ON THE INVERSION CHARACTERISTICS OF CFOSAT WIND SCATTEROMETER

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Mar. 2021

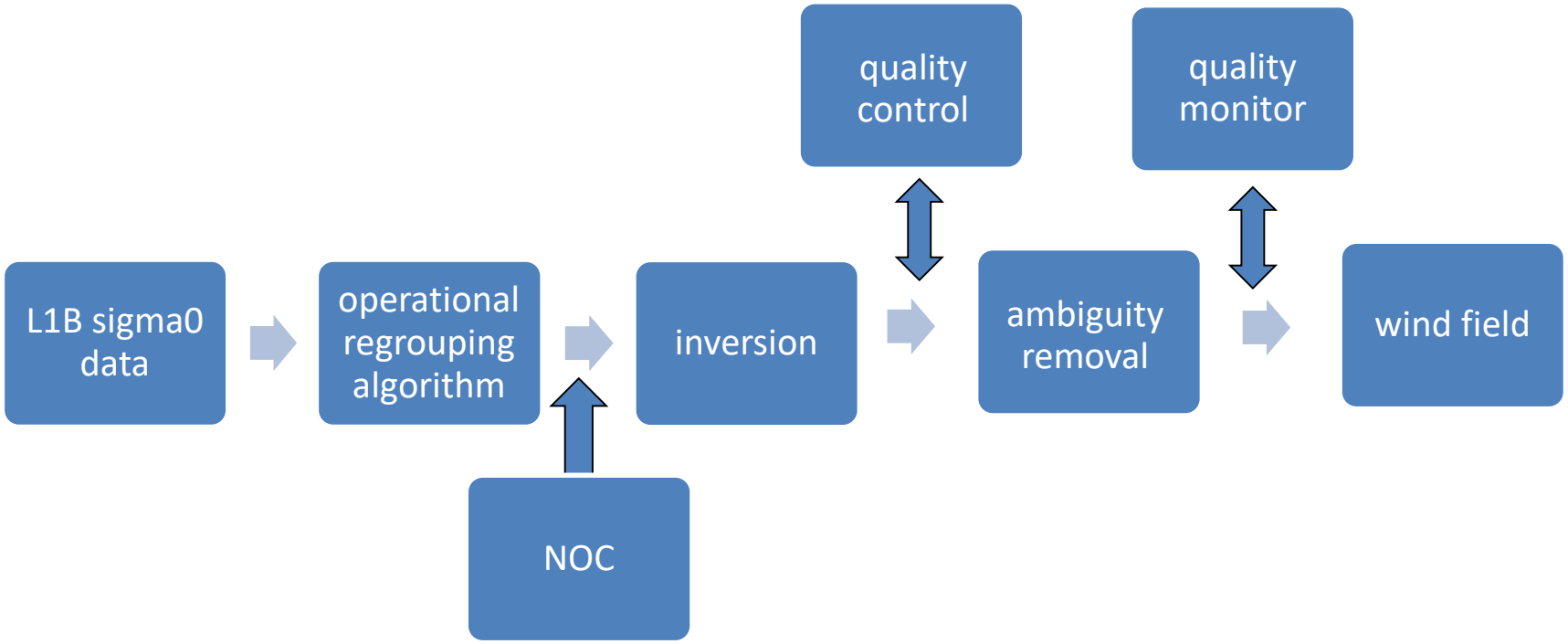
Outlines

- CSCAT wind retrieval process
- Characteristics of inversion residual distribution
- Empirical solution probability
- Results and verifications
- Summary

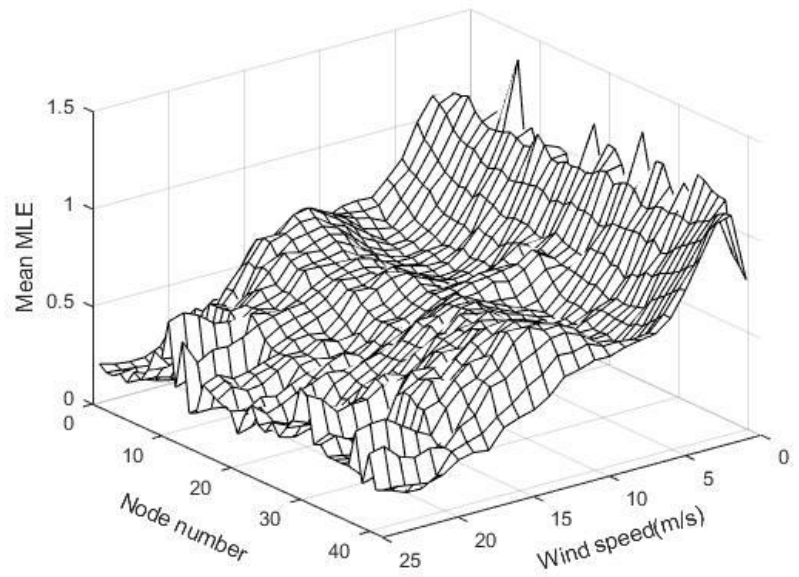
CFOSAT wind scatterometer(CSCAT)

- First rotating fan beam scatterometer operated in Ku band micromave frequency.
- CSCAT is dedicated to the monitoring of sea surface wind vectors but also provides valuable data for applications over land and Polar Regions.
- Observe Earth’s surface at different incidence and azimuth angles using innovative observing geometry.

