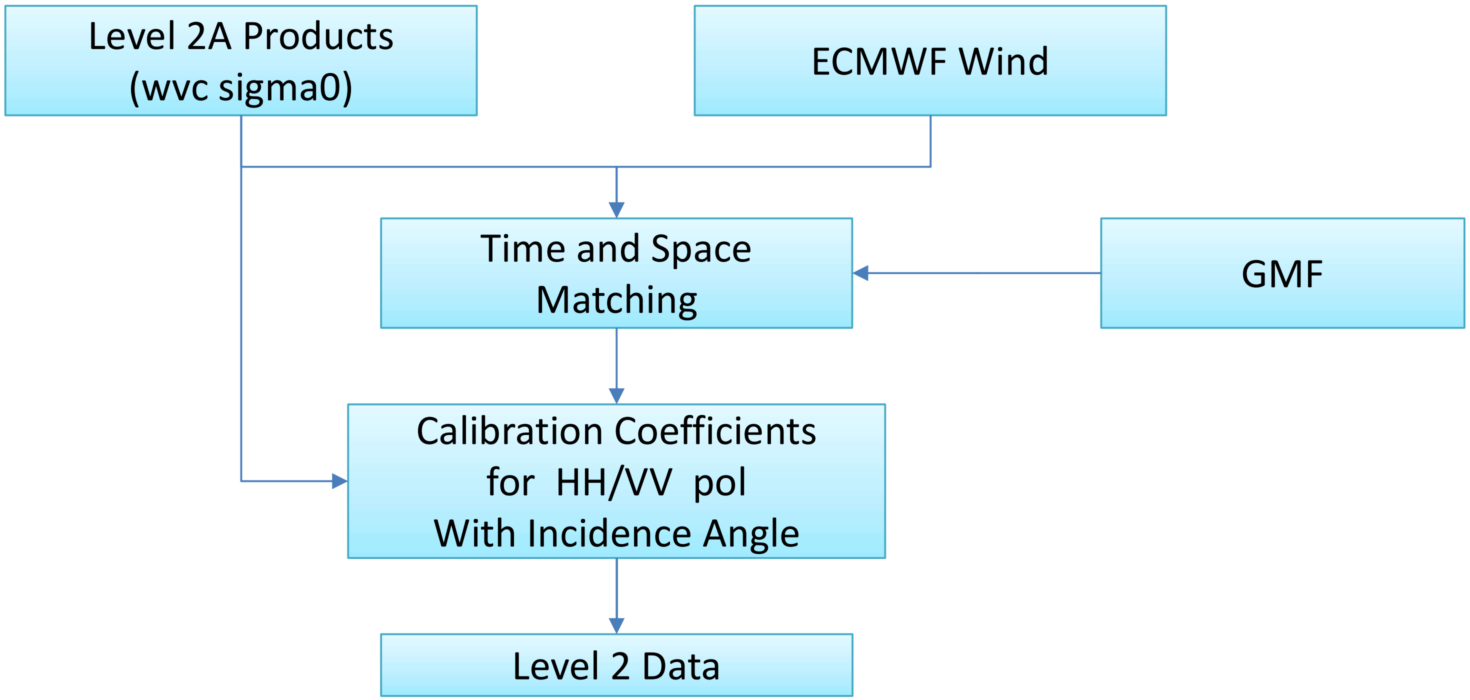
1.1 Scatterometer data

- A global coverage in 3 days
- The first fan beam rotating scanning system
- Numbers of individual backscatter observations in a wind vector cell
- Calibration is very important for subsequent wind inversion

