



EGU 2011

**Remote Sensing Ocean Currents in the German Bight:
HF Radar Measurements and Quality Control**
Presented by Klaus-Werner Gurgel

Remote Sensing Ocean Currents in the German Bight: HF Radar Measurements and Quality Control

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Overview

- Information on COSYNA
- HF Radar Network in the German Bight
- Estimates of the Measurement's Accuracy
- How to Mitigate Radio Frequency Interference (RFI)
- Quality Control



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Coastal Observing System for Northern and Arctic Seas

www.cosyna.org

Pre-operational forecasting by combining
observations and numerical models

Main Partners:

- Helmholtz-Zentrum Geesthacht (HZG)
- Alfred-Wegener-Institut für Polar- und Meeresforschung (AWI)
- Bundesamt für Seeschifffahrt und Hydrographie (BSH)

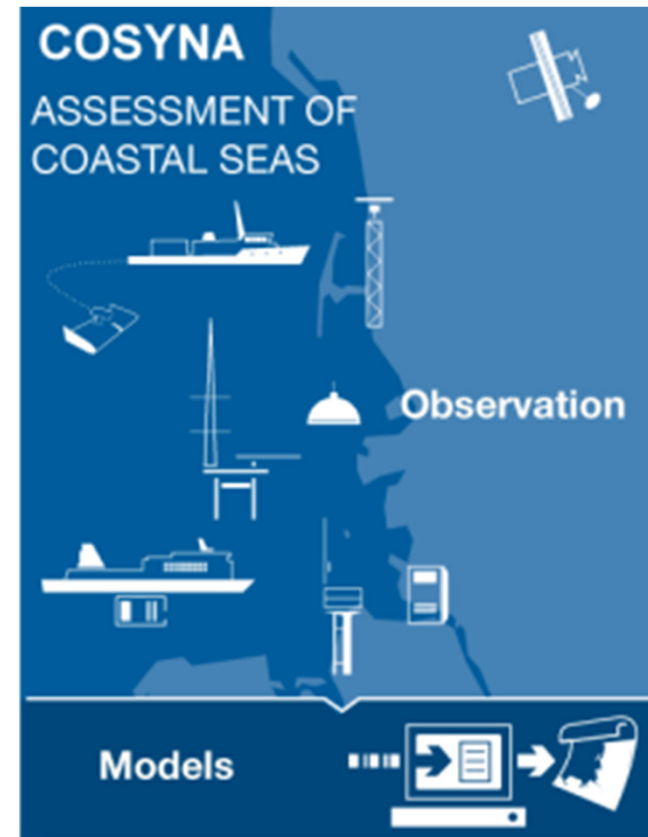


Figure from www.cosyna.org

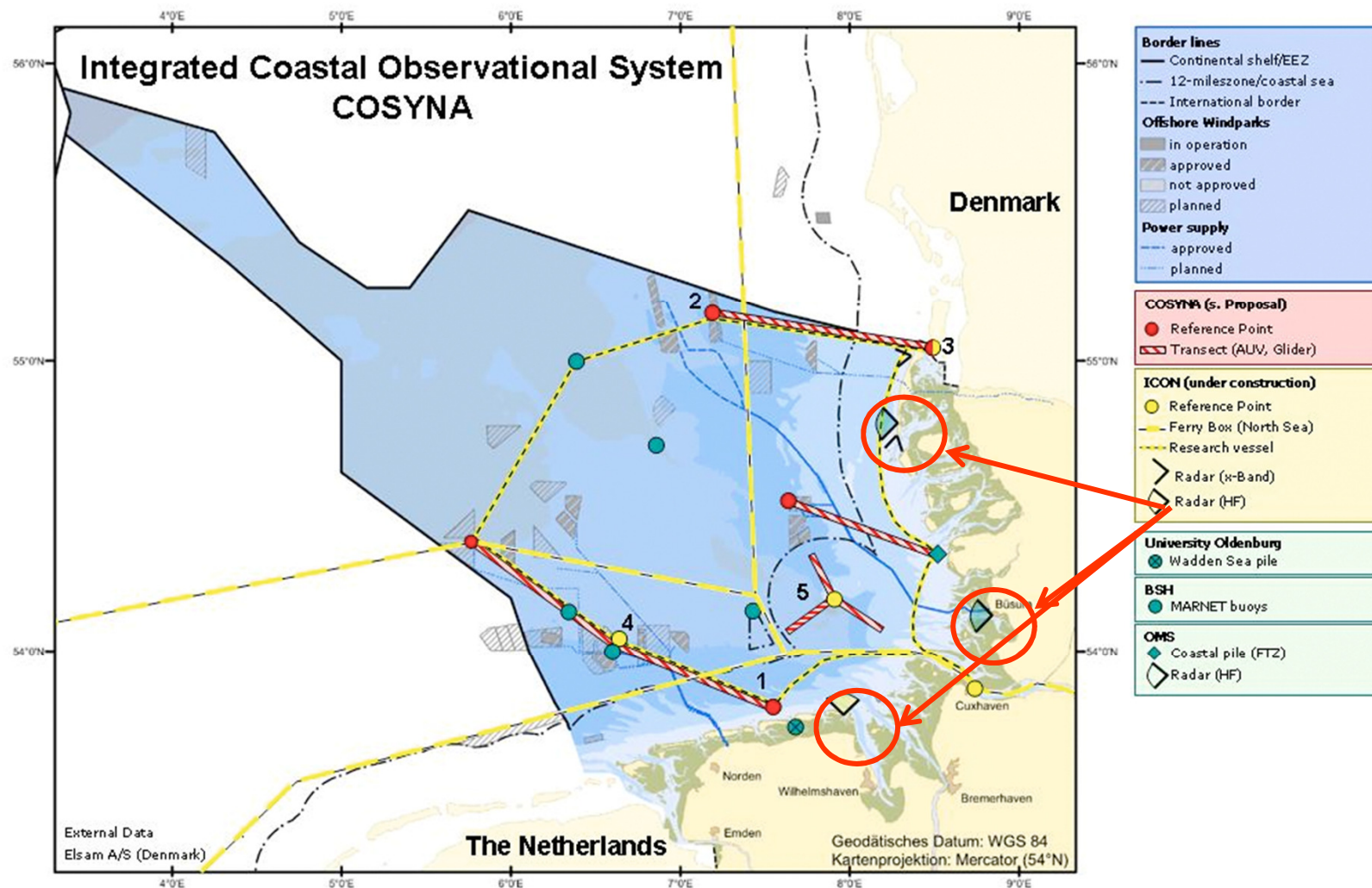
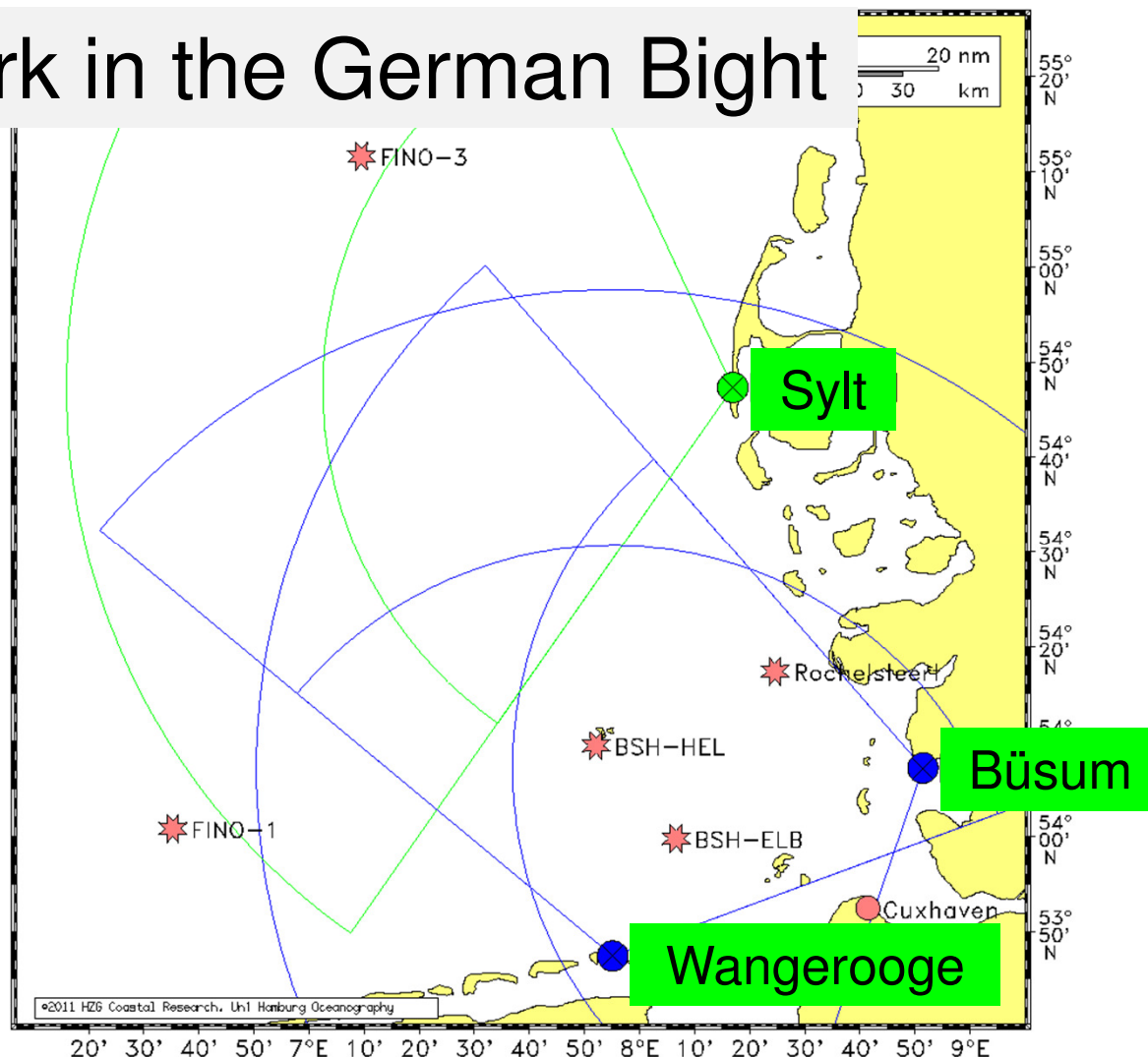