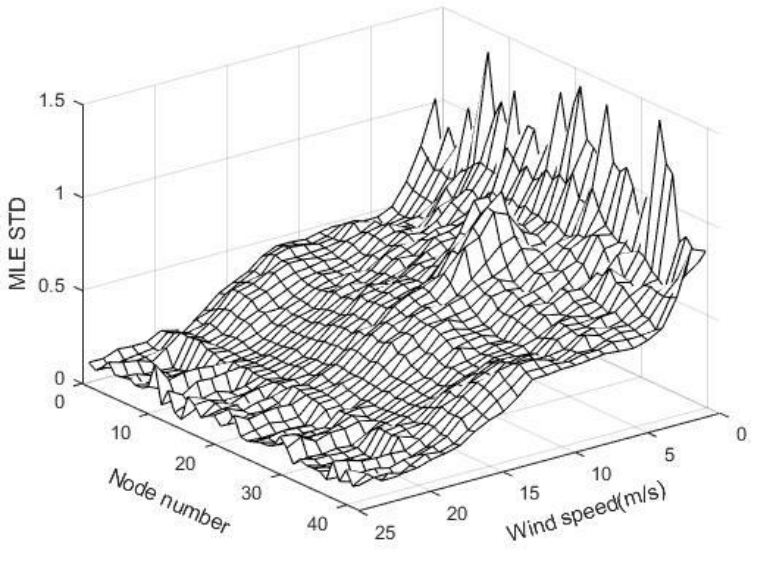
1.CSCAT wind retrieval process



2. Characteristics of Inversion Residual Distribution

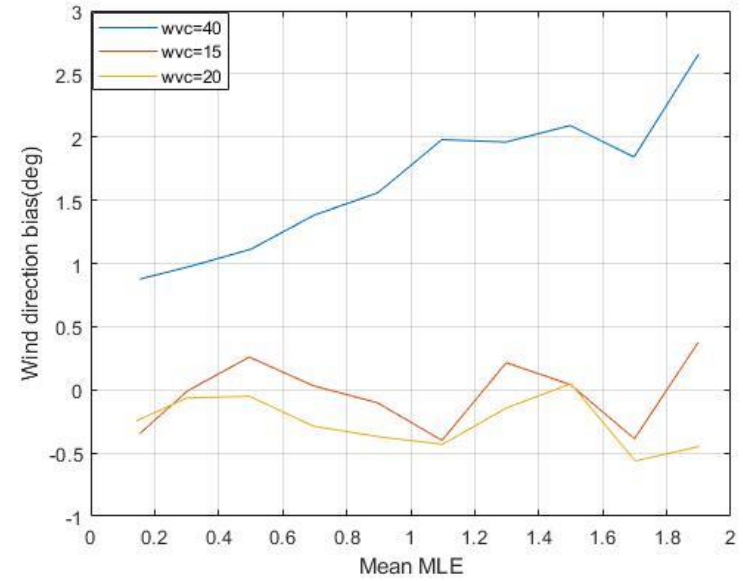


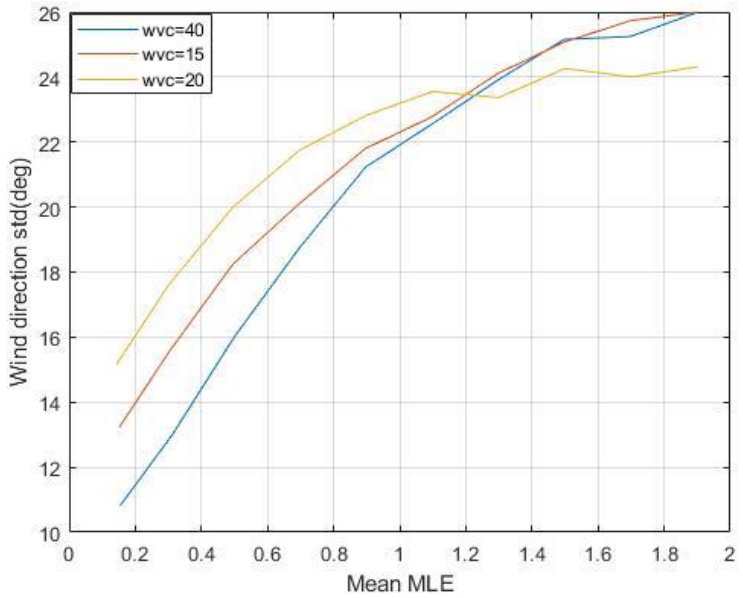
(a)