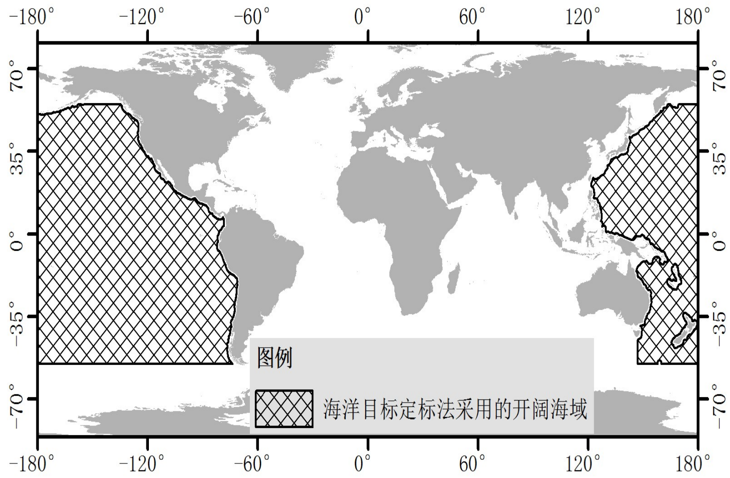
1.2 Ocean calibration theory



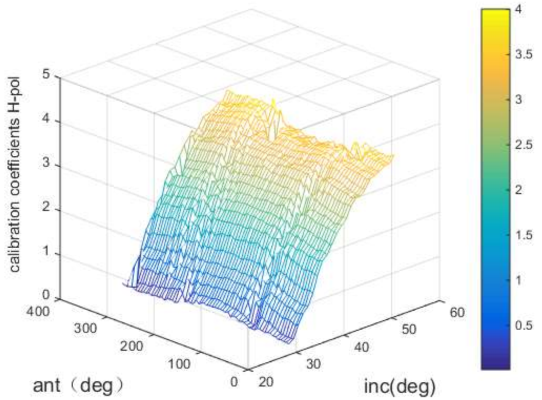
Theory:

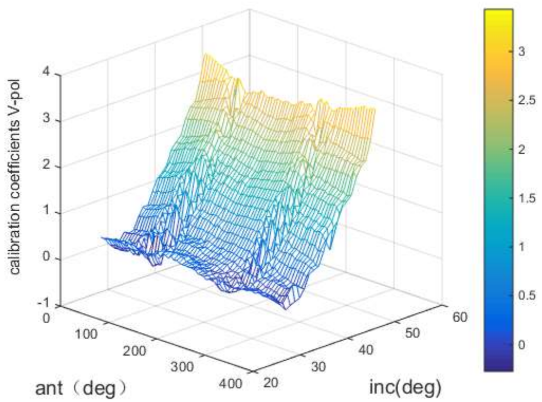
The simulated backscatter coefficients are obtained by using GMF model refering to the wind information of NWP, and have a comparison with the actual backscatter coefficients measured by the scatterometer .Then obtain the calibration coefficients.

