QuikSCAT radar cross section correction for improved coastal winds retrieval

G. Grieco [1] J. Vogelzang [2] A. Verhoef [2] A. Stoffelen [2] M. Portabella [3]

19th Apr 2022

[1] **Istituto di Scienze Marine (ISMAR-CNR)**

[2] **Koninklijk Nederlands Meteorolgish Instituut (KNMI)**

[3] **Barcelona Expert Center (ICM-CSIC)**

Aims of the project

- Development of pencil-beam scatterometer coastal wind processor
- Development of a QuikSCAT coastal wind climatology

Outline of this presentation

- Implementation of the Land Contribution Ratio (LCR)-based σ_0 correction scheme
- Preliminary conclusions and future work

LCR-based σ_0 correction scheme

- Hypothesis: Near the coast, σ_0 varies linearly with LCR

$$\sigma_0 = \sigma_0^{SEA} + a * LCR \tag{1}$$

- σ_0s with $LCR > f_T$ are discarded
- Use of σ_e^2 for QC:

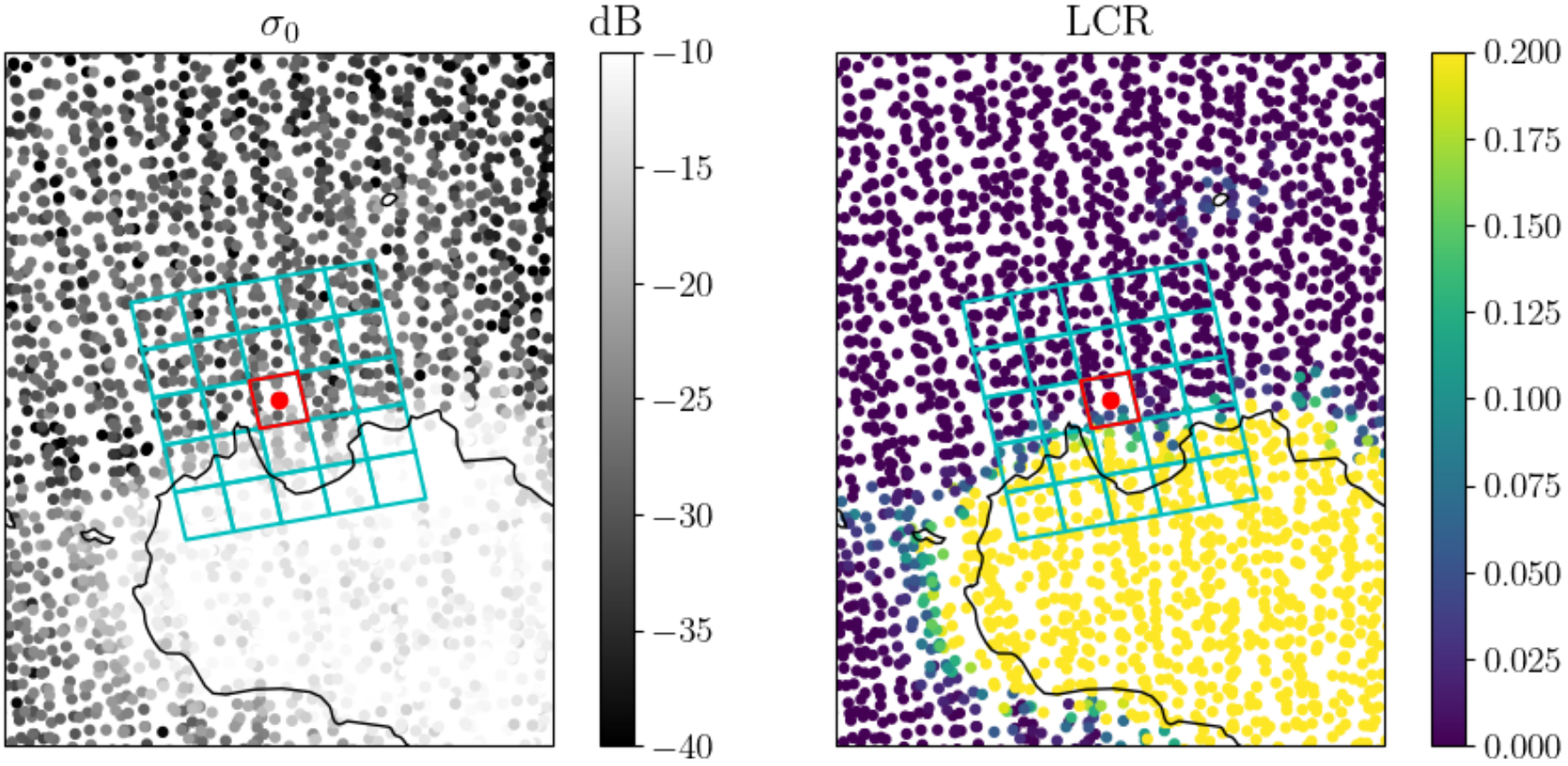
$$\sigma_e^2 = \frac{n}{n-2}\left(C_{\sigma\sigma} - 2aC_{f\sigma} + a^2 C_{ff}\right) \tag{2}$$

with C_{xy} second order central moment, n the number of samples in the *mxm* WVC matrix, f stands for LCR and σ for σ_0. n is required to be higher than 3.