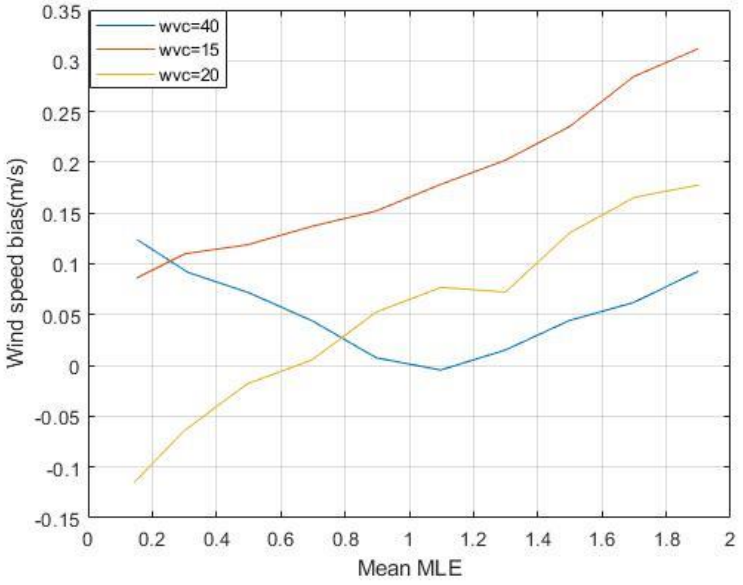


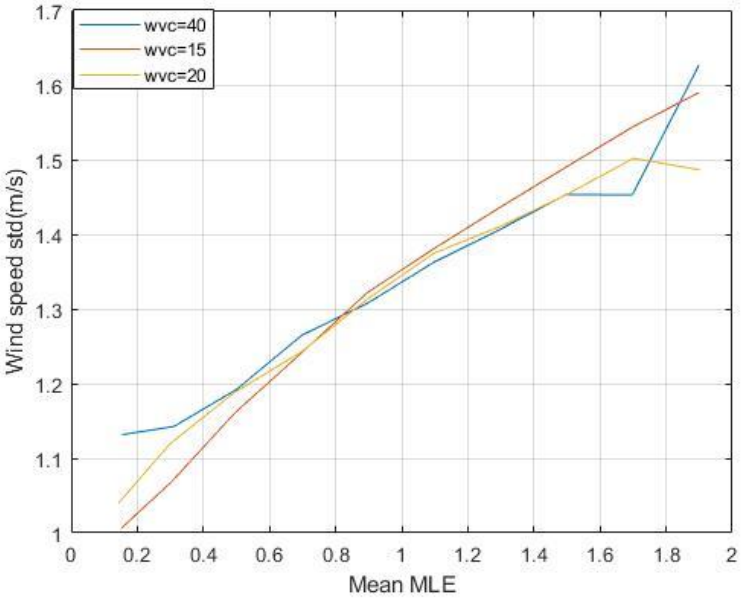
(b)

Mean MLE versus wind speed and WVC number(a); MLE STD versus wind speed and WVC number(b)









Statistics of CSCAT winds versus ECMWF winds as a function of the mean MLE of CSCAT

3.Empirical solution probability

$$P(v|\sigma^0) = \frac{1}{k} e^{-MLE/2} \tag{1}$$

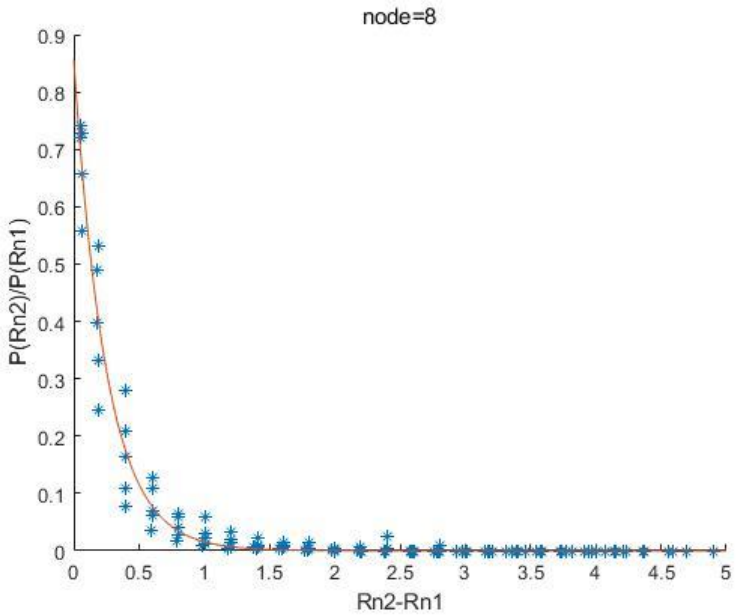
$$R_n = MLE / < MLE > \tag{2}$$

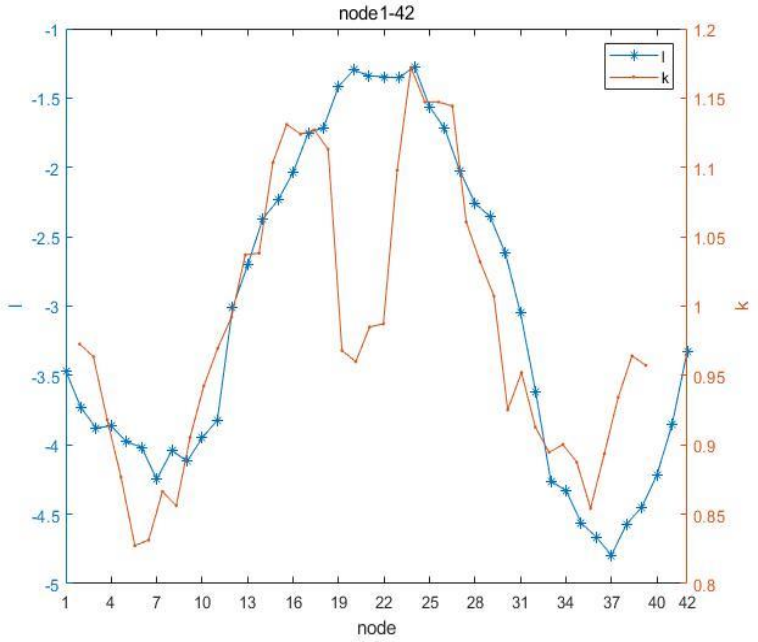
$$p(v|\sigma^0) = k e^{R_n \cdot l} \tag{3}$$

$$p(s = j|Rn_i, i \in \{1, N\}) = \frac{p_s(Rn_j)}{\sum_{i=1}^{N} p_s(Rn_i)} \tag{4}$$

$$P(s = 1|Rn_1, Rn_2) = \frac{p_s(Rn_1)}{p_s(Rn_1) + p_s(Rn_2)} \tag{5}$$

$$= \left(1 + p_s\left(Rn_2\right)/p_s\left(Rn_1\right)\right)^{-1}$$





The exponents and coefficients of the probabilistic model versus node number. The black curve (left y-axis) represents the exponents and the red curve (right y-axis) represents the coefficients.