2.1 Ocean calibration

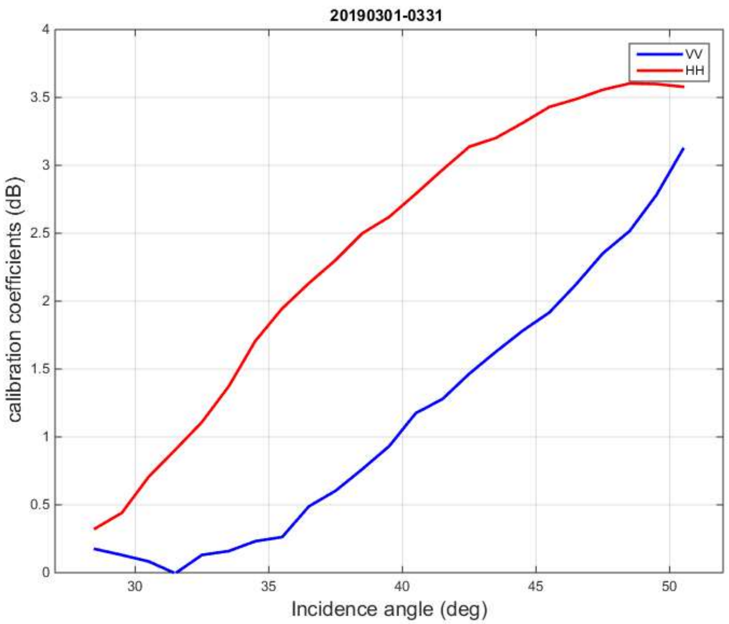


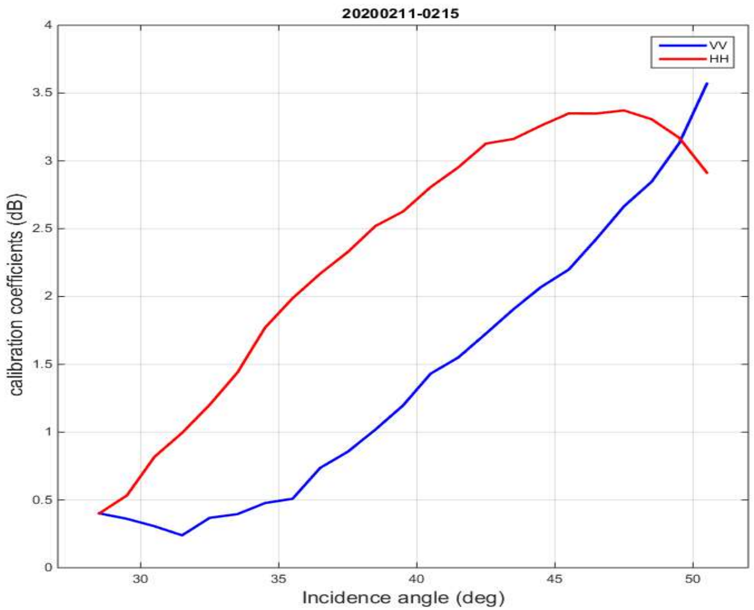
- GMF：NSCAT4 model
- Area：open sea area
- Data：2019.03.01-2019.03.31 (429 tracks)
  2020.02.11-2020.02.15(75 tracks)
- Incidence：interval(1 degree)，range[26,51]
- Wind speed：interval (1m/s)，range[0,20]
- Azimuth: interval(5.625 degree)，range[0,360]



