Reprocessing the 10-year QuikSCAT Climate Data Record

E. Rodríguez, B. Stiles, A. Chau,

R. Gaston, S. Hristova-Veleva,

S. Dunbar, and J. Turk

Jet Propulsion Laboratory

California Institute of Technology

- Improved matching of noise to signal detection to optimize resolution and accuracy
  - Emphasis on wind and wind stress derivatives (curl, divergence)
- Improved performance in rain
  - See Bryan Stiles talk
- Improved nudging
  - ECMWF and 2D-var
- Improved binning of σ_0 for estimation
  - Overlap weighted binning rather than centroid binning
- Improved model function
  - Use latest results for high winds obtained by U. Mass IWRAP system.
- HDF4 to netCDF format transition
- Question: should we produce stress and derivative (divergence, curl) products at L2B?

- New product to be released to the science community at large at the end of the year.

- A β-version will will be released by the end of summer
  - We are looking for volunteer users. Is this product significantly better for your science application?

- There will be a second reprocessing released probably 1-2 years after the first.

- Goals of 2nd release:
  - Further improvements in the model function
  - Reduction of cross-platform biases with ASCAT and OceanSat-2
  - Specialized products in collaboration with the science team
    - Cyclone products
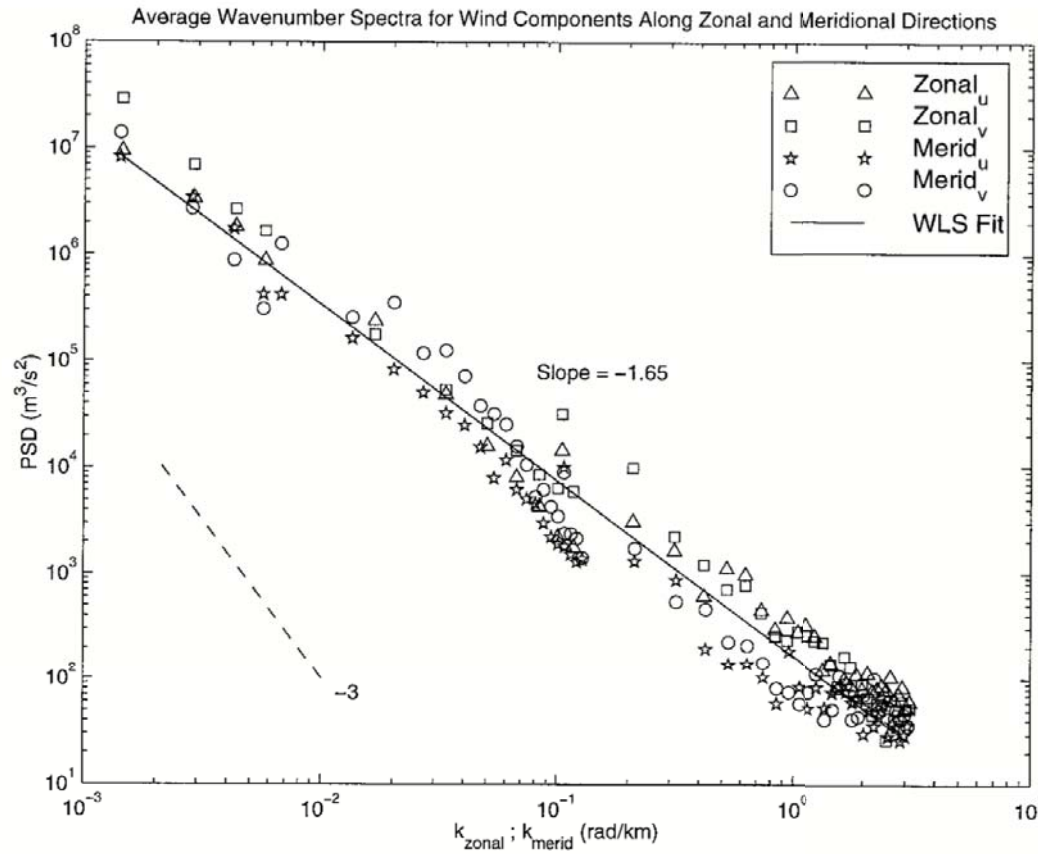   - Coastal products
    - Stress model function

WIKLE ET AL.