4.Results and Verifications

Predicted/observed distributions (far swath)

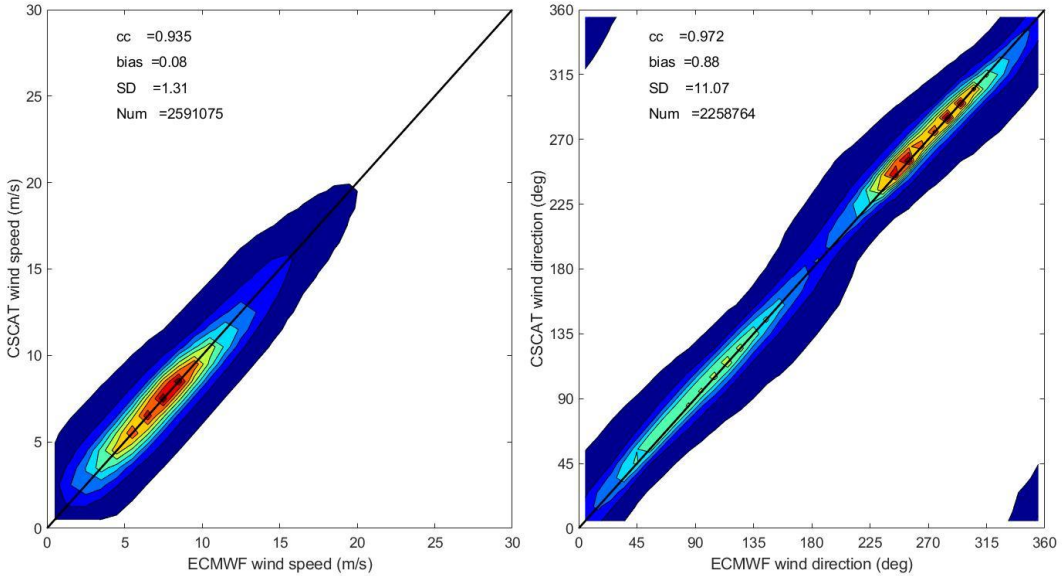
	2 solutions	3 solutions	4 solutions	All solutions
Number of Data	267607	117849	458349	472138
Rank1	84/81	82/79	83/80	83/80
Rank2	16/19	13/16	10/13	14/17
Rank3	-	5/5	4/4	2/2
Rank4	-		3/3	0/0

Predicted/observed distributions (nadir swath)

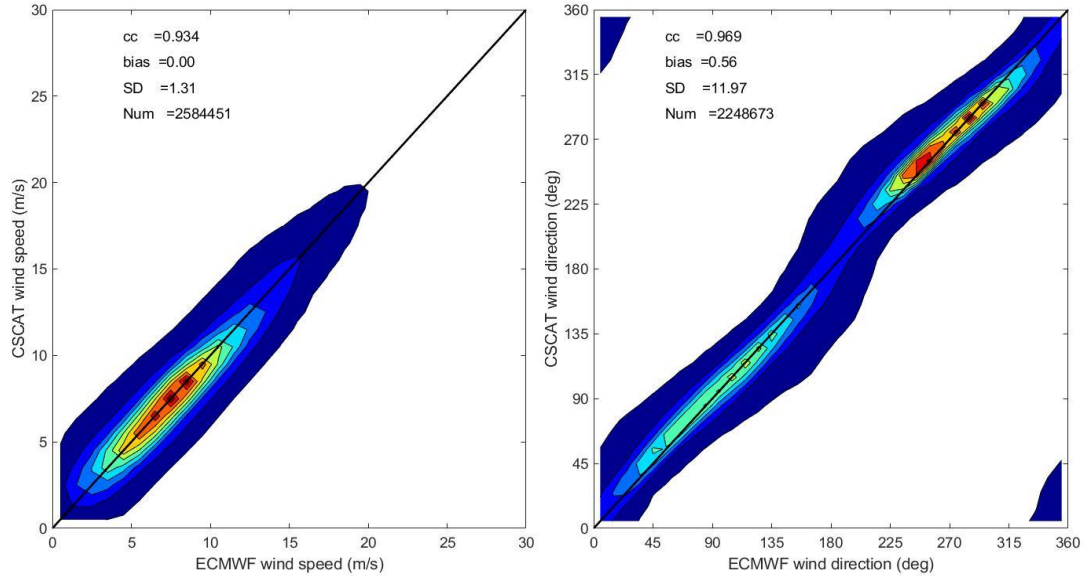
	2 solutions	3 solutions	4 solutions	All solutions
Number of Data	162112	144373	40206	346691
Rank1	78/78	56/66	45/56	65/71
Rank2	22/22	28/22	23/21	25/22
Rank3	-	16/11	17/13	9/6
Rank4	-		12/10	1/1

Predicted/observed distributions (sweet swath)

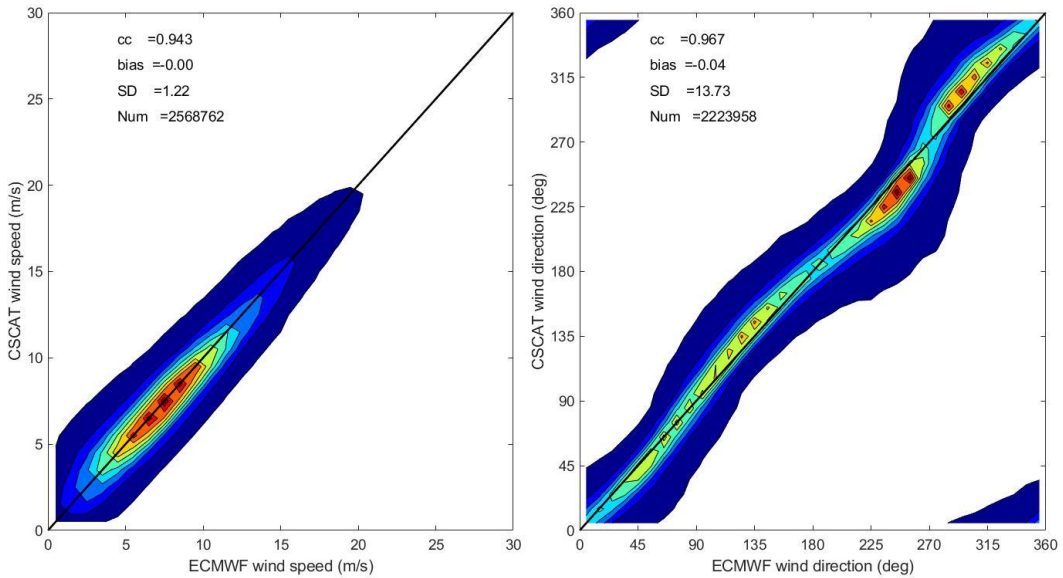
	2 solutions	3 solutions	4 solutions	All solutions
Number of Data	514639	345693	273984	1134316
Rank1	90/88	78/82	80/83	84/85
Rank2	10/12	16/14	14/13	13/13
Rank3	-	6/4	4/3	3/2
Rank4	-		2/1	0/0