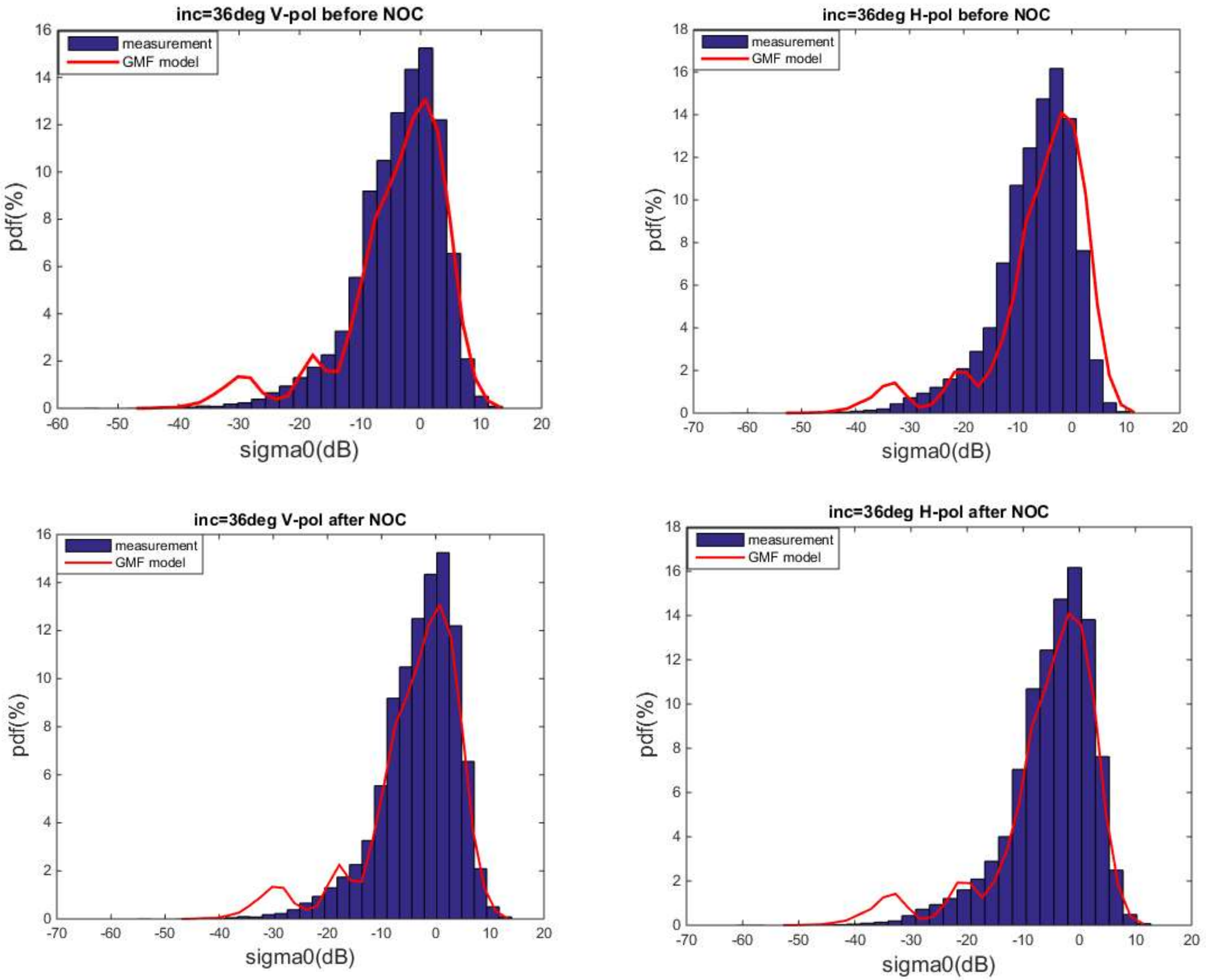


2.2 Results and error analysis

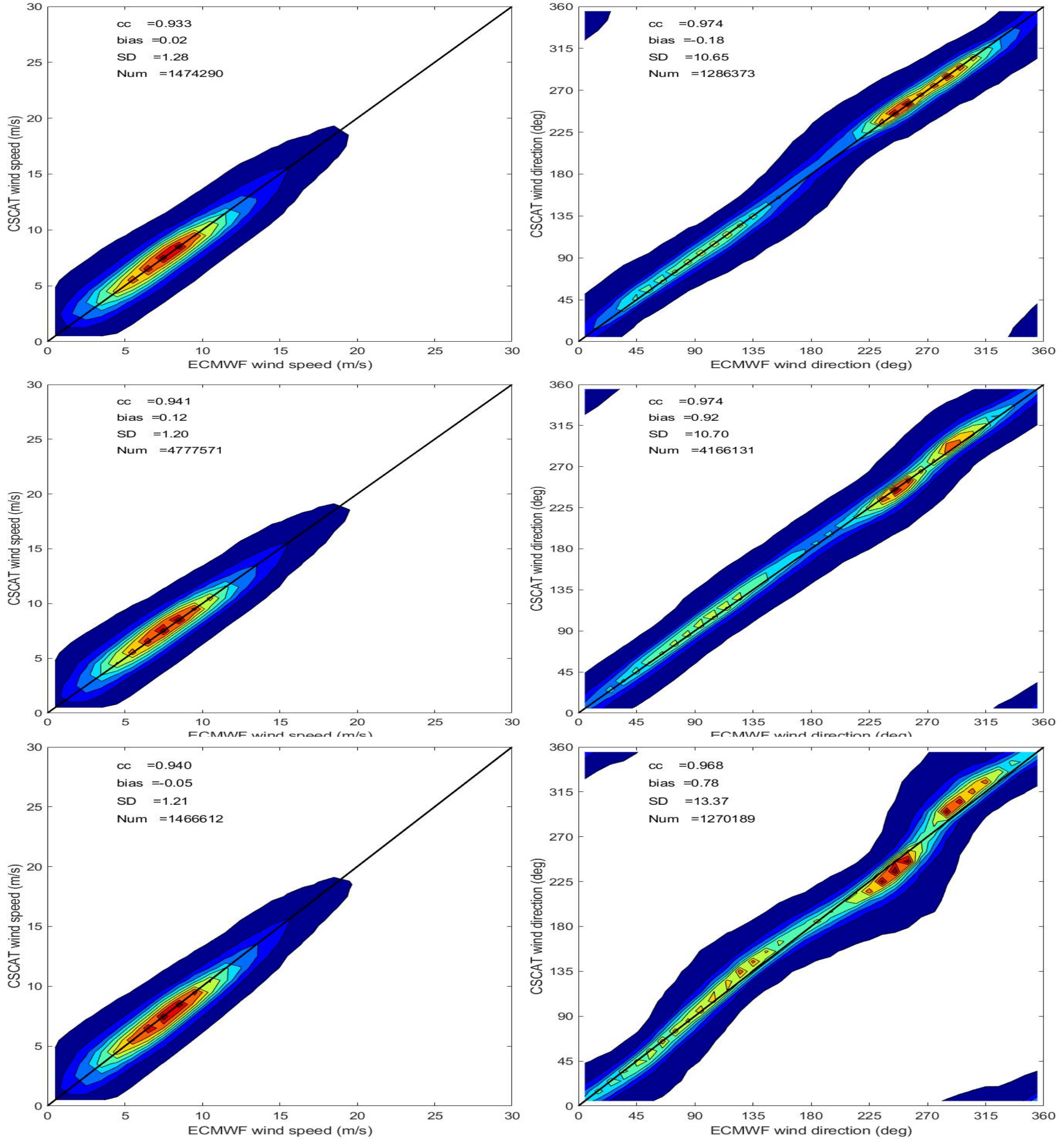




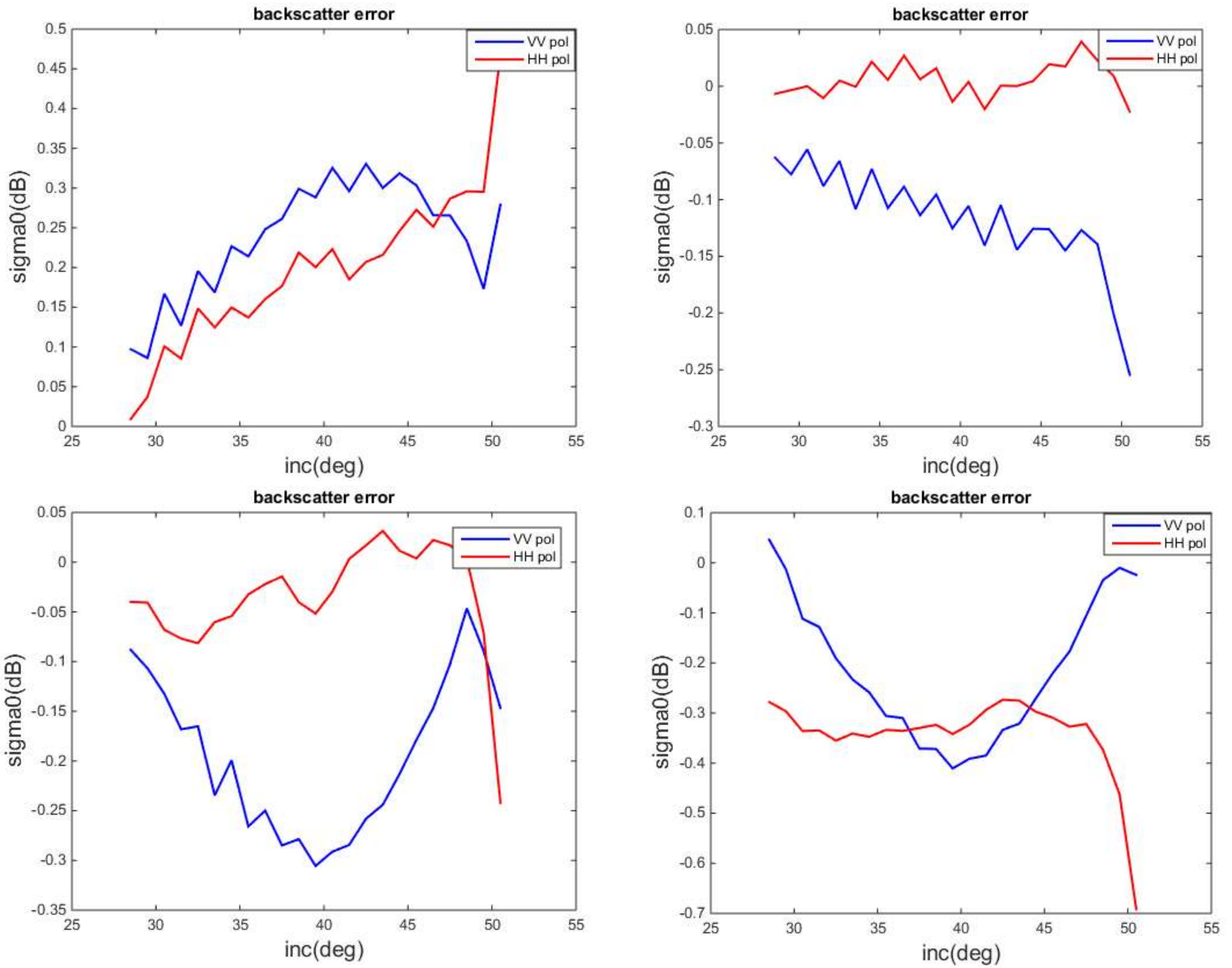
Ocean calibration coefficients range from 0dB to 3.6dB witn incidence angles. (The current L1 and L2 processors both assume the potential bias is induced by the lack of true antenna gain pattern, then the calibration coefficients are modeled as a function of incidence angles.)