FIG. 4. Average wavenumber spectral estimates for u- and v-wind components for both zonal and meridional sample paths. Also shown is the WLS linear fit of these estimates. The regression is weighted by the relative precision of the spectral estimates. The dashed line depicts a k^{-3} spectral slope; a $k^{-5/3}$ slope is indistinguishable from the WLS fit of the data. Note that the NCEP data at higher wavenumbers have been excluded from the analysis as described in the text.

C. Wikle, R. Milliff, and W. Large, "Surface wind variability on spatial scales from 1 to 1000 km observed during TOGA COARE," Journal of the Atmospheric Sciences, vol. 56, pp. 2222–2231, July 1999.

CCMP V Year: 2008 Lat: [5N, 25N]
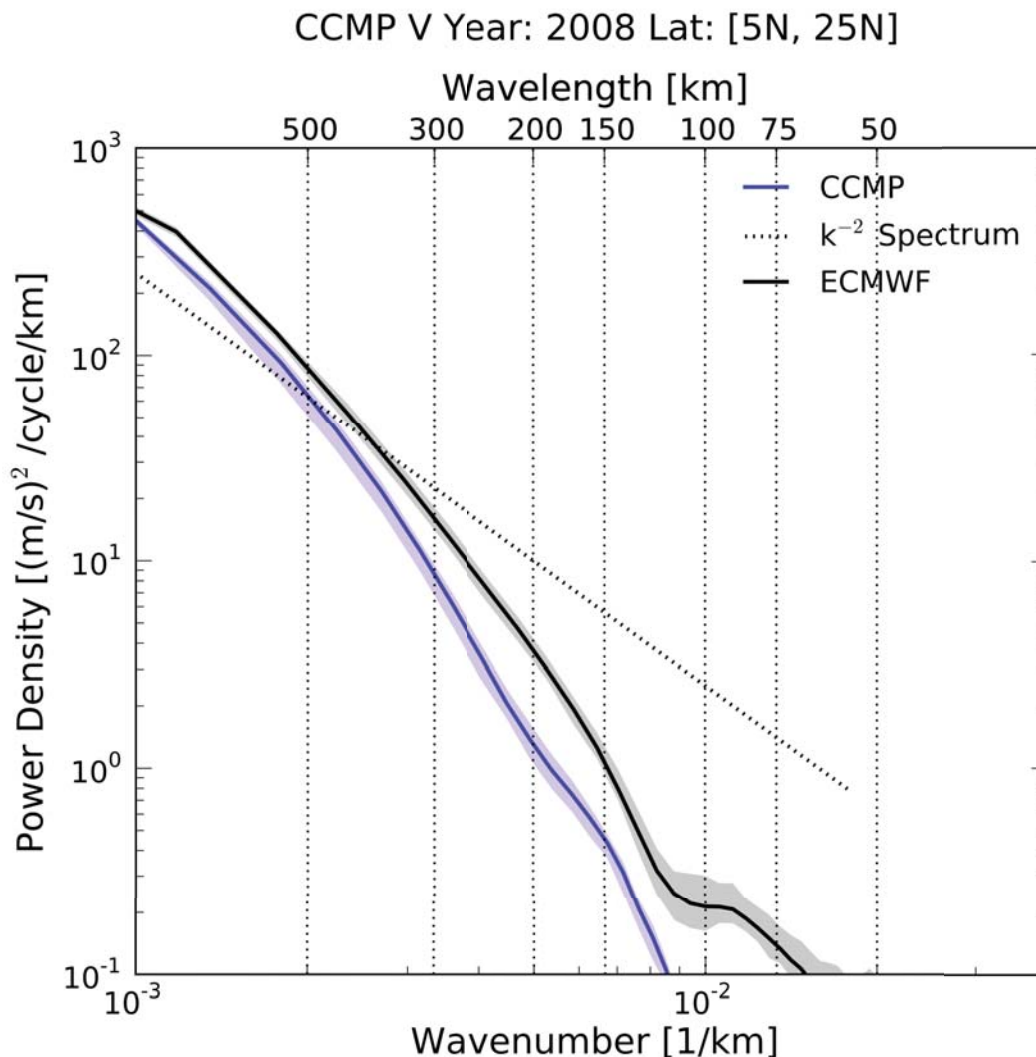
Wind products that assimilate many different data sources to produce maps with high temporal sampling typically underestimate the high spatial frequency component of the wind field.

Plots based on 1 year of data.

R. Atlas, R. Hoffman, J. Ardizzone, S. Leidner, and J. C. Jusem, "Development of a new cross-calibrated, multi-platform (CCMP) ocean surface wind product," in AMS 13th Conference on Integrated Observing and Assimilation Systems for Atmosphere,Oceans, and Land Surface (IOAS-AOLS), 2009.