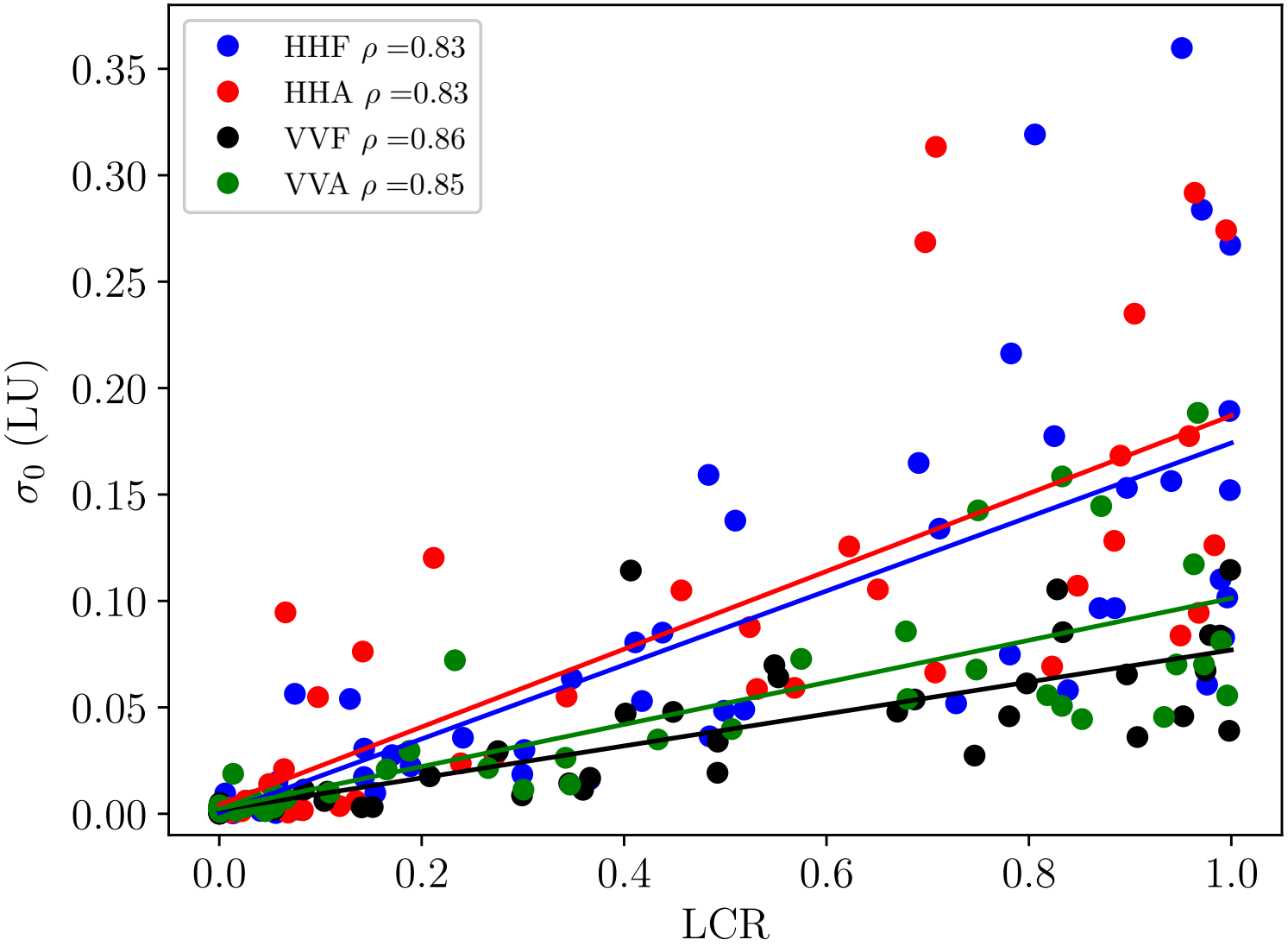
Excercise configuration

- Dataset
  - Date: 10th April 2007
  - QuikSCAT Full Resolution file. Orbit ID 40653
- slice σ_0 correction methodology:
  - 5x5 WVC matrix around the given WVC
- σ_0 integration:
  - $\sigma_0^{pv} = \frac{\sum_i w_{pvi} \sigma_{0C}^{pvi}}{\sum_i w_{pvi}}$
    - $w_{pvi} = 1,\ \sigma_e^2 \leq 0.005$
    - $w_{pvi} = exp^{-\frac{(\sigma_0^{pvi} - a^{pv} f^i - b^{pv})^2}{F \sigma_e^{pv\,2}}} \quad F = 2$
- Area test: Sicily