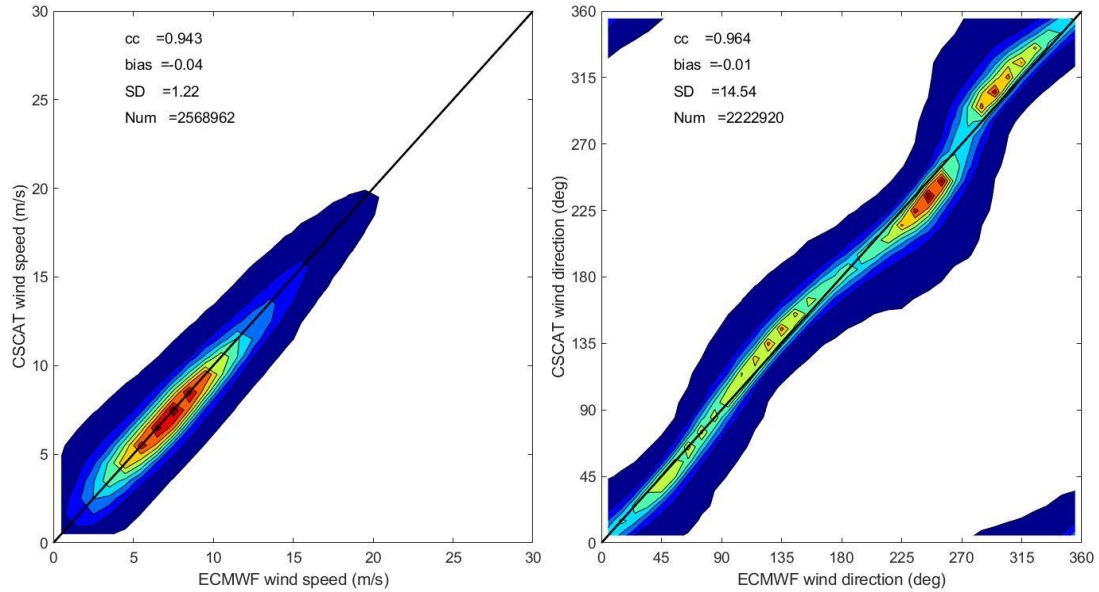
Far swath (l=-1.4)