CCMP V Year: 2008 Lat: [5N, 25N]
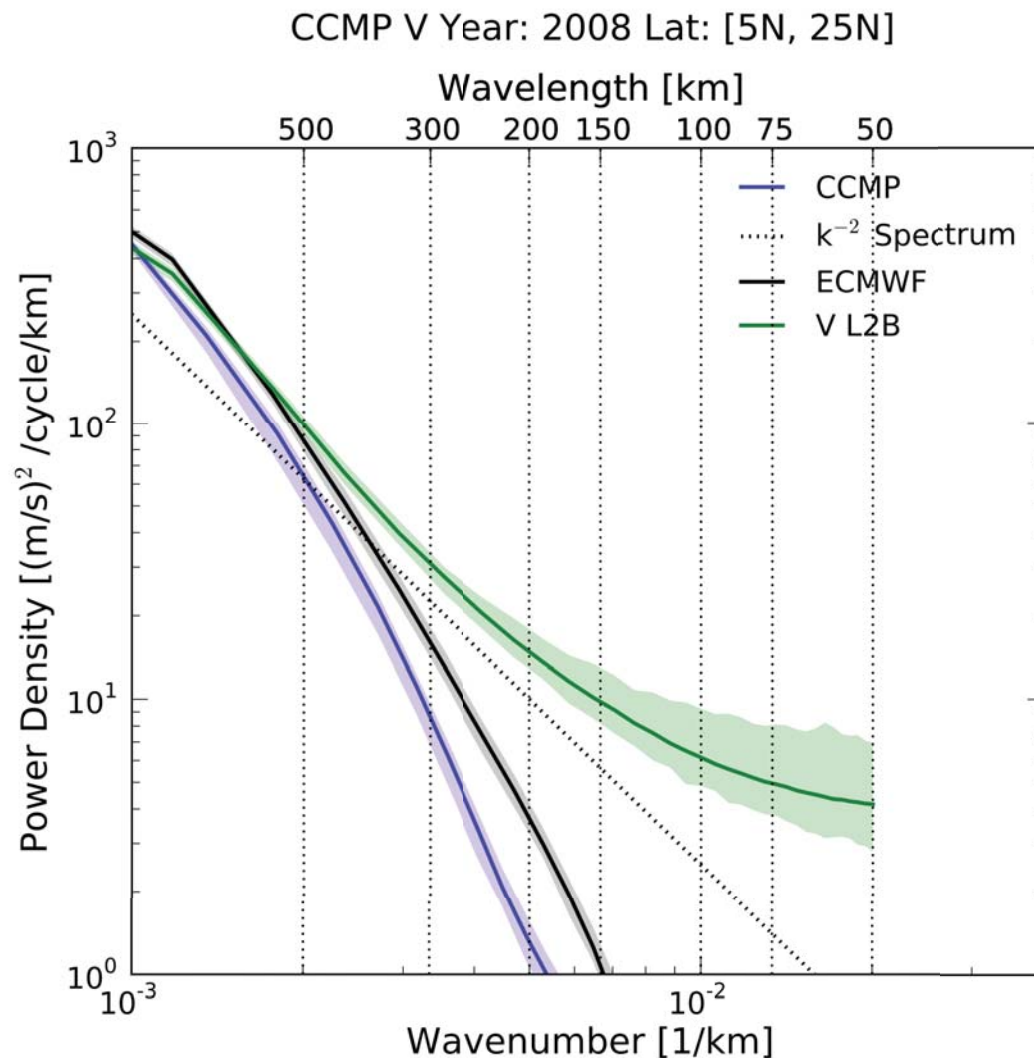
The QuikSCAT scatterometer wind products reproduce the spectrum to higher frequencies, but are contaminated by noise at high frequency.