The backscattering distribution tends to be consistent with the GMF model after calibration .

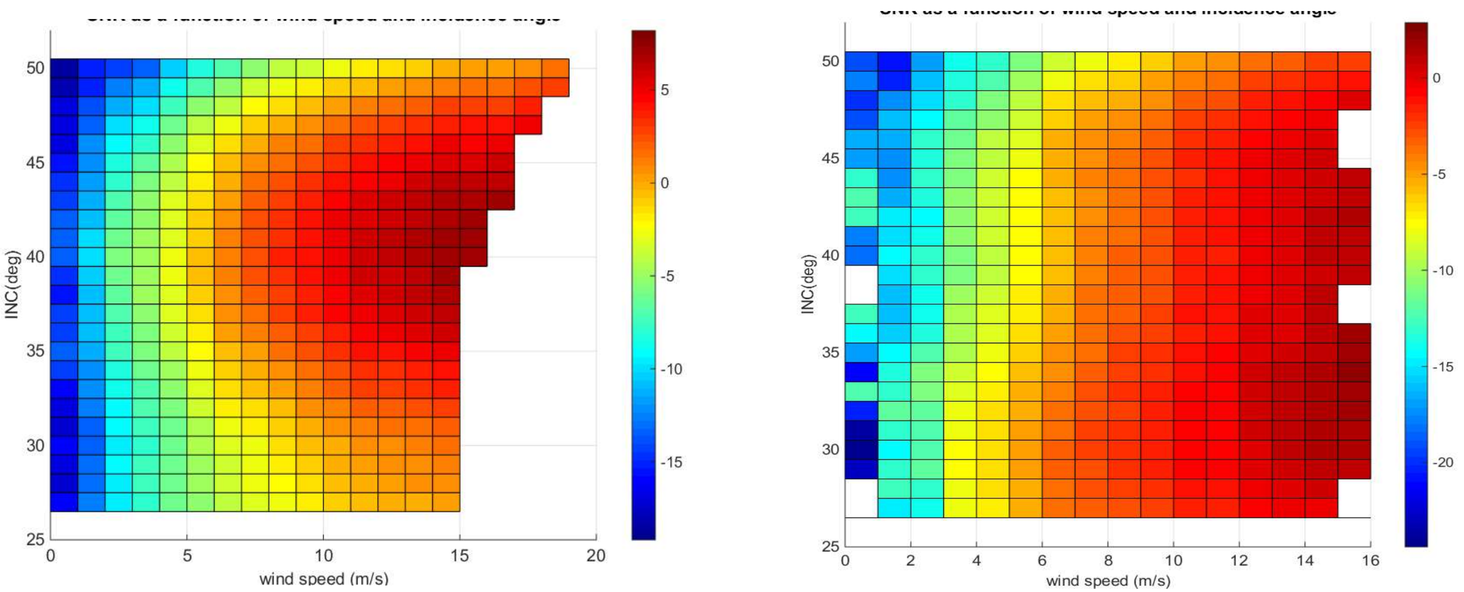


Wind field inversion in different positions： far swath、sweet swath、nadir swath respectively



