

# Feasibility of Simultaneous Ocean Wind and Current Measurements.

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## Feasibility of combining ocean wind and current:

- Scatterometry provides wind vectors relative to a moving ocean surface. Ocean motion knowledge is needed to retrieve absolute wind vectors
- SAR ocean surface motion vector processing needs prior wind knowledge
- combining both measurement will have significant advantages
  - it gives the relation between absolute and relative winds
  - it may be easier to solve the scatterometer ambiguity problem
  - more accurate SAR current retrieval may be possible

## 1. Objectives

DOPSCAT aims at assessing the potential of scatterometer instruments for sea surface current retrieval. The objectives are twofold:

- To obtain some preliminary new results from existing scatterometer data capitalizing on new signal processing techniques;
- To propose an optimized scatterometer concept maintaining the good directional NRCS detection performances and coverage for wind vector retrieval but, at the same time, allowing Doppler shift estimation with sufficient accuracy for surface current measurement.

## 2. Scope

We will consider a dynamic range of surface currents spanning from:

- 0.05 m/s to 4 m/s
- with a retrieval accuracy of 0.10 m/s
- at a spatial resolution of approximately 10 km

- and at a temporal resolution of 12-24 hours.

## 3. DC estimation

The Doppler Centroid (DC) has been estimated over 3 full EWIC cycles.

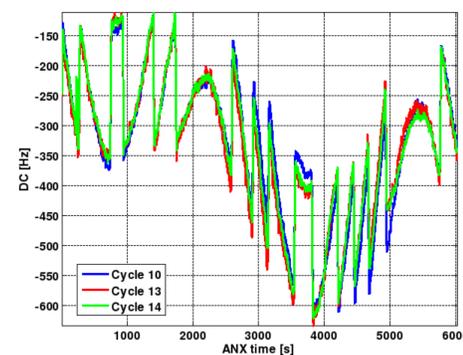


Figure A ERS-2 orbit and attitude inaccuracies lead to different round-orbit reference DC functions for the 3 cycles.

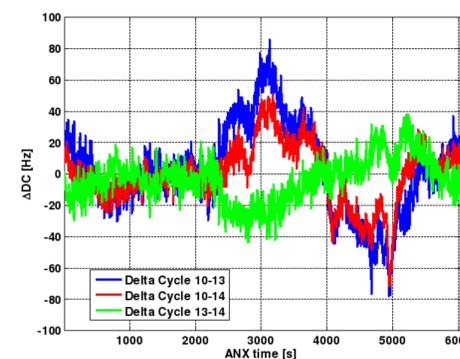


Figure B Differences between the reference DC functions typically is in the range of 20 to 60 Hz.

## 4. First ERS-2 Doppler results

The ERS-2 Doppler signal has been extracted from the side beam I/Q data for 3 EWIC cycles (a total of 26 days of data). Detrending using the reference DC functions has been applied.

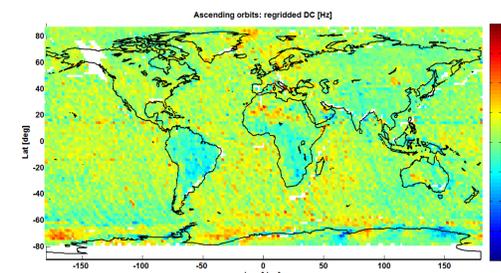


Figure C First ERS-2 Doppler Centroid estimates, indicating some clear geophysical effects (i.e. land-sea differences).

## 5. Plans

Next steps will be:

- The cdop GMF will be used to remove the effect of wind on the DC signal.
- New algorithms will be explored to allow using the Doppler information in the scatterometer wind inversion procedure, based on simulations, rather than using the ERS-2 results.

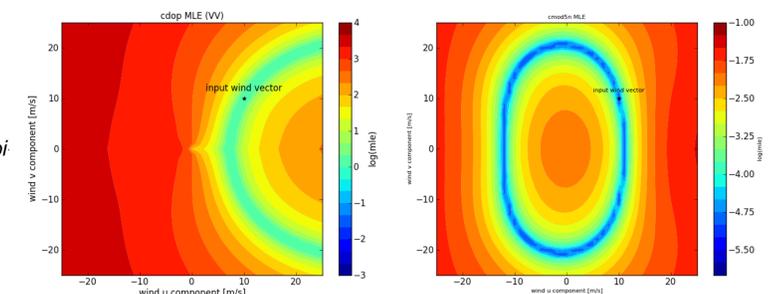


Figure A MLE based on CDOP (left) and CMOD5N GMF (right).

## Conclusions

First Doppler estimates from ERS-2 data have been obtained at a coarse resolution. Simulation studies are underway to test scatterometer Doppler capability on future systems.

## Bibliography

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