CCMP V Year: 2008 Lat: [5N, 25N]
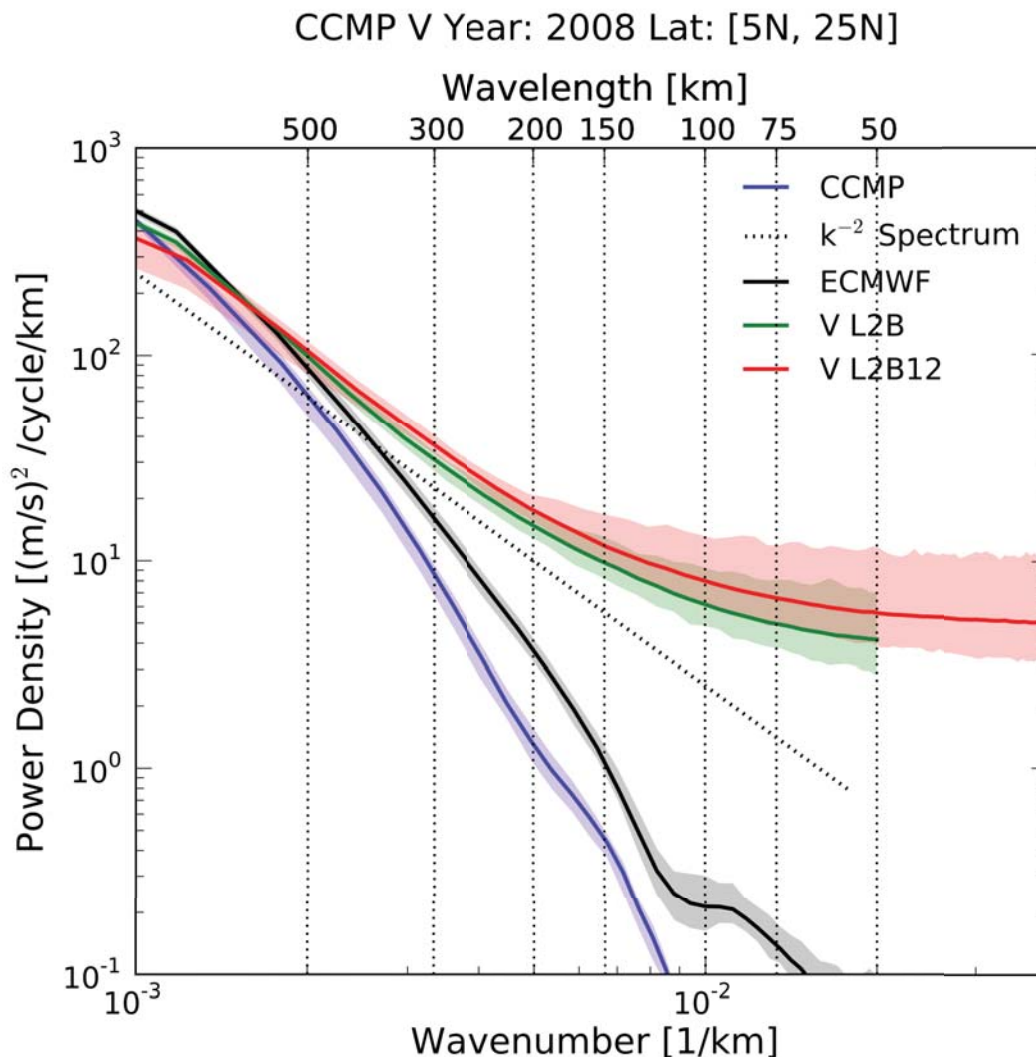
The QuikSCAT 12.5 km data product has even higher noise!