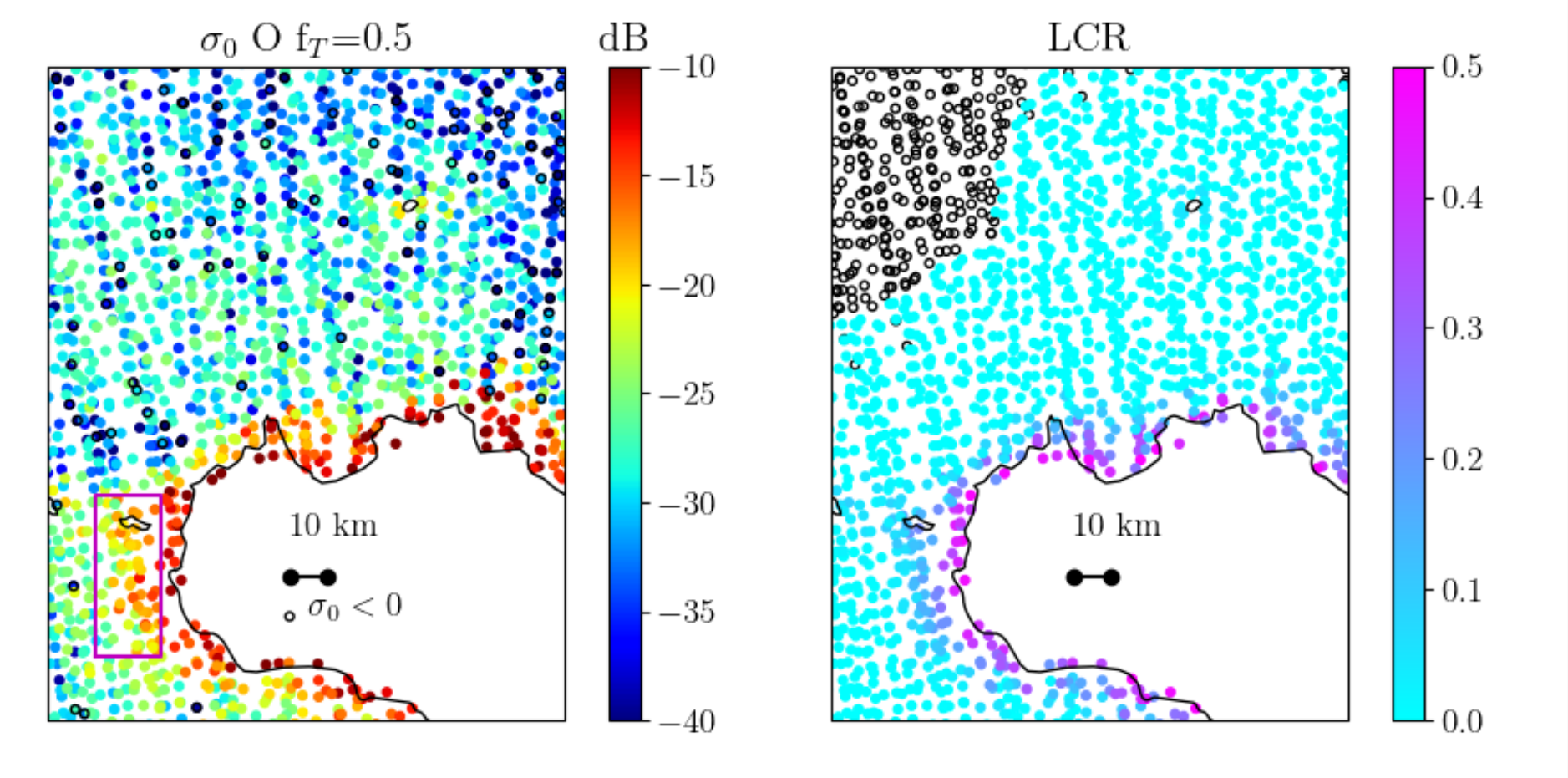
Area test: Sicily



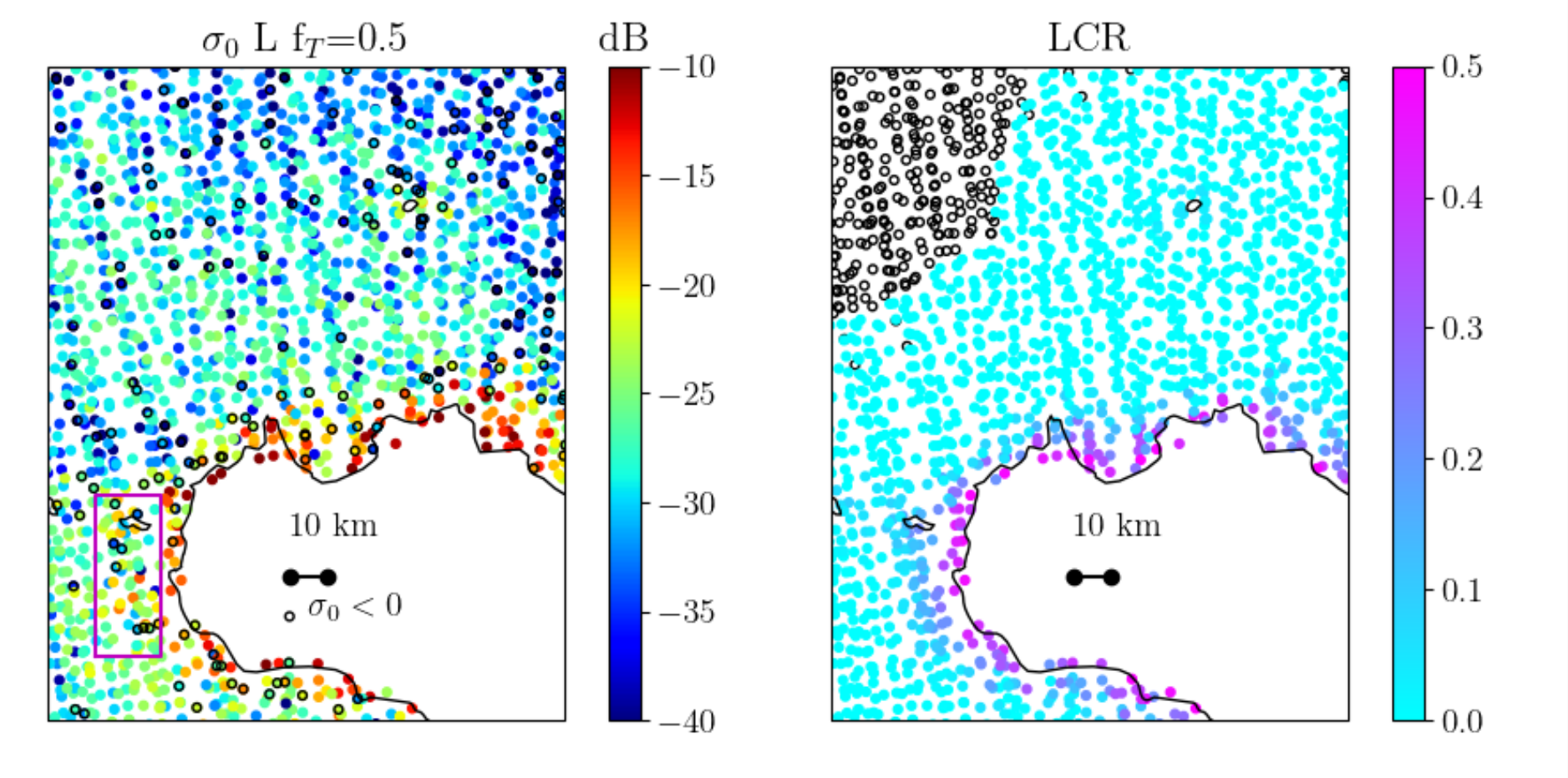
σ_0 vs LCR



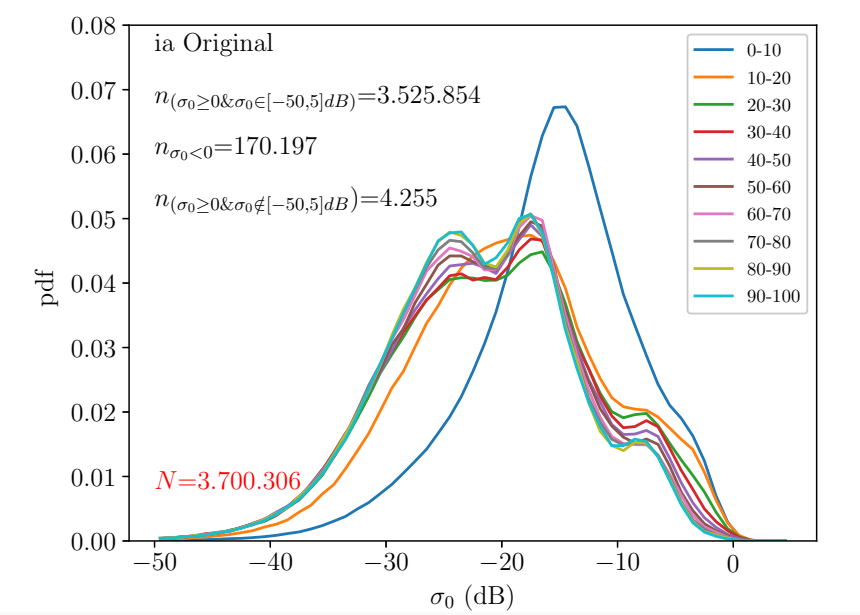
Before σ_0 correction. Case test: Sicily