Figure from www.cosyna.org

HF Radar Network in the German Bight

- Three WERA HF radars are currently installed.
- Operating frequency is 10.8 MHz (Sylt and Büsum) 12.2/13.5 MHz (Wangerooge)
- Raw data is stored on the sites.
- Ocean current radial components and pre-processed wave data is sent to the central server at HZG.





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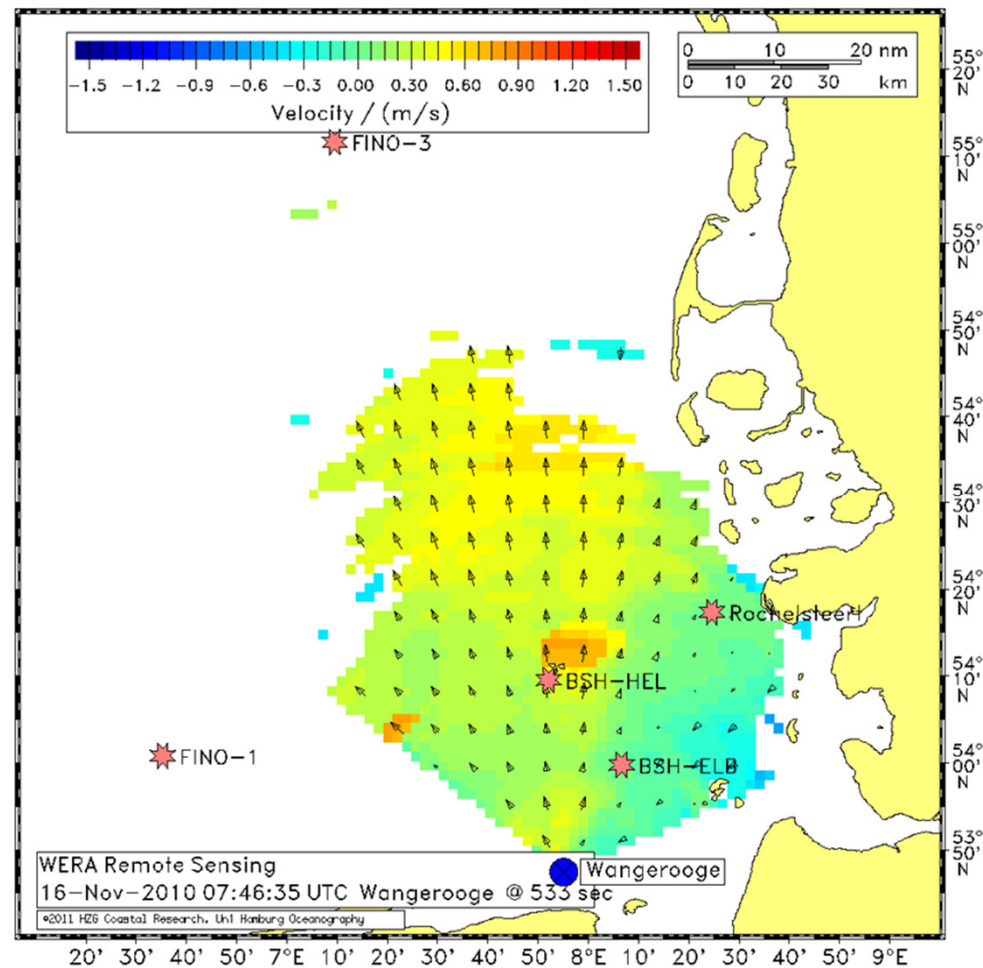