The 12.5 km product was designed to meet the needs of weather forecasters (do not average out high winds!)
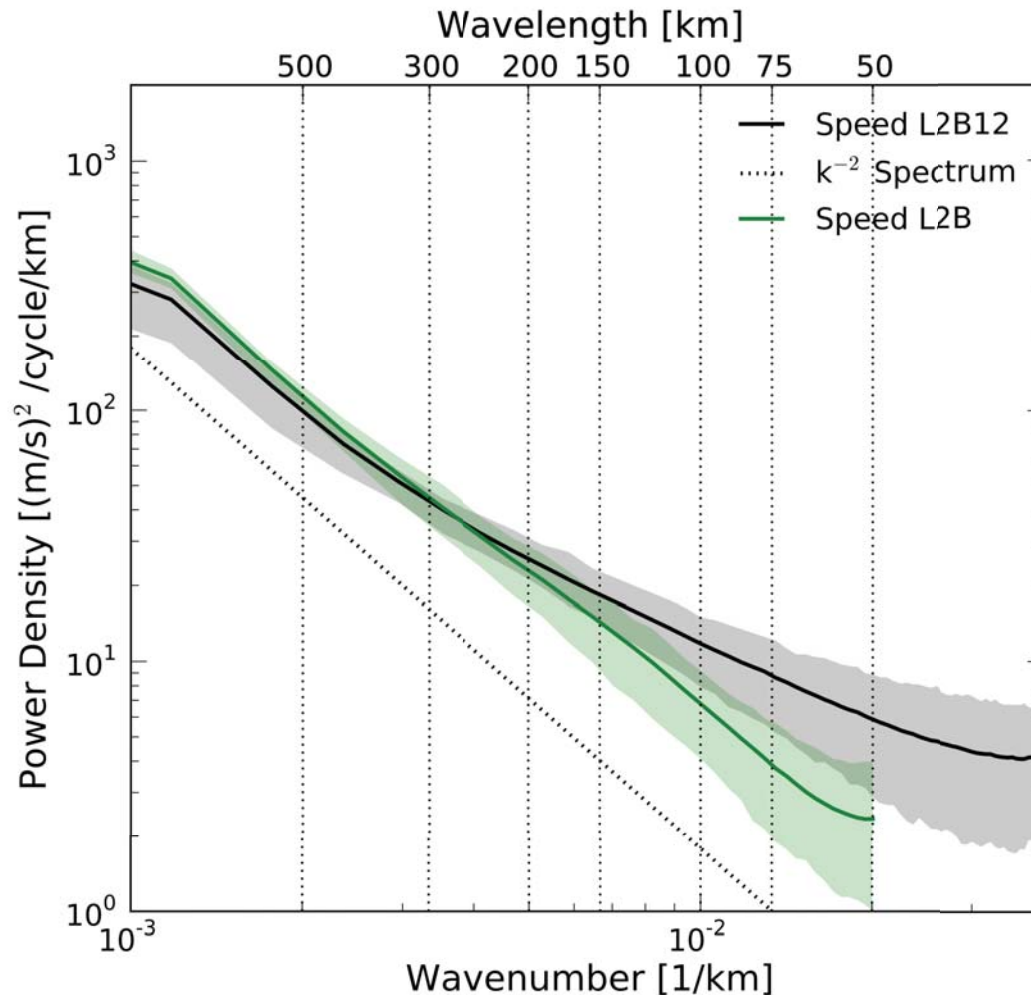
It has been much looked down upon by the science community (perhaps rightly so) due to its high noise content.
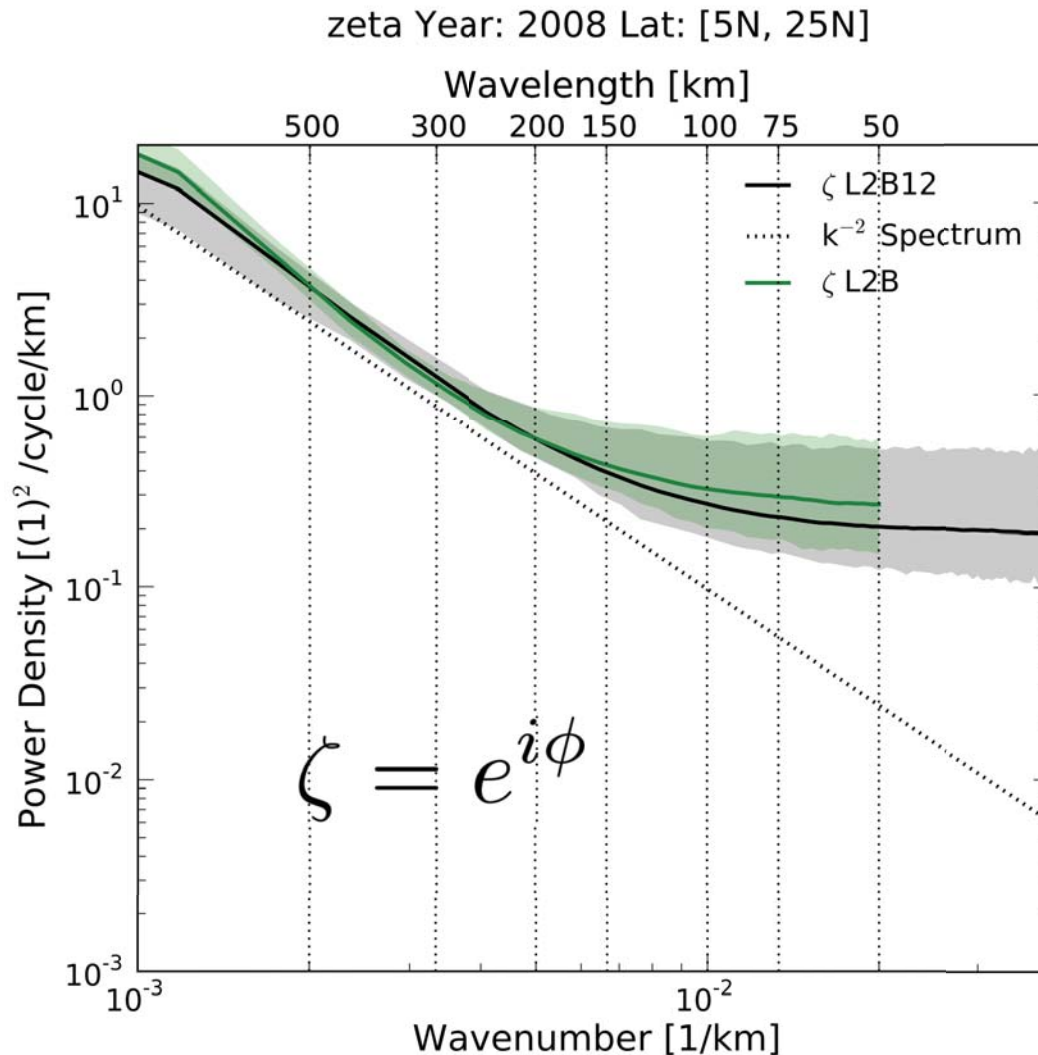
Is it useful for climate?