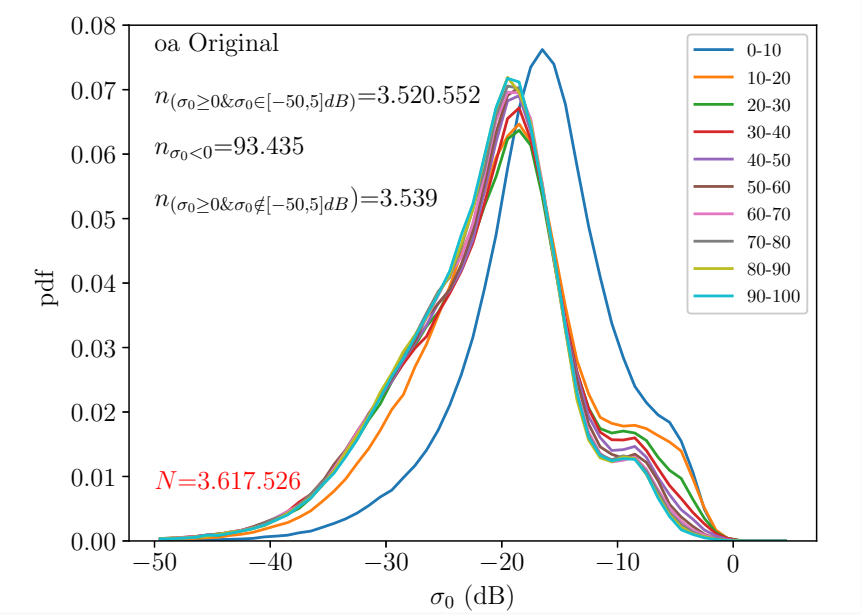


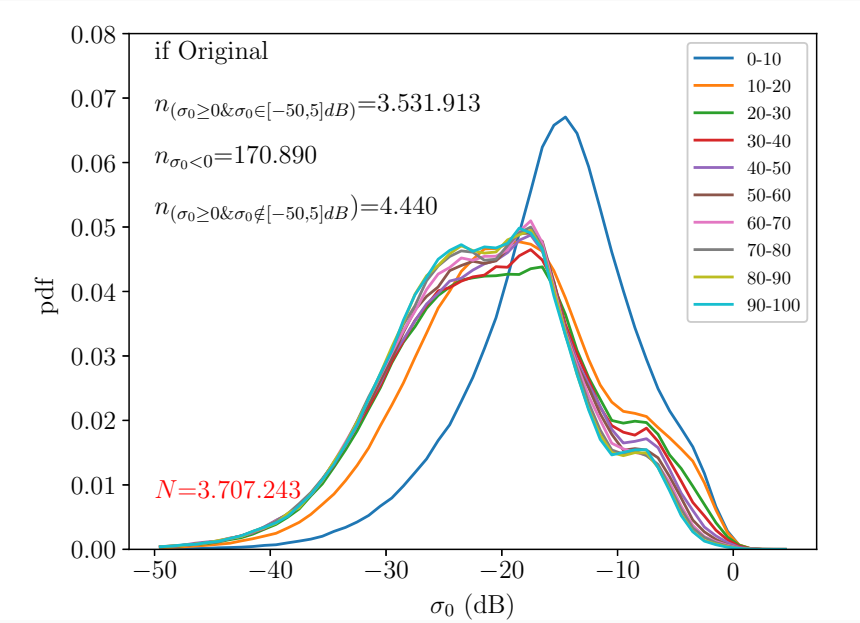
σ_0 correction ($f_T = 0.5$)