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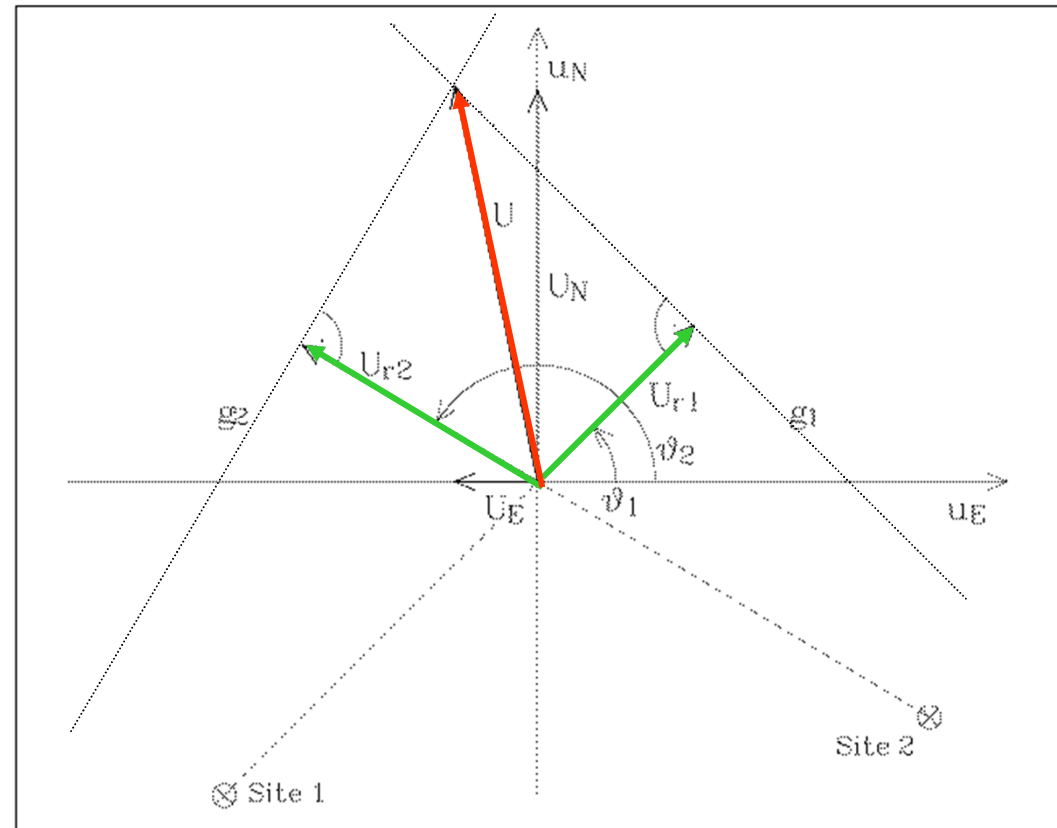


One Radar measures Radial Components



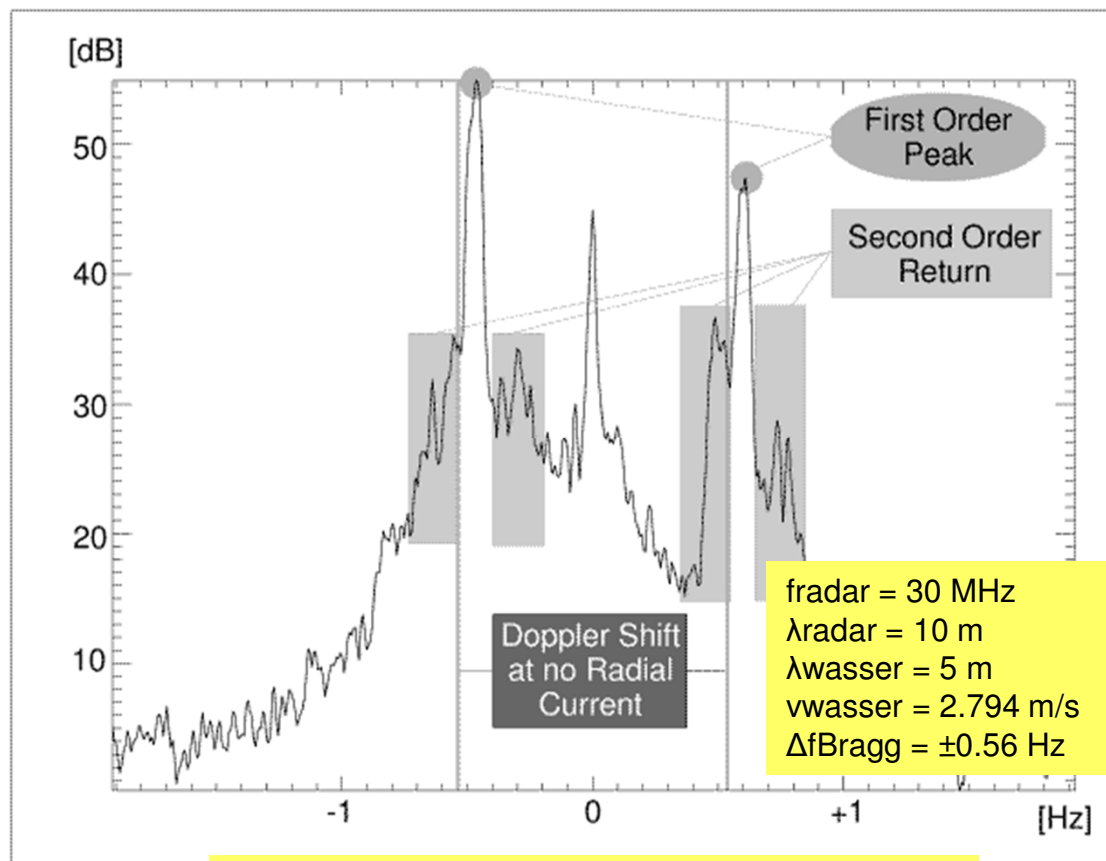
2-D Ocean Surface Current

- 2 or 3 radial components are combined to form the 2-D surface current.
- These quality checked and archived at HZG.



How to estimate the Accuracy

- Data assimilation of ocean currents into numerical models requires knowledge of the measurement's accuracy.
- Accuracy is estimated from the width (std. deviation) of the first-order Bragg peaks.