speed Year: 2008 Lat: [5N, 25N]

The speed spectra decay much more slowly than the component spectra.

Is direction the root problem?

zeta Year: 2008 Lat: [5N, 25N]

$$\zeta = e^{i\phi}$$

Direction is indeed a problem, and it seems bad at both 25 km and 12.5 km.
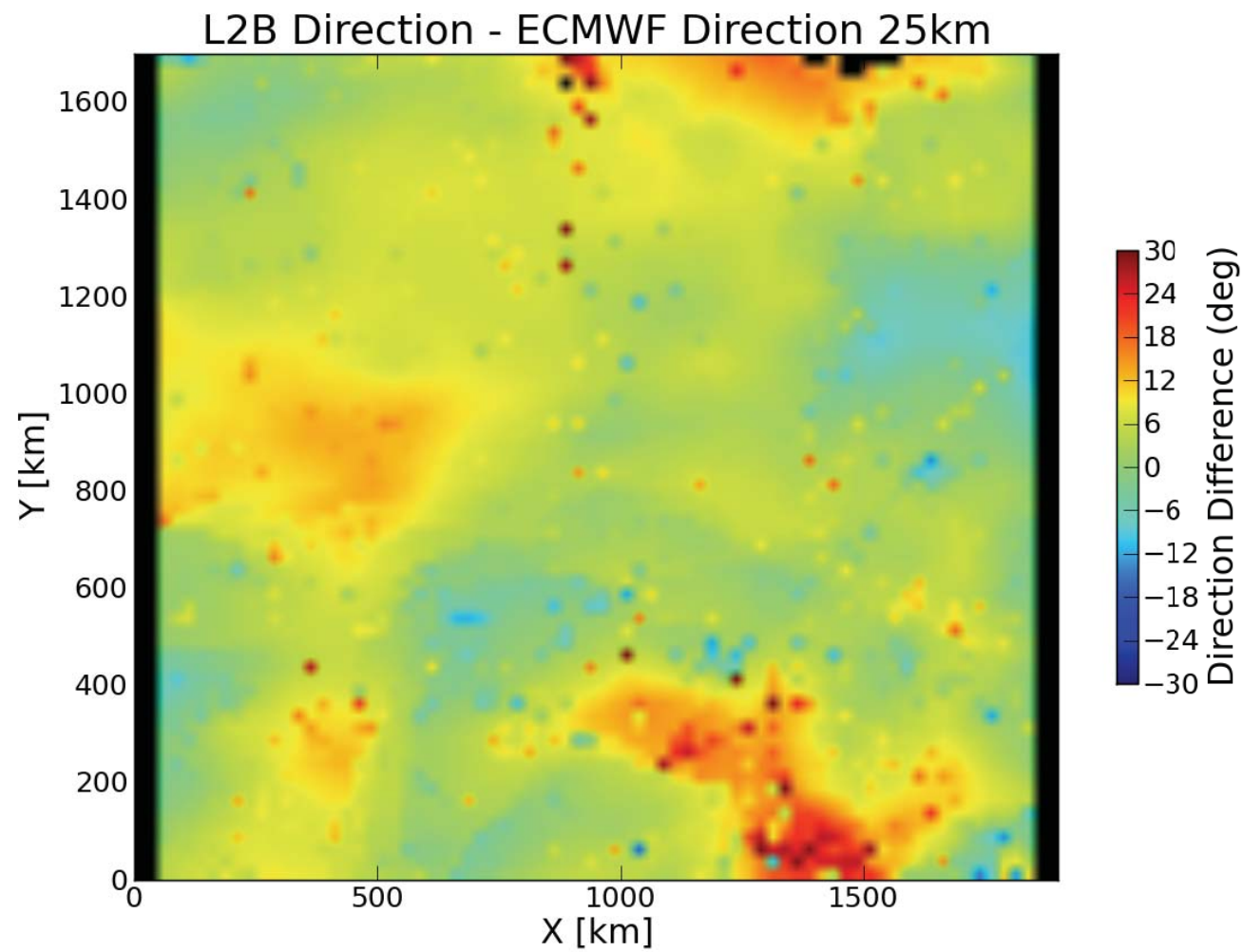
What is going on?