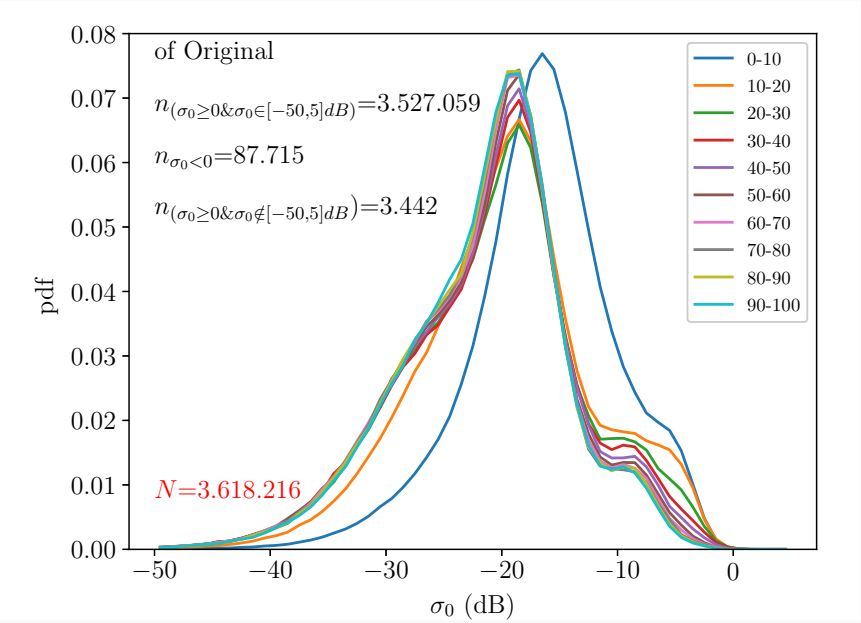


pdfs of slice σ_0 before correction

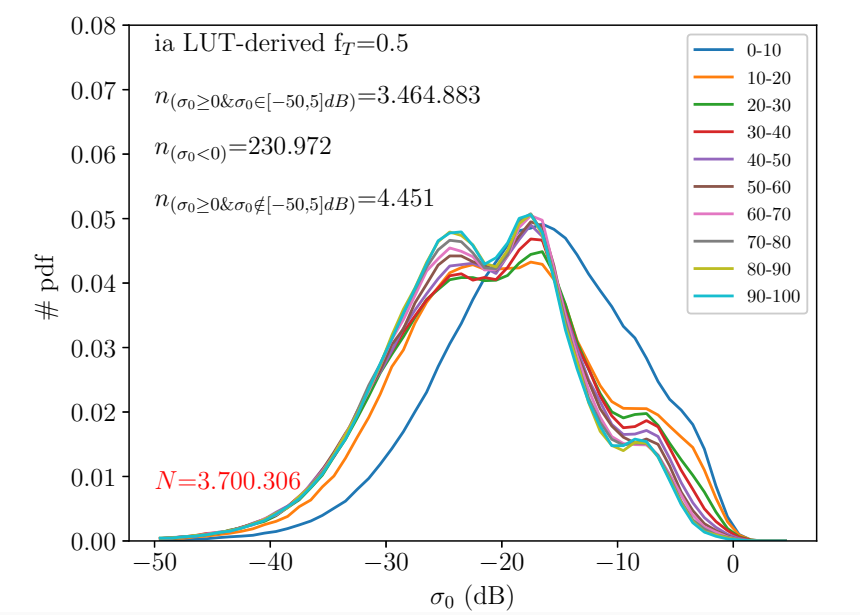


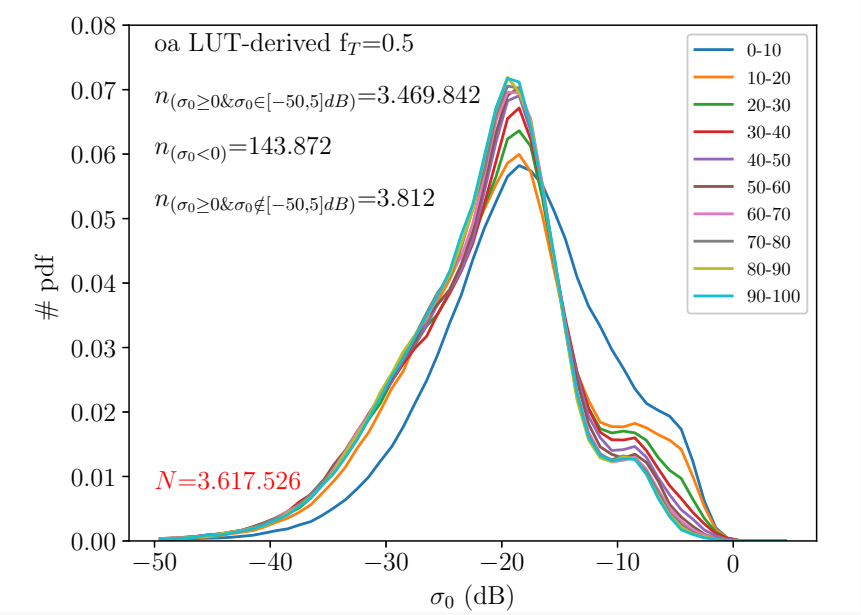


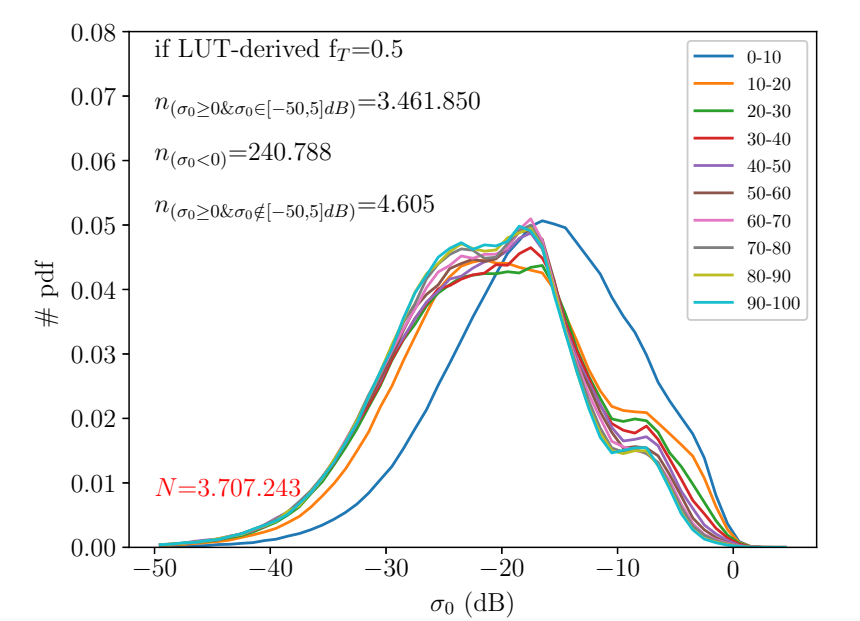


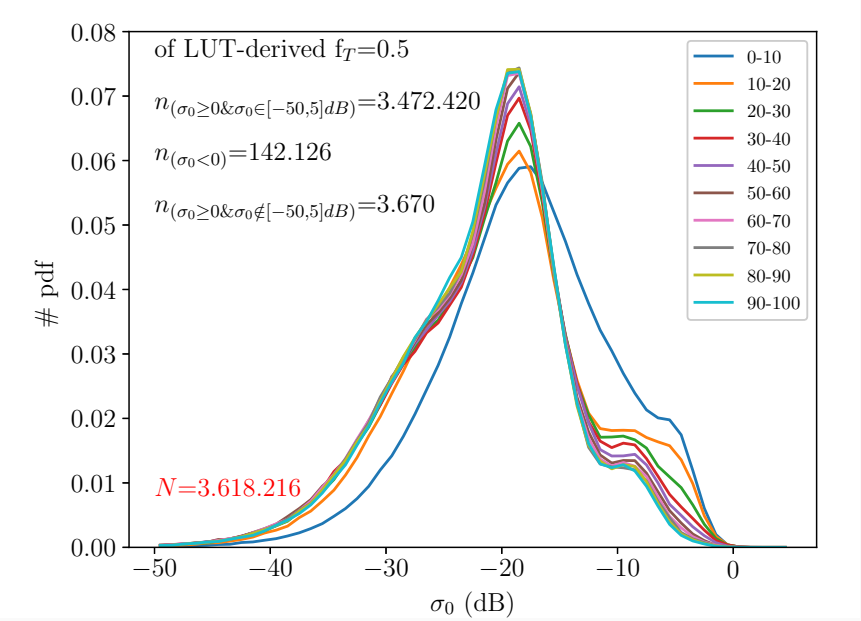


pdfs of slice σ_0 $f_T = 0.5$

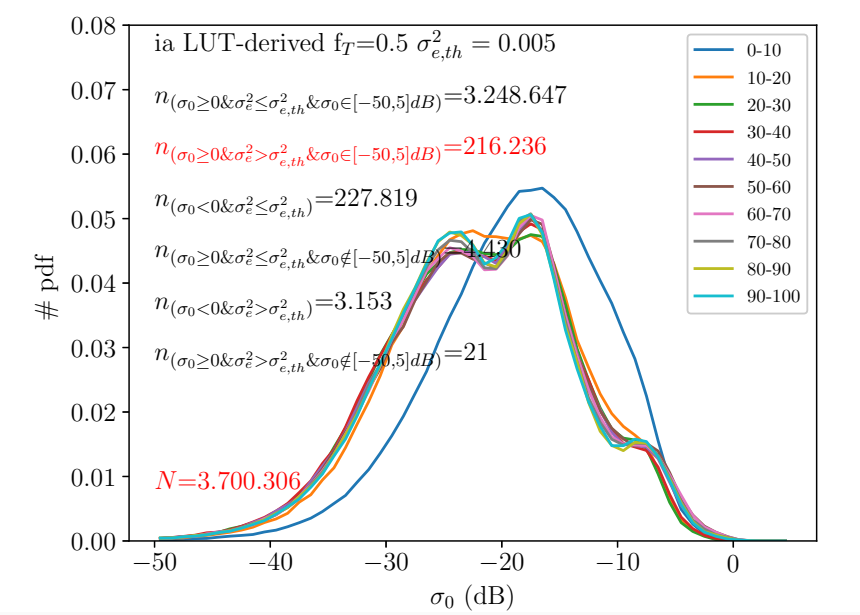