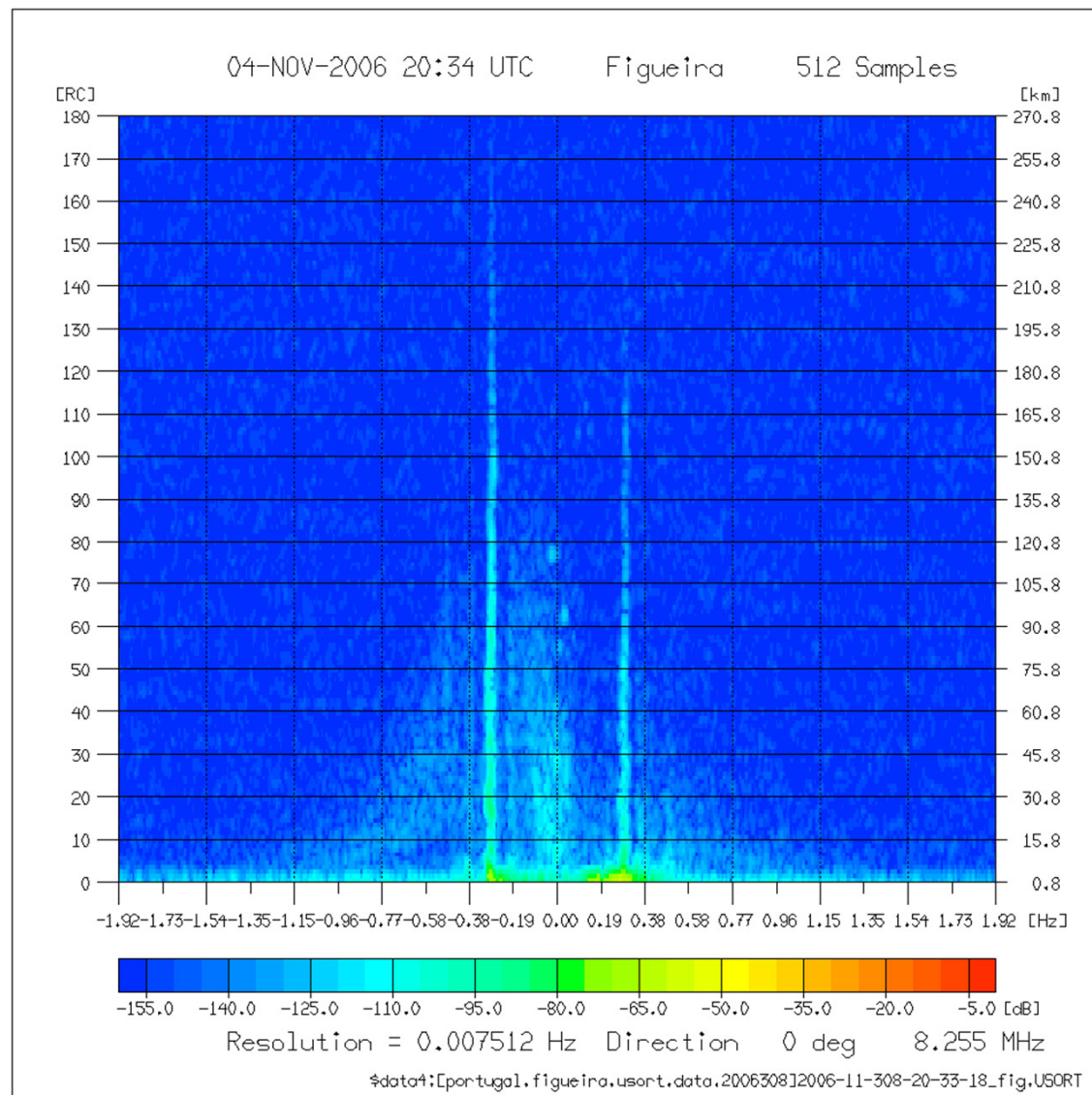




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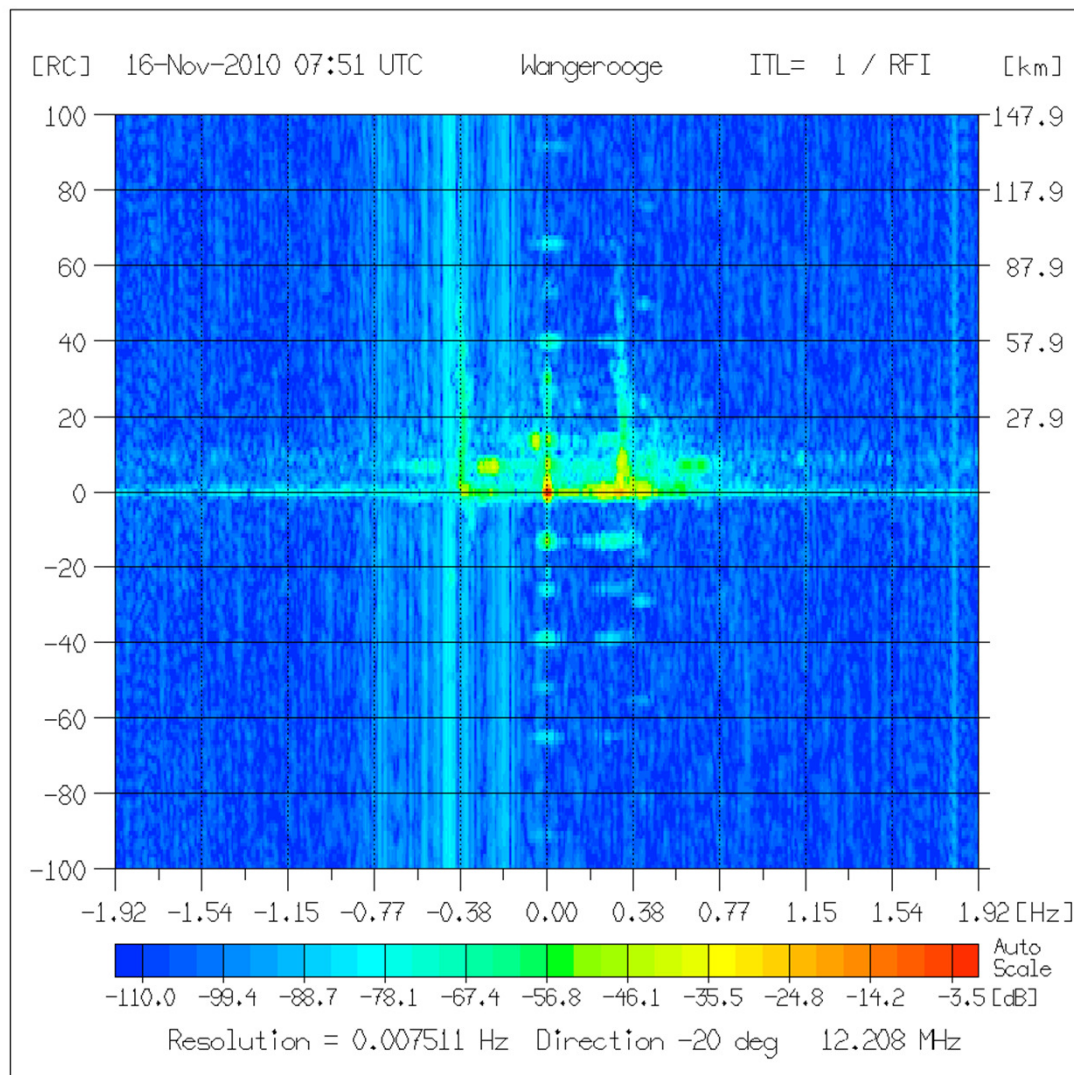
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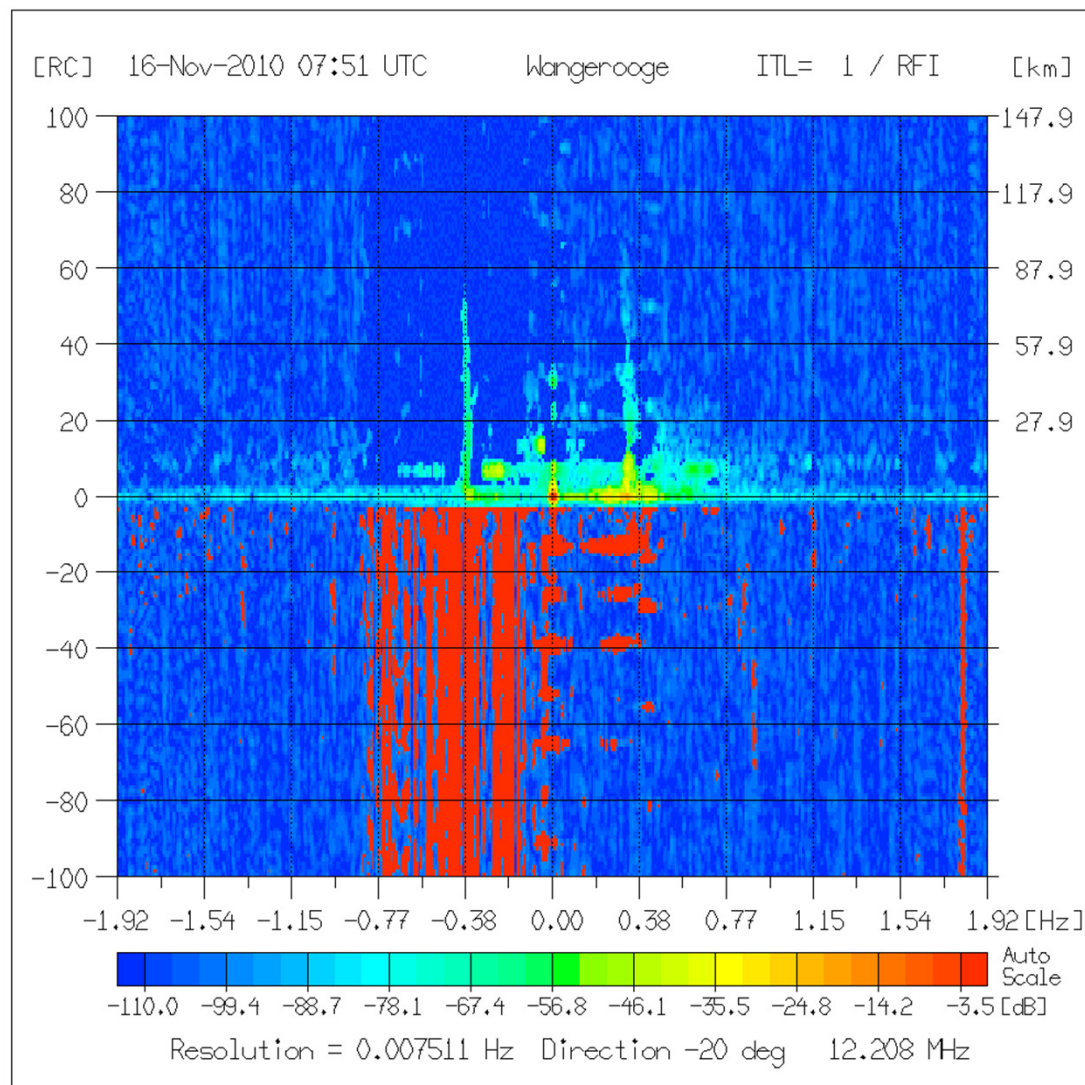
Example of RFI