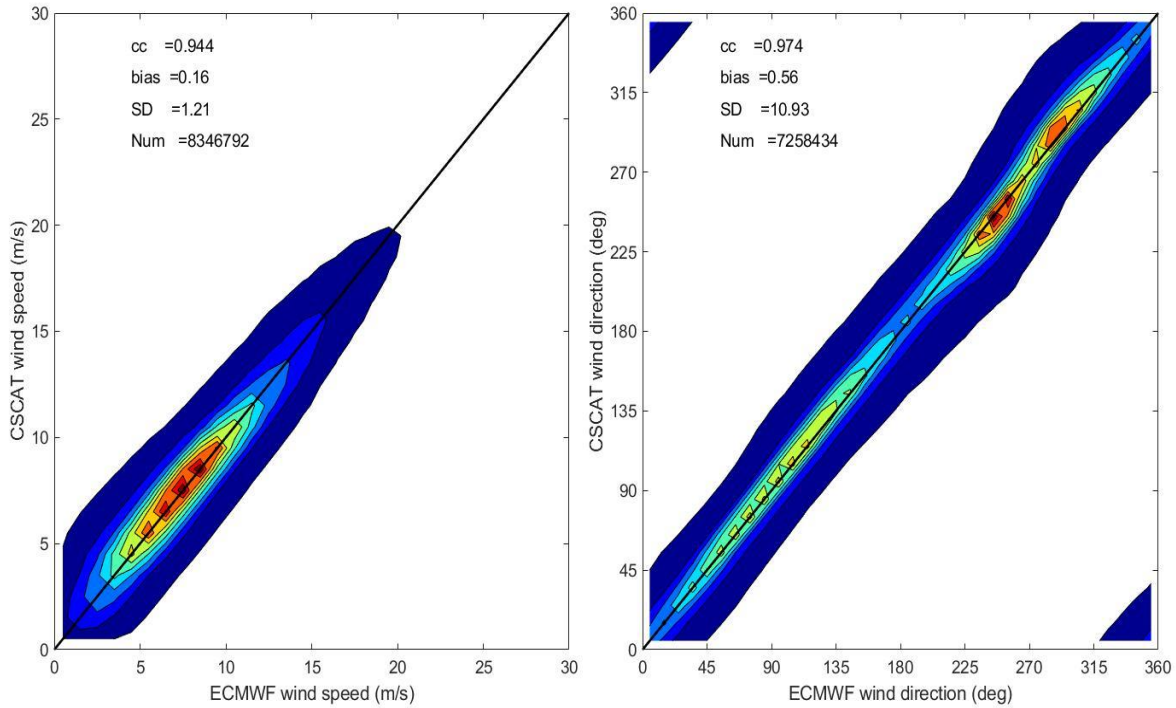
Far swath



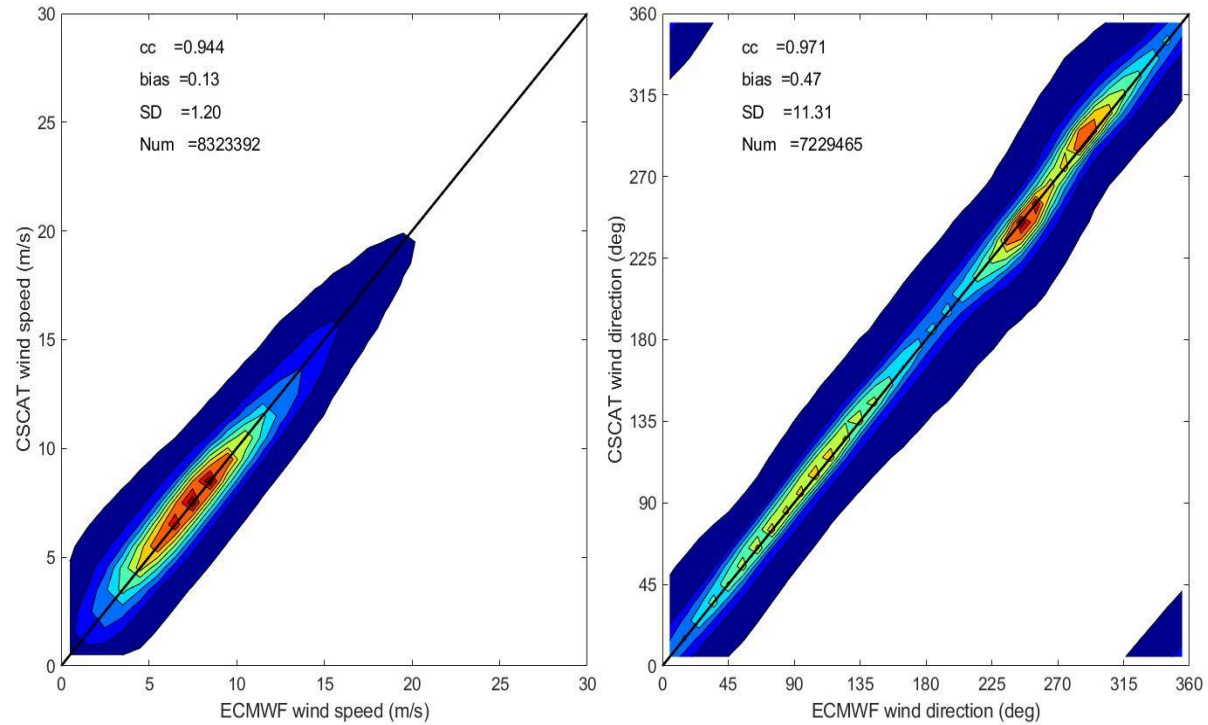
Nadir swath (l=-1.4)