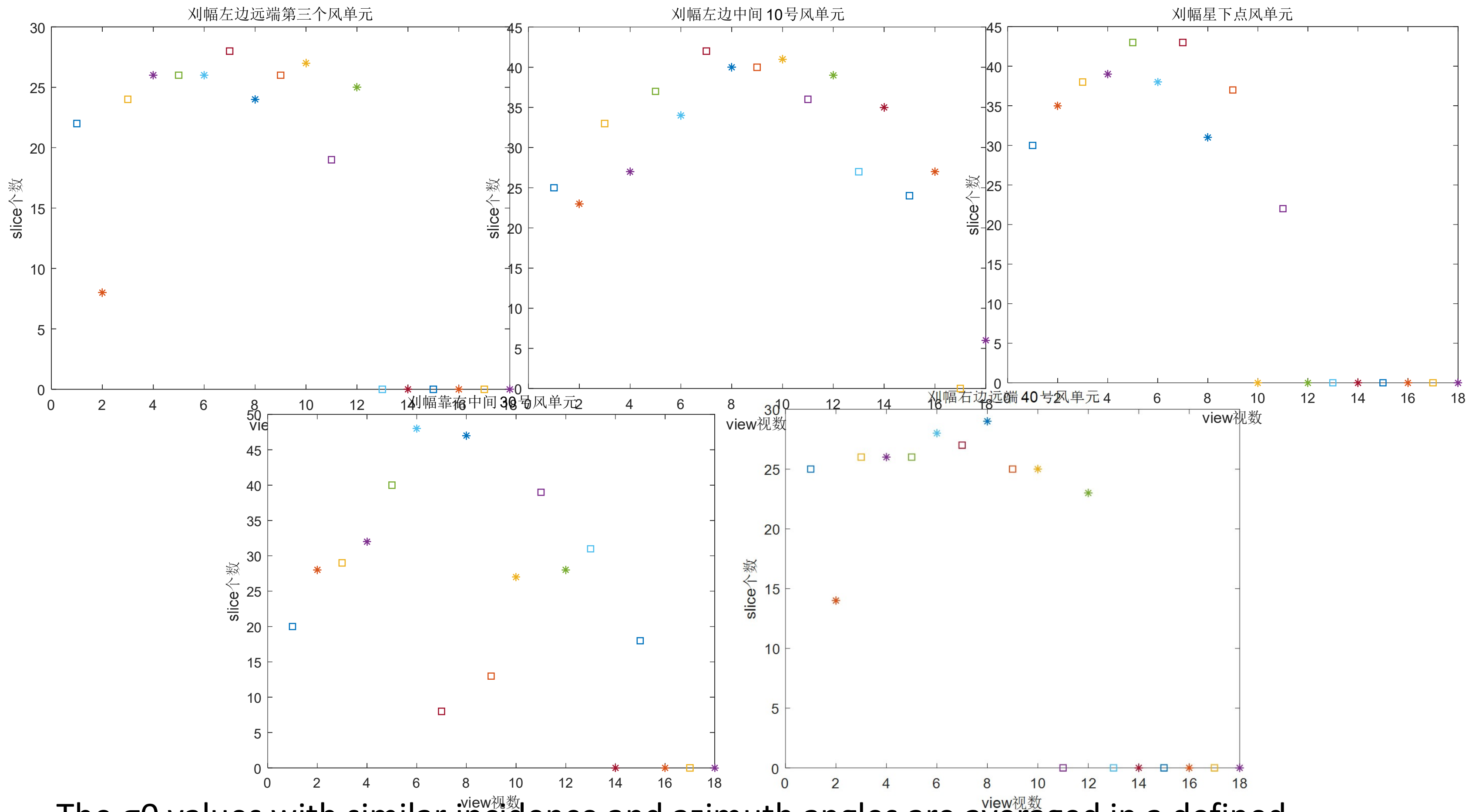
The error is large at large incident angles and at low wind speed ,which is consistent with the distribution of wind products. The overall calibration accuracy reaches 0.3dB (wind speed: 7, 10, 15, 18 respectively)