- Positive range cells show echoes due to Bragg scattering, targets & RFI.
- Negative range cells show RFI and line power frequency interference (50 Hz) only.
- In many cases, RFI can be identified by vertical lines.



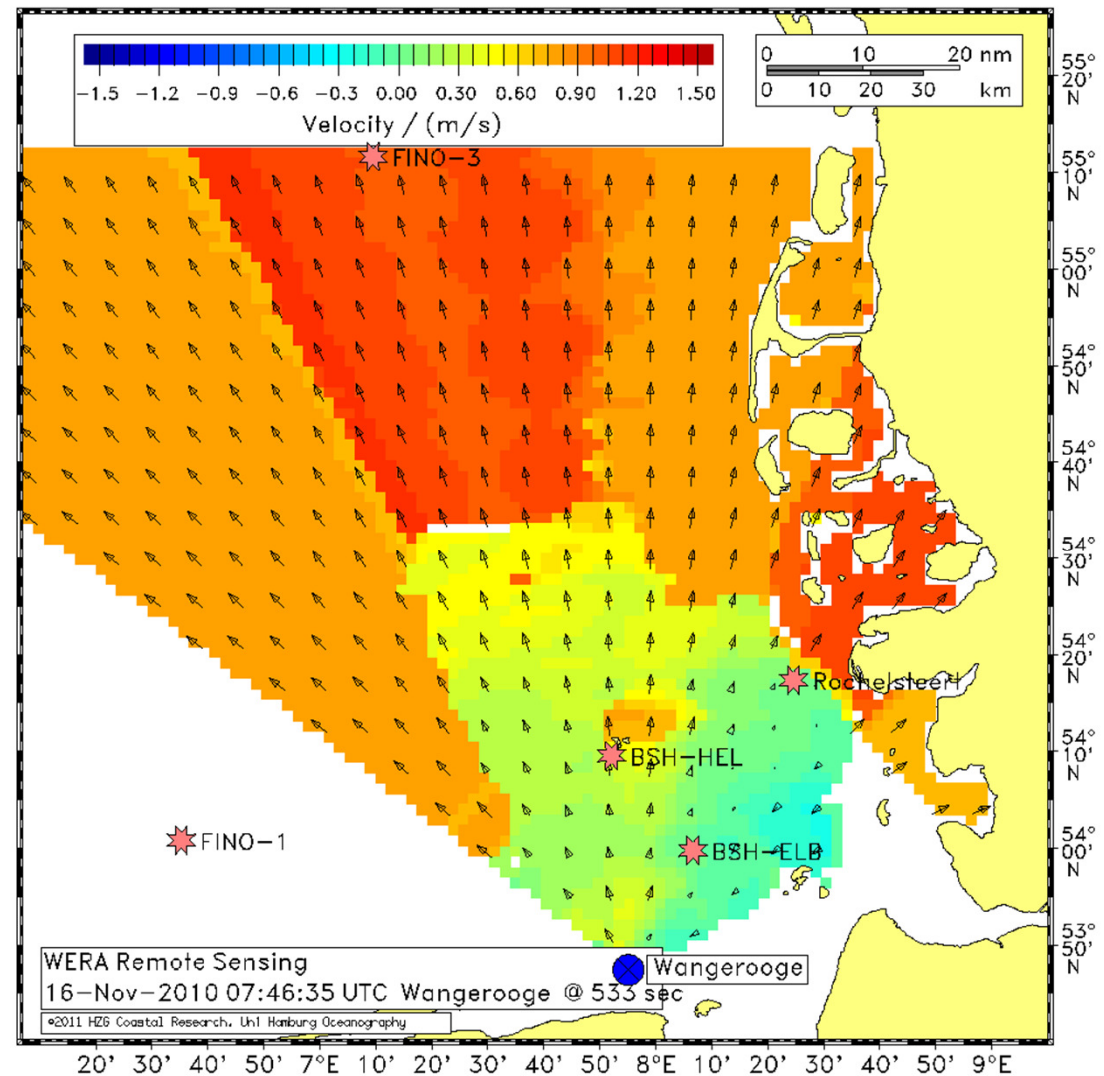
RFI Reduction

- Identify RFI on the negative range cell side.
- Where identified, subtract RFI signals from the echoes.
- Positive range cells show the signal after RFI reduction.