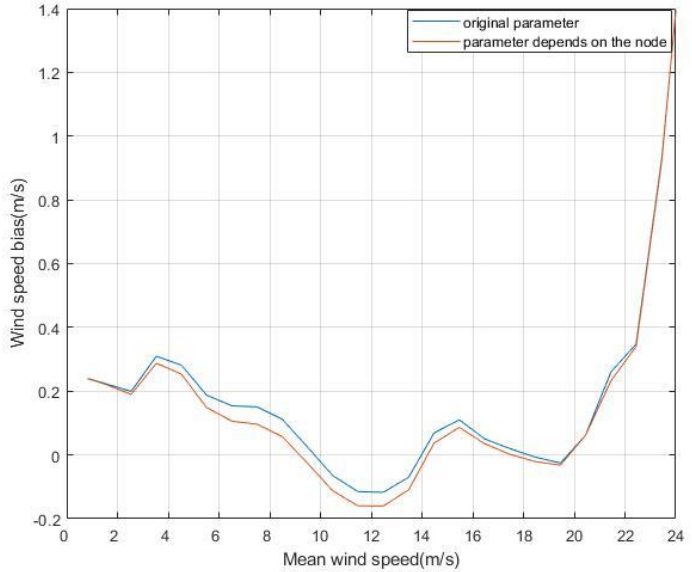
Nadir swath

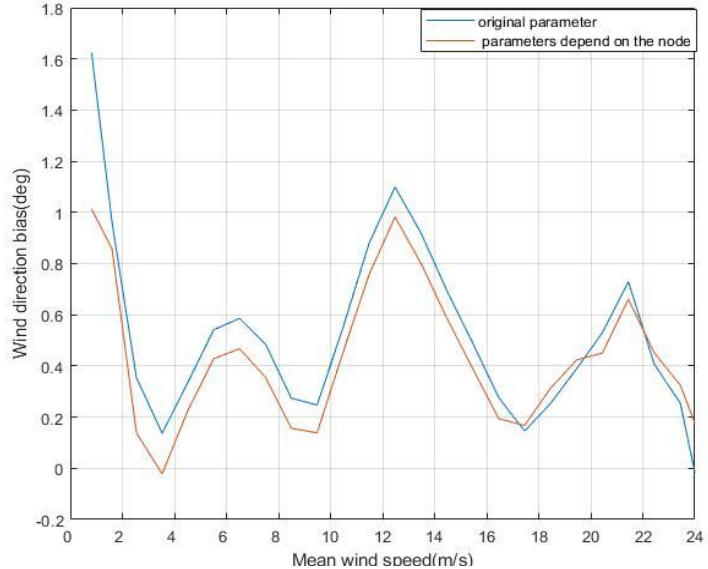


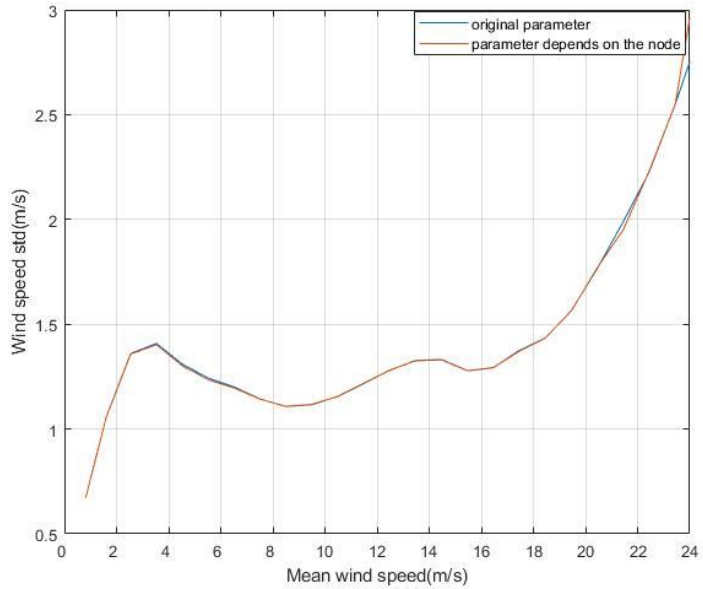
Sweet swath (l=-1.4)