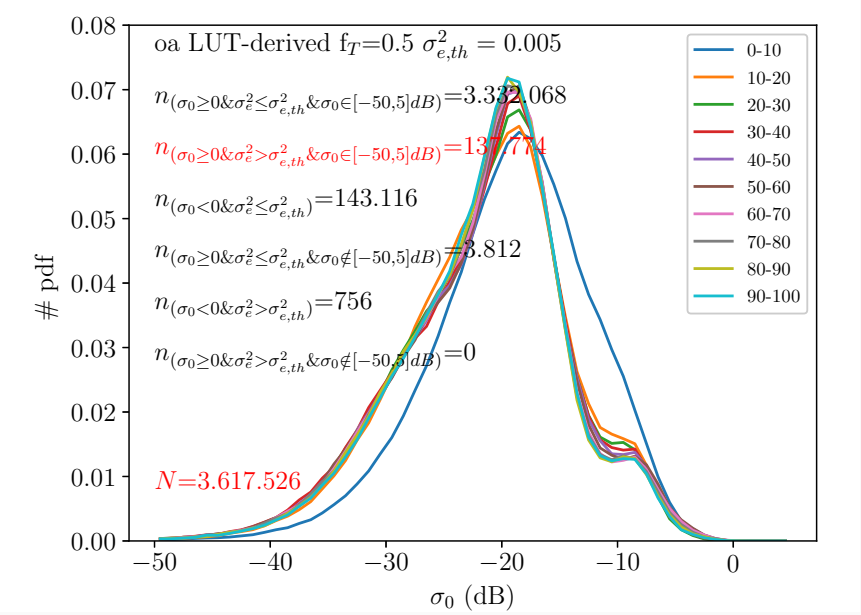


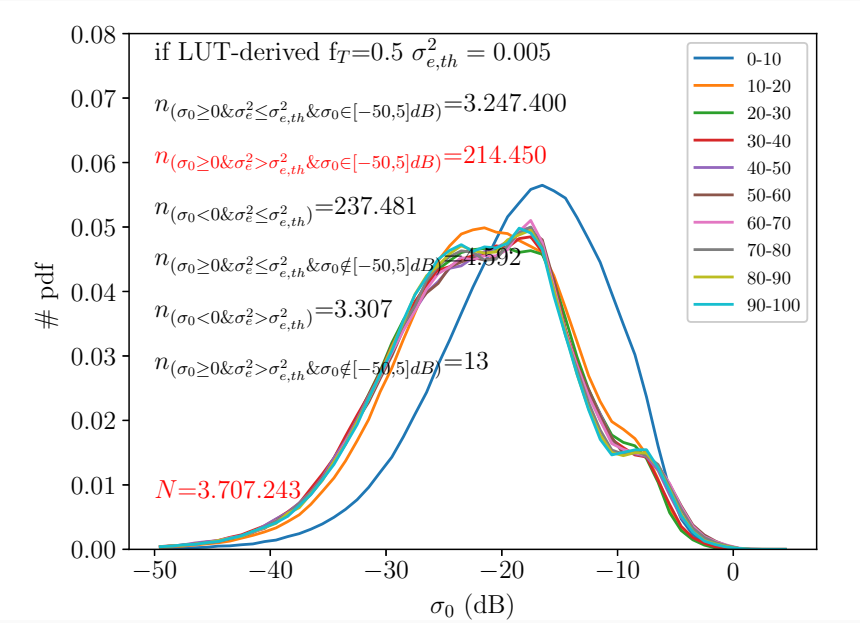


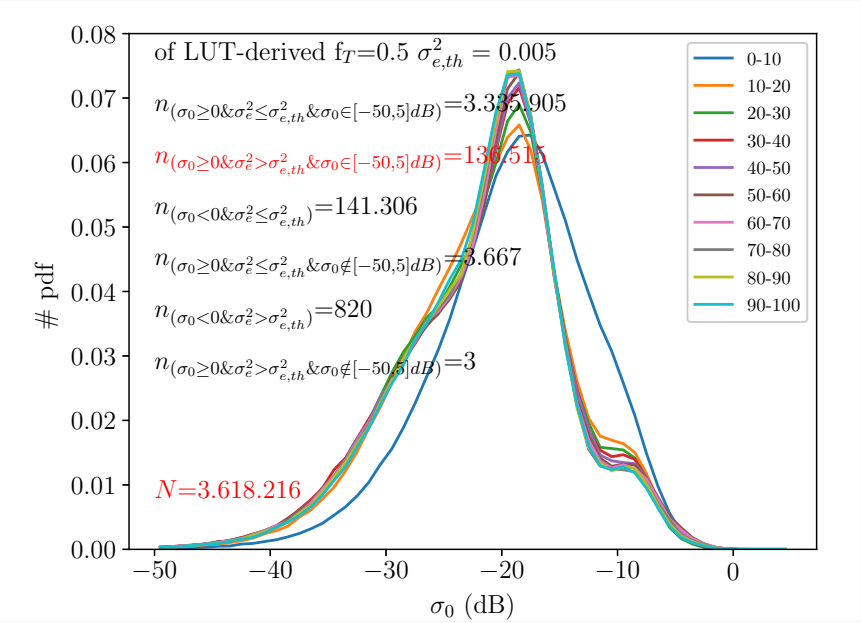


pdfs of slice σ_0 $f_T = 0.5$ $\sigma_e^2 \leq 0.005$

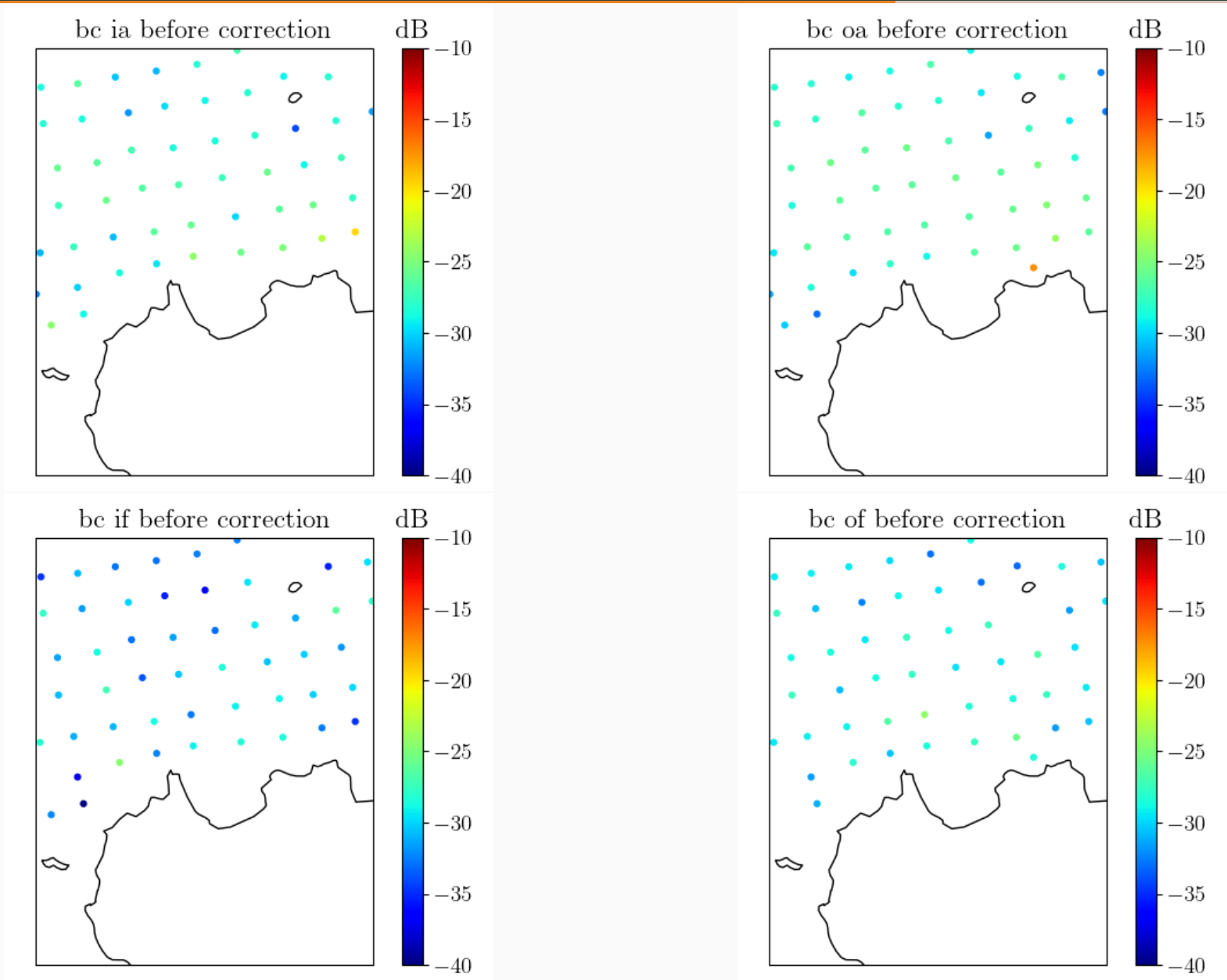




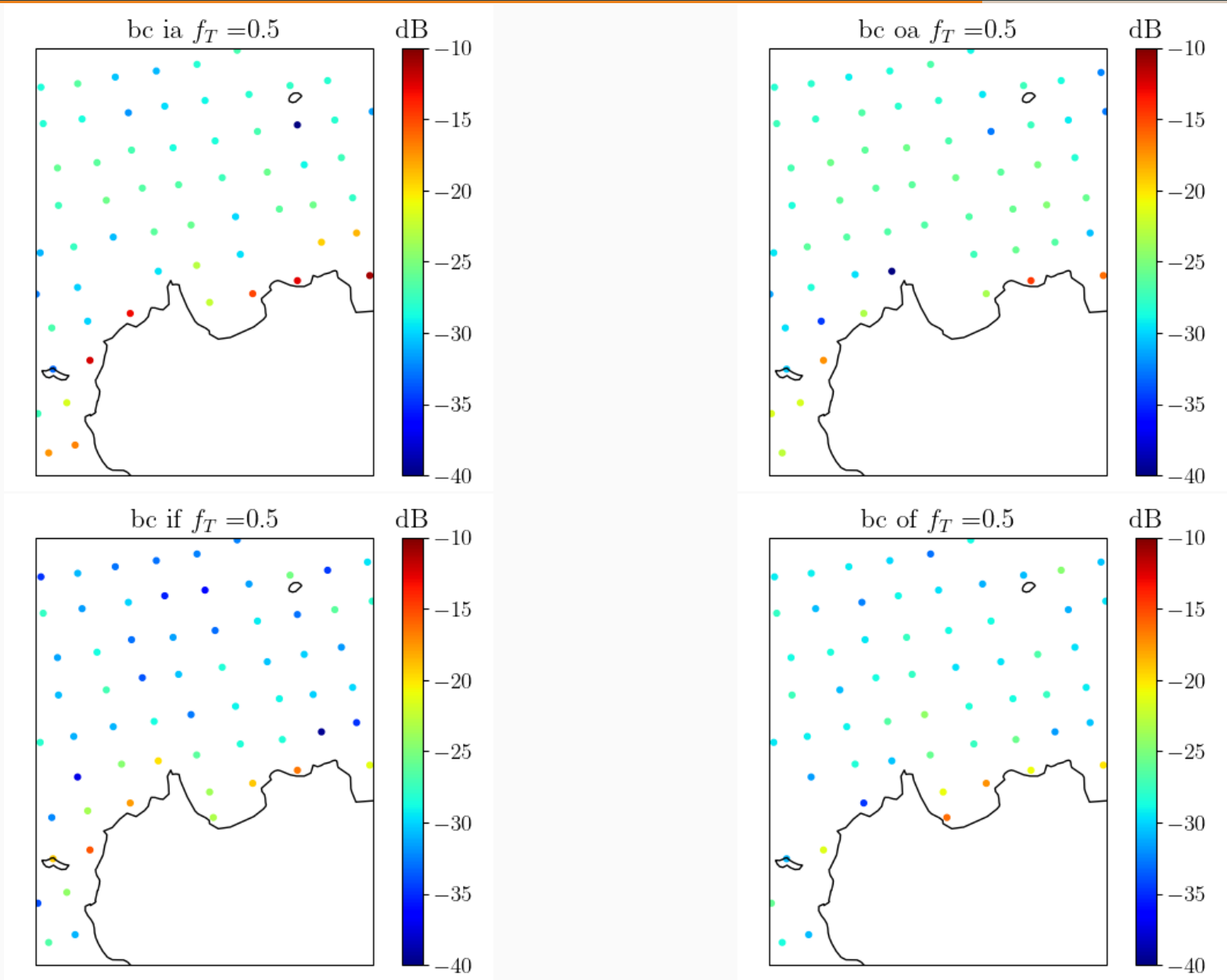




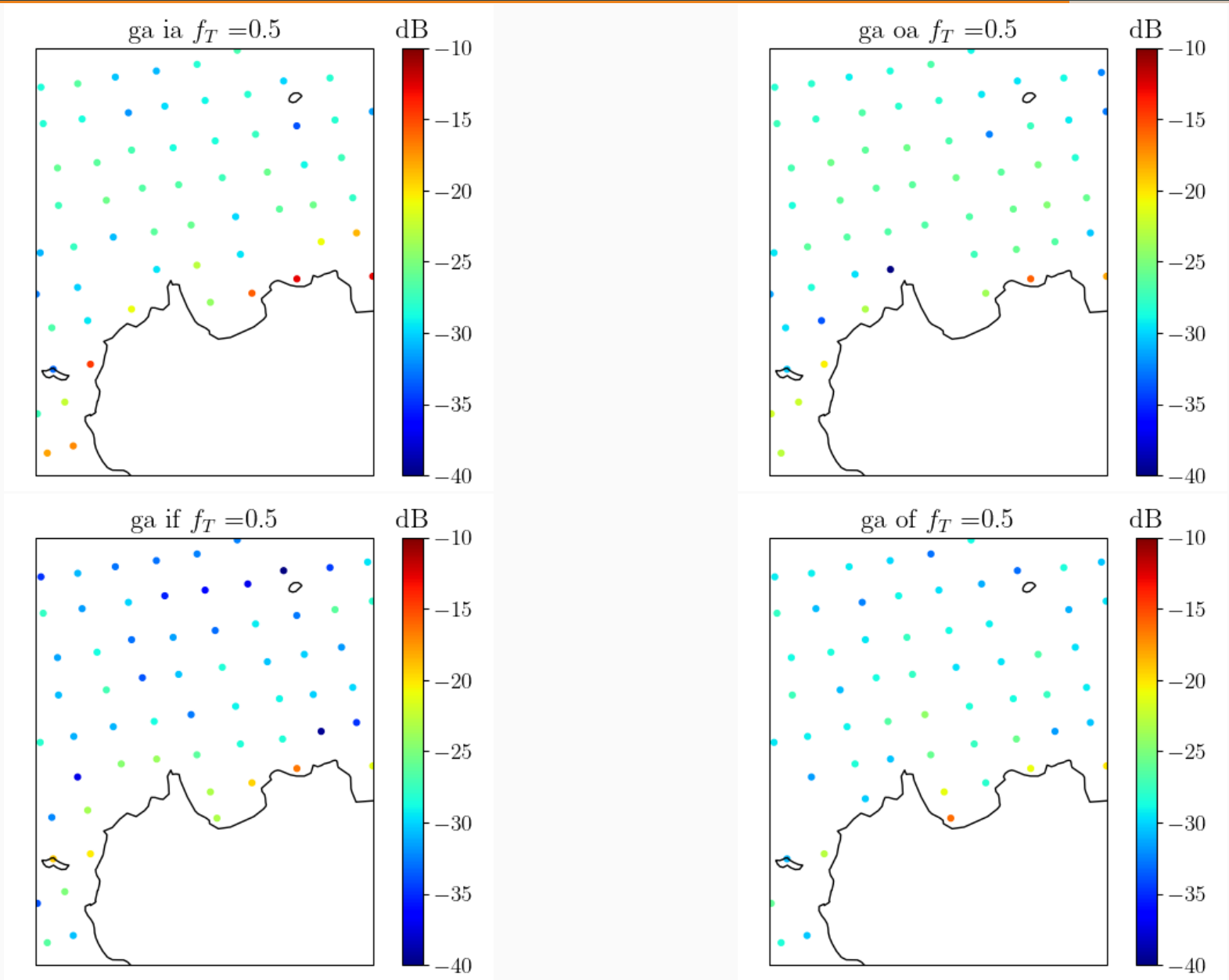
L2B σ_0 Sicily, box-car ave, no corr ($f_T \leq 0.02$)



L2B σ_0 Sicily, boxcar-ave, $f_T = 0.5$ $\sigma_e^2 \leq 0.005$



L2B σ_0 Sicily, Gaussian-ave, $f_T = 0.5$



Preliminary conclusions

- The σ_0 correction scheme gives reasonable results, up to 5-10 km to the shoreline

Future work

- Retrieve the winds
- Assess the accuracy of the new coastal winds

Acknowledgements

- Project financed by OSI-SAF EUMETSAT: OSI_VSA_20_01, OSI_VSA_20_03, OSI_VSA_21_03
- Special thanks to
  - Prof. Dave Long (BYU)
  - Dr. Bryan Stiles and Dr. Roy Scott Dumbar (JPL)

Questions? Please contact Giuseppe Grieco at

giuseppe.grieco@cnr.it

Thanks