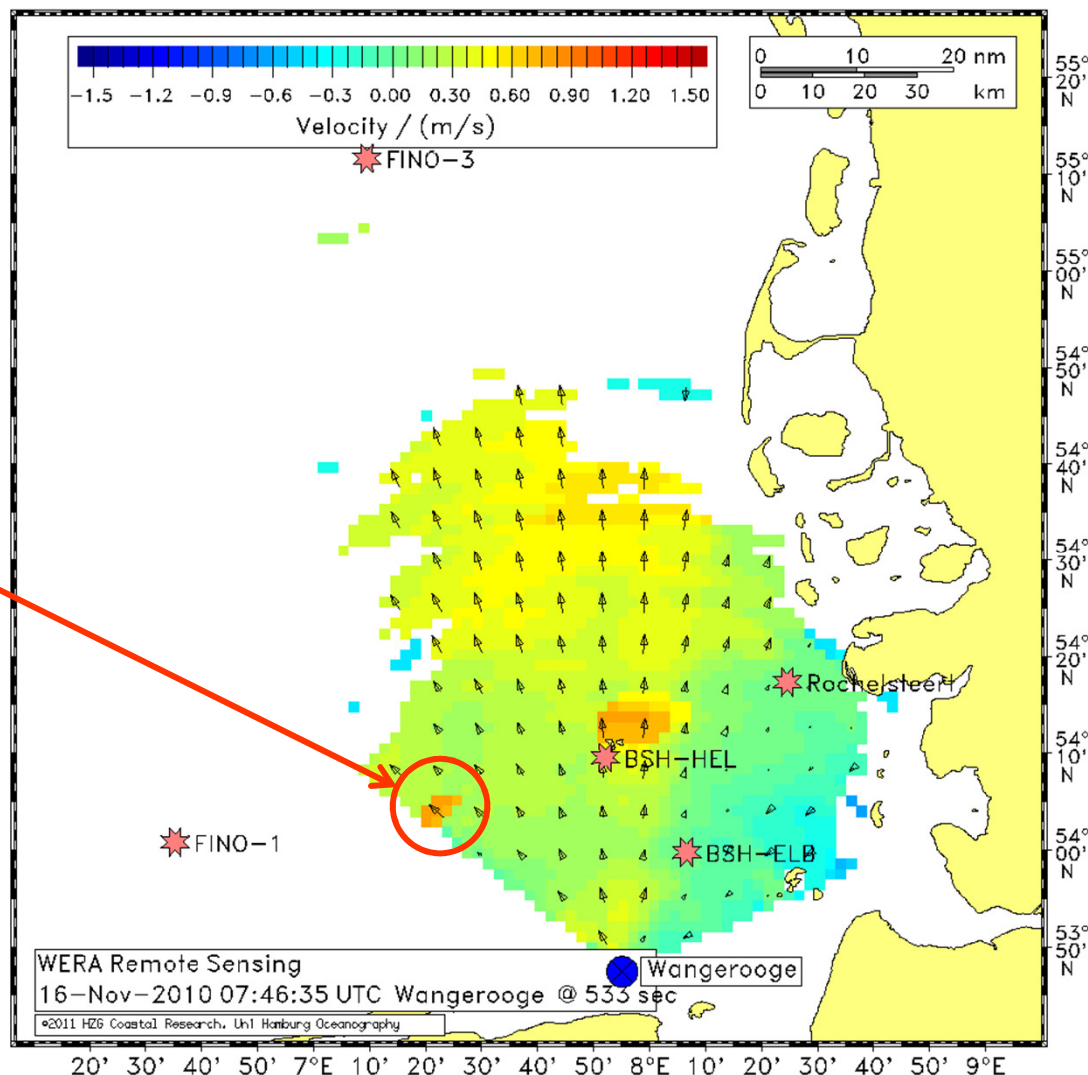
RFI Reduction

- Radial ocean current components measured at Wangerooe.
- Where RFI is stronger than the Bragg echoes, wrong values are calculated.



RFI Reduction

- Same as the previous map but with RFI reduction applied.
- Not all distorted values due to RFI and line power frequency are removed.
- Implement an additional layer: Quality Control