2.3 Analysis of L1B data

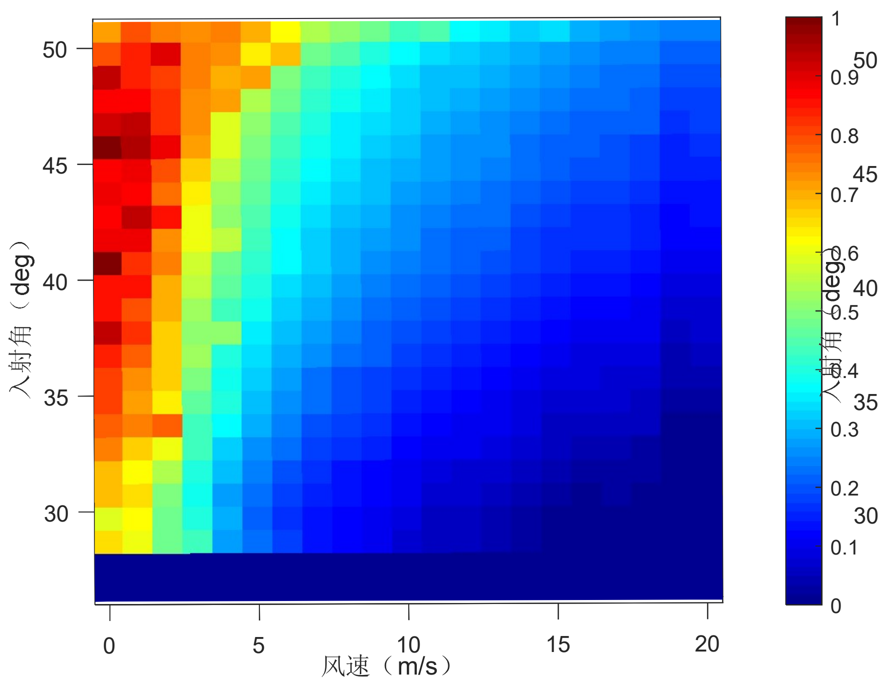


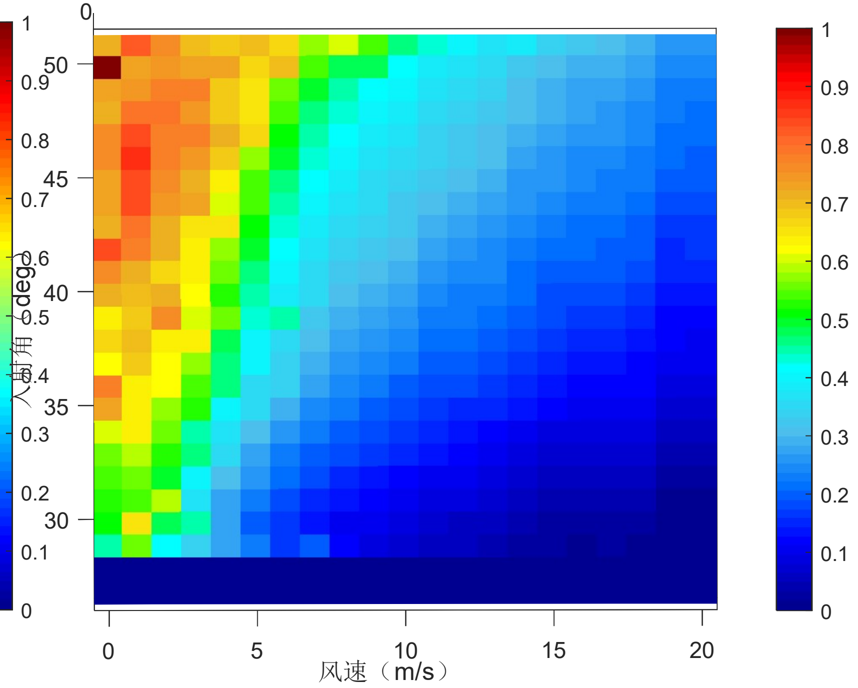
L1B: SNR as a function of incidence angle and wind speed
VV pol （left ） HH pol （right）

3 Analysis of L2 backscatter coefficient Kp



The σ0 values with similar incidence and azimuth angles are averaged in a defined swath.Typically, 25–50 slices are collected to a view, and 2–8 views per antenna beam are acquired at each WVC.（The pictures show the number of slices in each WVC from left to right in a certain line of a certain track ）





L2A: sigma0 Kp as a function of incidence angle and wind speed

VV pol （left ） HH pol （right）

Conclusion

1. Ocean calibration can improve sigma0 measurement accuracy effectively
2. The trend of sigma0 error with polarization, wind speed and incidence angle are consistent with the wind products
3. The above are only preliminary analysis, and it is expected to get further calibration analysis and better quality of the data

Thanks for reading!