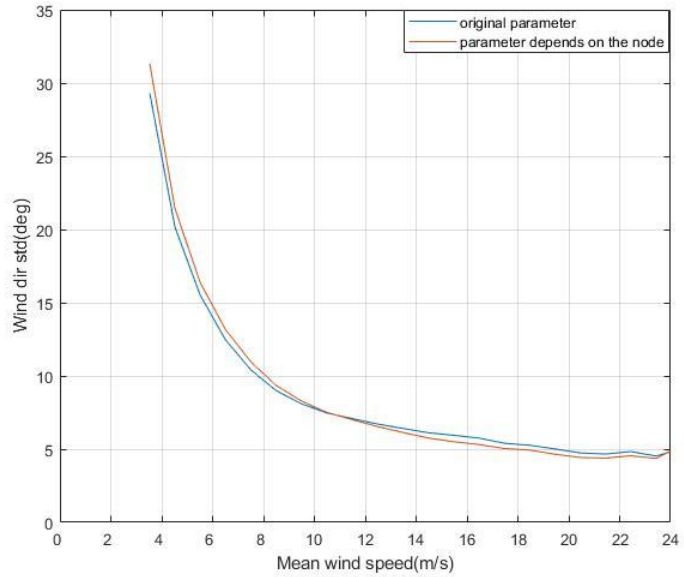


Sweet swath

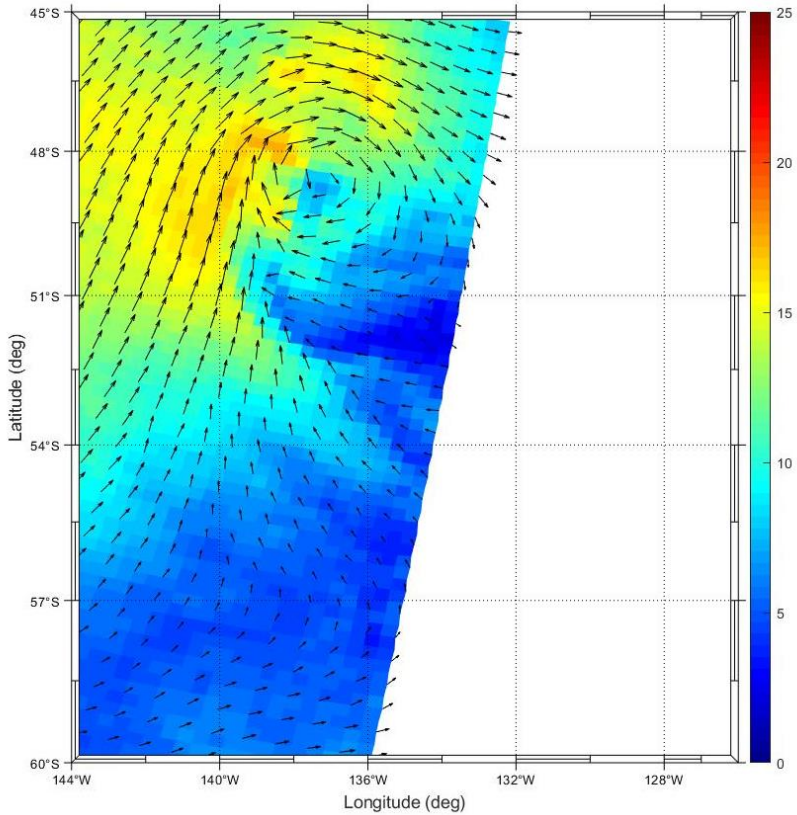


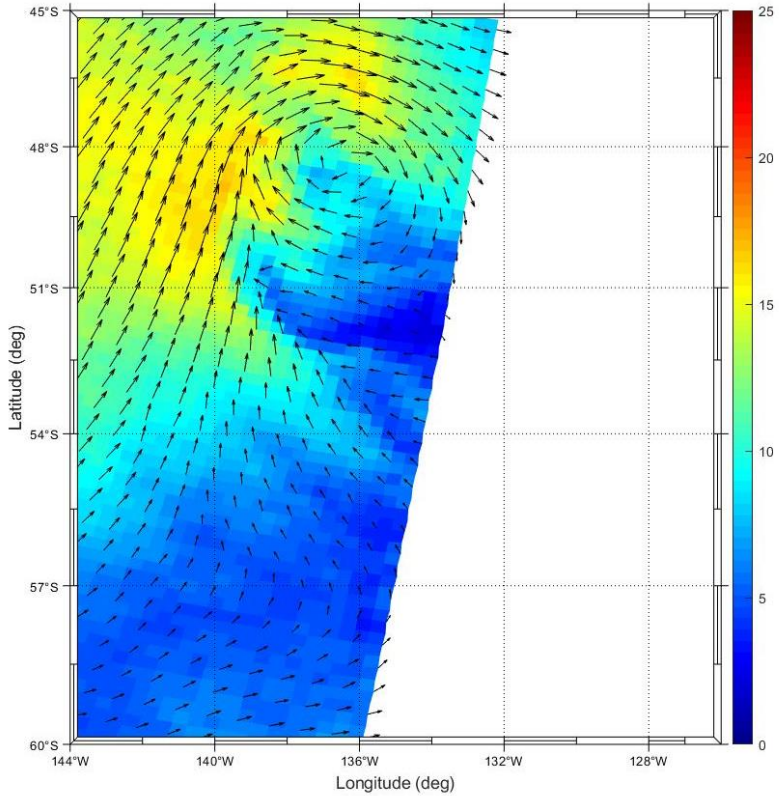






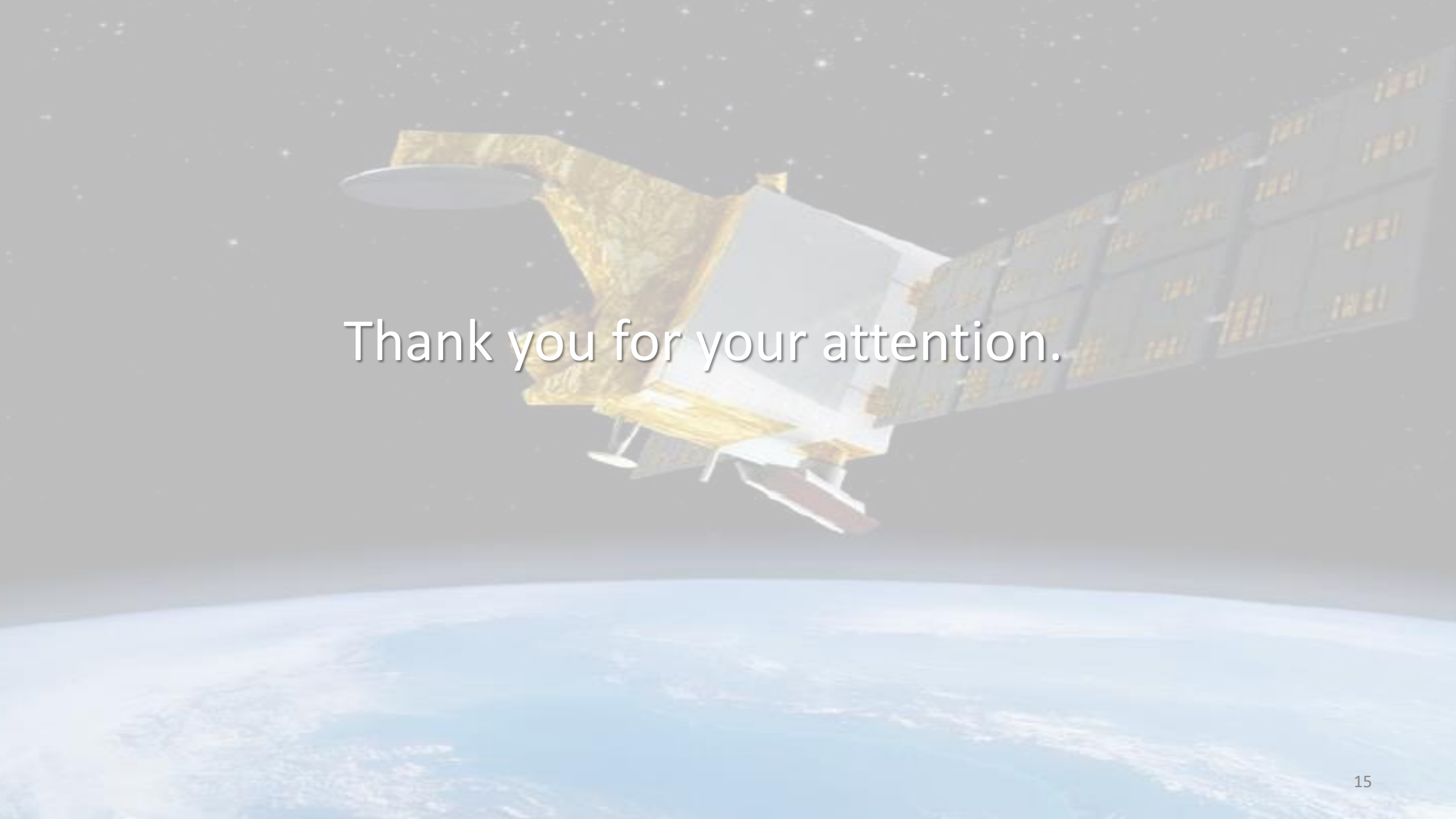
CSCAT winds versus ECMWF winds as a function of the mean wind speed of CSCAT and ECMWF.


45°S
48°S
51°S
54°S
57°S
60°S
144°W
140°W
136°W
132°W
128°W
Latitude (deg)
Longitude (deg)
25
20
15
10
5
0


45°S
48°S
51°S
54°S
57°S
60°S
144°W
140°W
136°W
132°W
128°W
Latitude (deg)
Longitude (deg)
25
20
15
10
5
0

SUMMARY

- The inversion residual distribution varies with the node and wind vector.
- The parameters of the probability function vary with the node, as the distance between the node position and nadir increases, the exponent of the probability function decreases.
- The node-dependent probability function can improve the wind vector bias and wind field consistency.


Thank you for your attention.