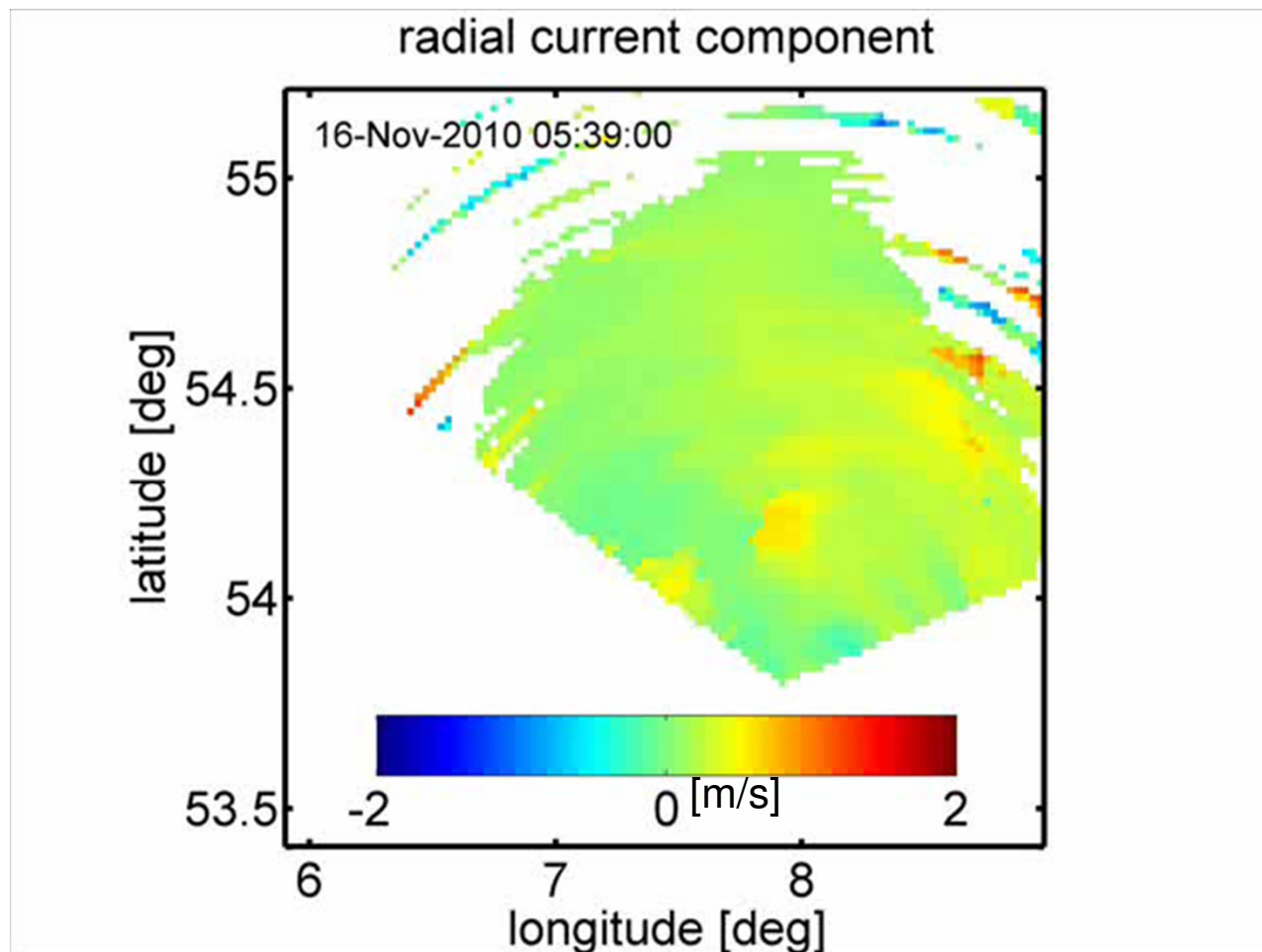




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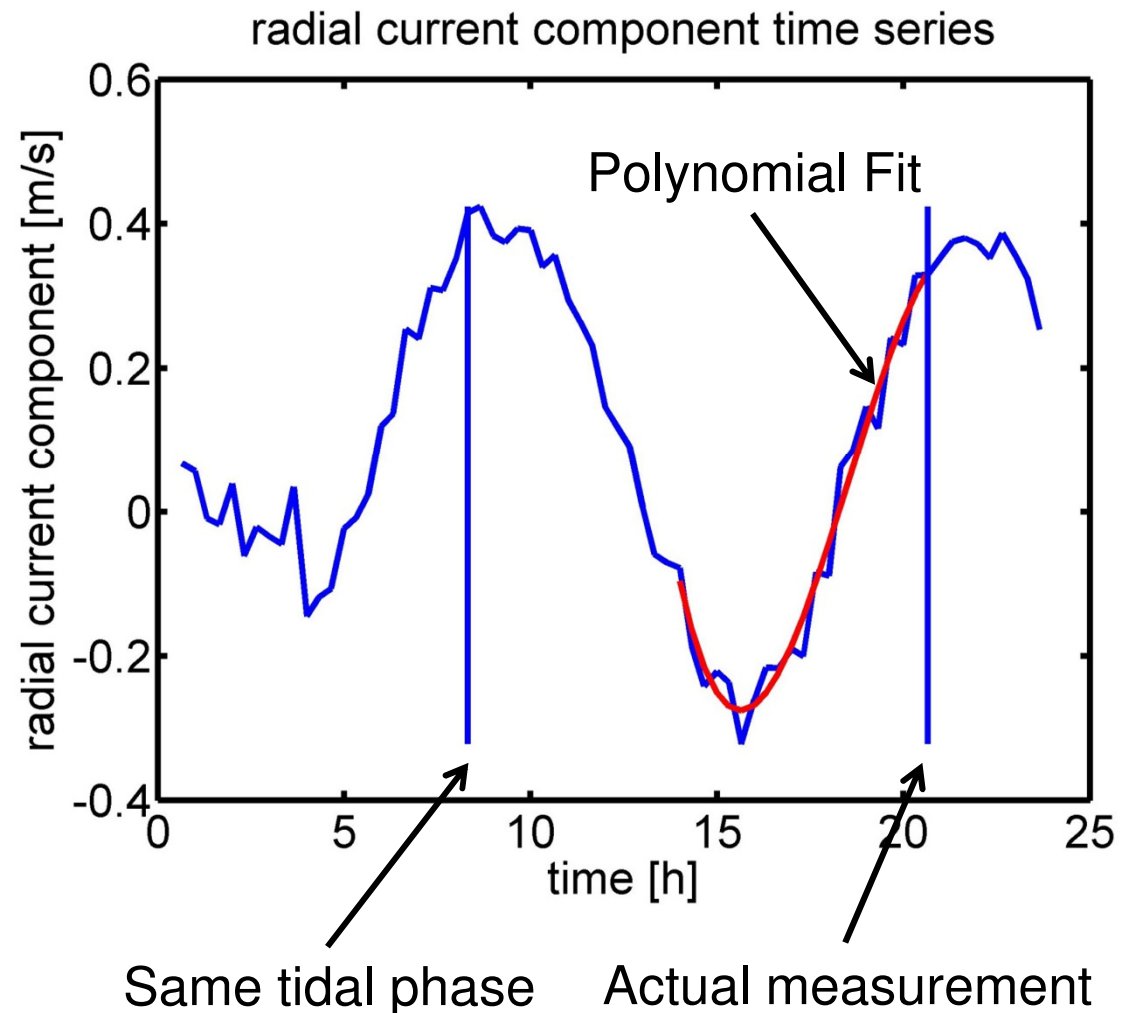
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Quality Control

- For each grid point look at the values during the last 6 hours.
- Fit a 3rd order polynomial to the data .
- Use polynomial to calculate the actual data.
- Check difference between measured and fitted actual data and the RMS error of the fit.

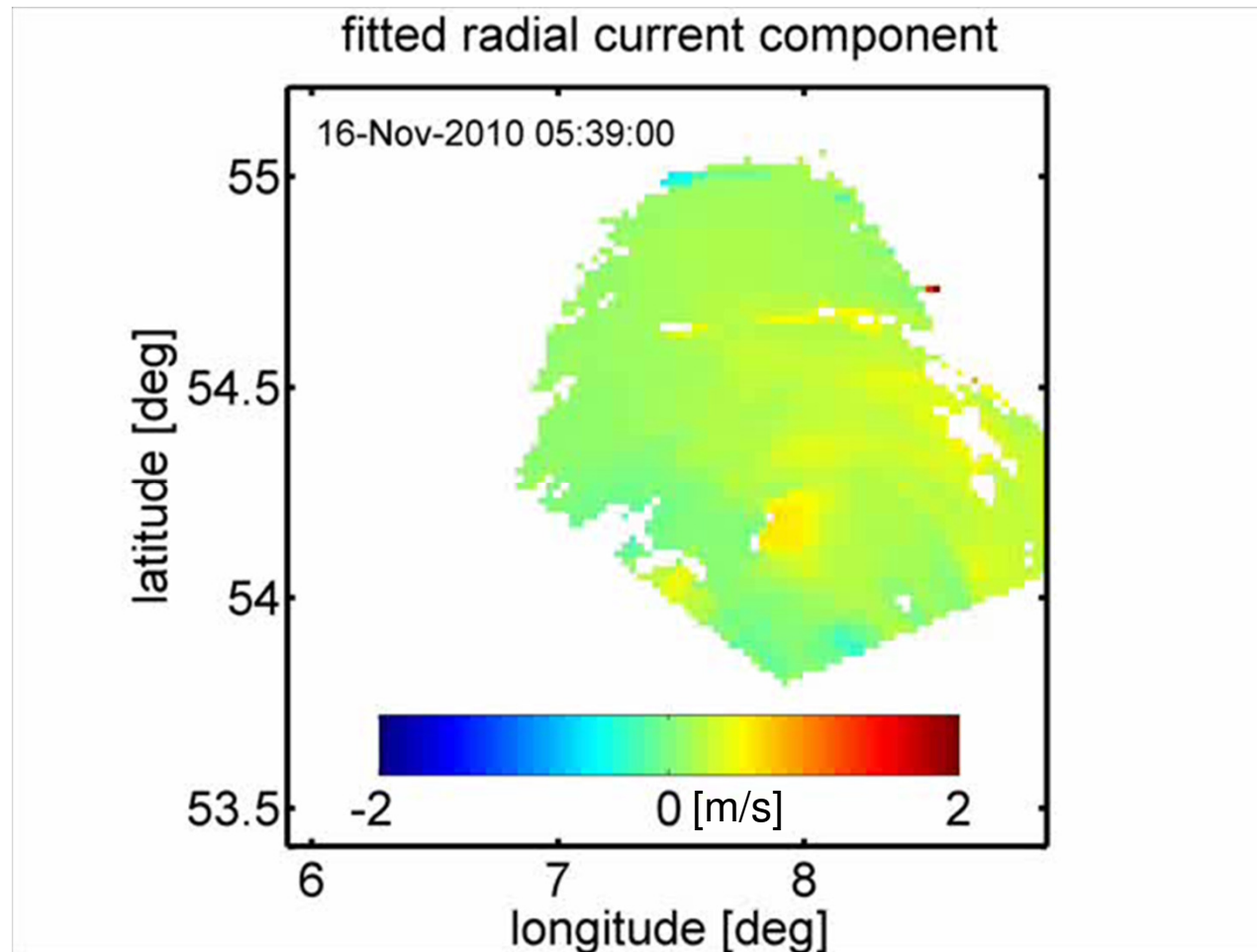




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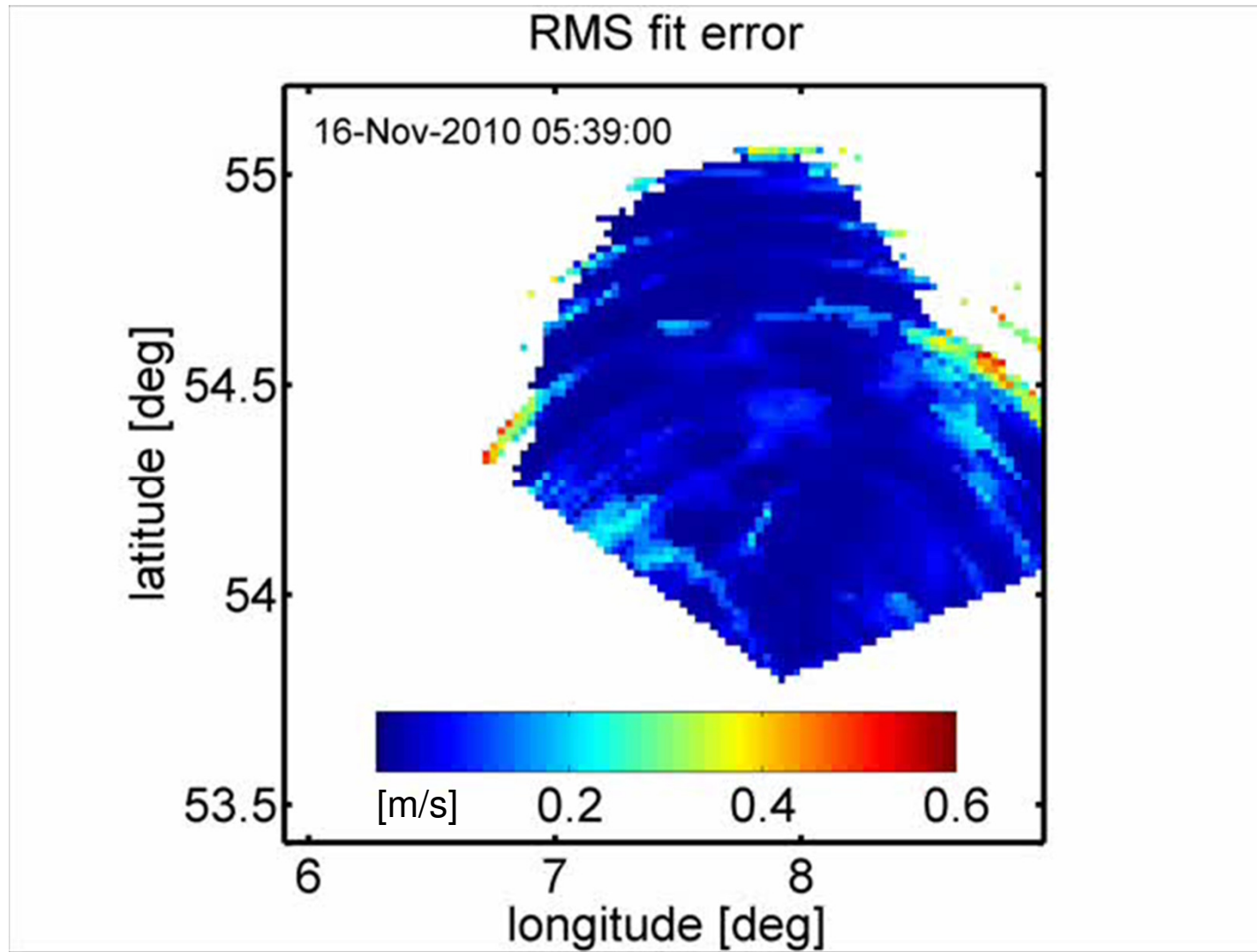
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Quality Control

- Sometimes, distortions along range rings can be identified by the polynomial fit. These are probably caused by line frequency interference.
- Transient (short time) distortions can be replaced by fitted values.
- Stationary (long lasting) distortions can be identified in the RMS error map of the fit. These values are kept, but flagged as 'bad data'.



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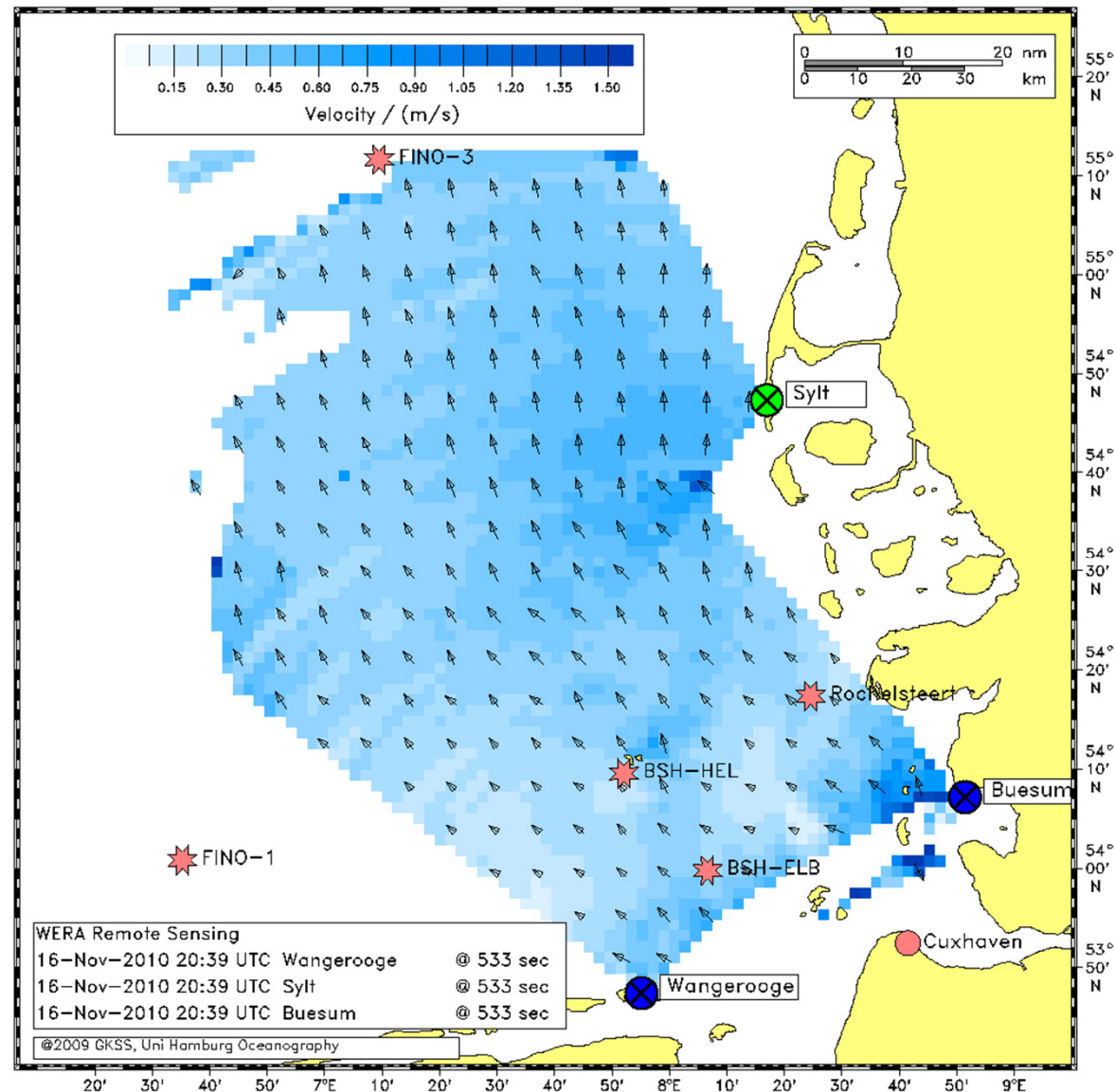




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Conclusions

- A pre-operational forecasting system is implemented in the frame of COSYNA.
- Three WERA HF radars are installed in the German Bight.
- A new technique to determine and mitigate RFI is implemented.
- Remaining distorted data are identified by a quality control procedure.
- These data are flagged before passing them to the model system.



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Thank you for your Attention