Two sources of white noise:

-Spatially distributed noise (what we usually think of as the noise characteristics).

- Shot noise (spikes)

Which one applies?
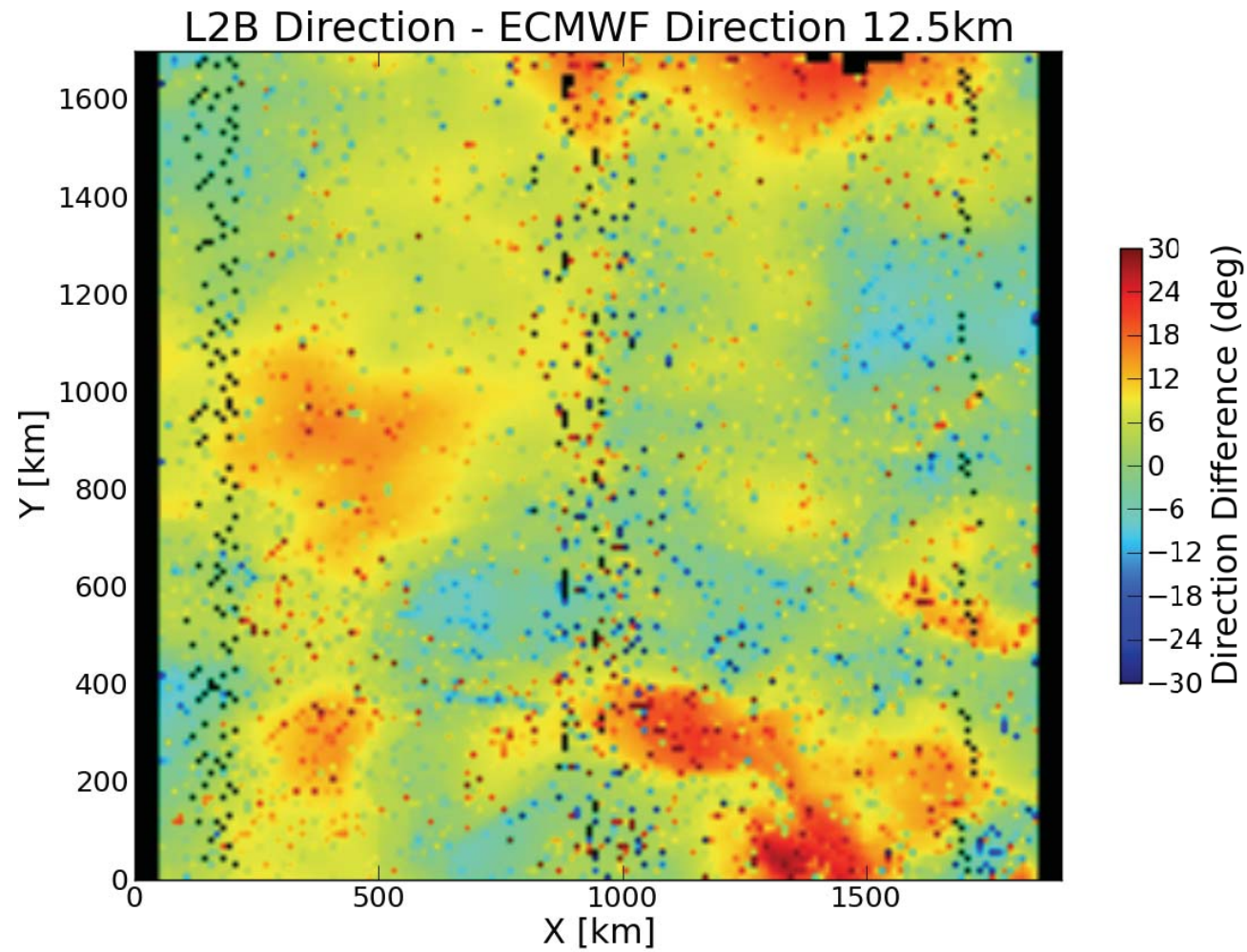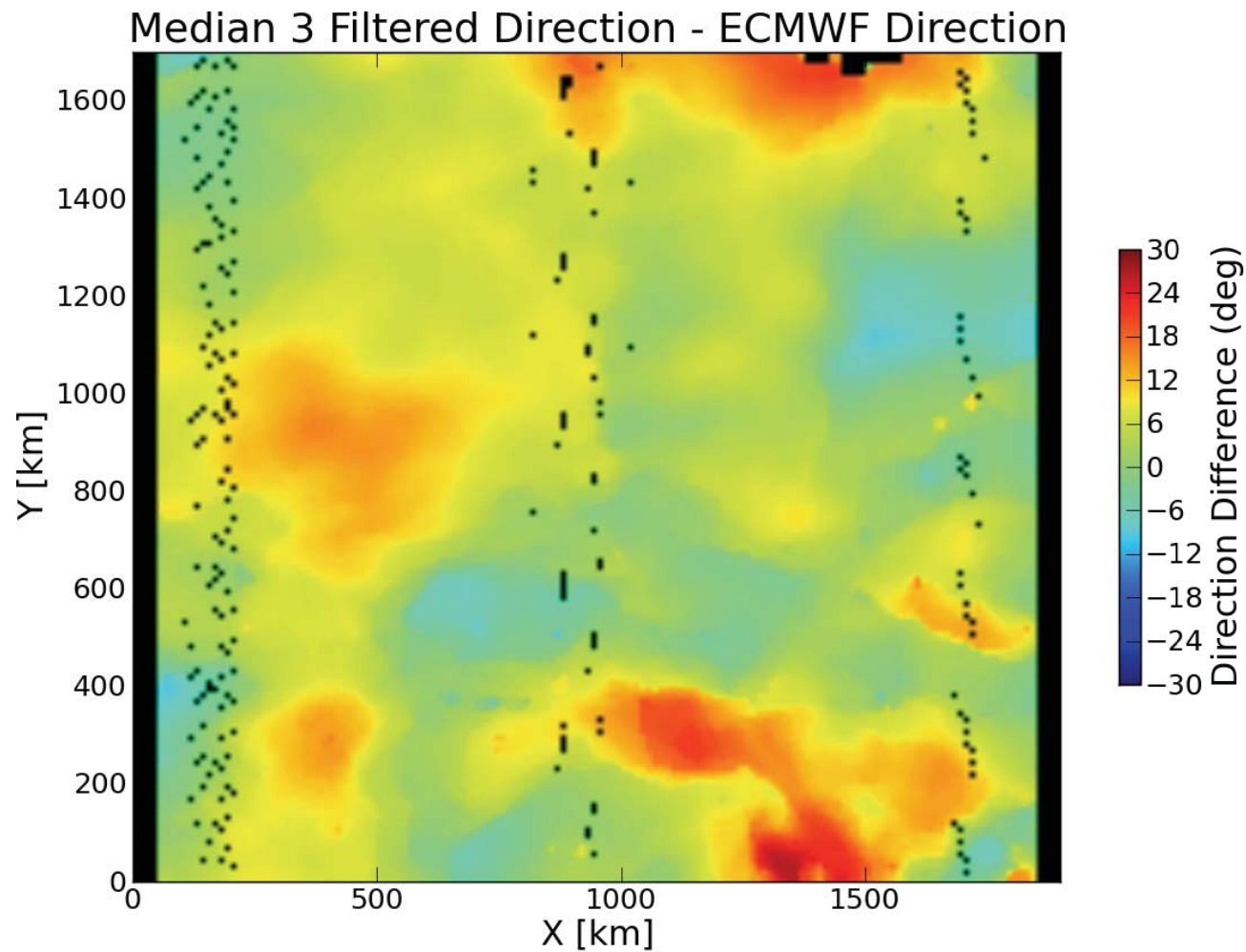
L2B Direction - ECMWF Direction 25km

L2B Direction - ECMWF Direction 12.5km
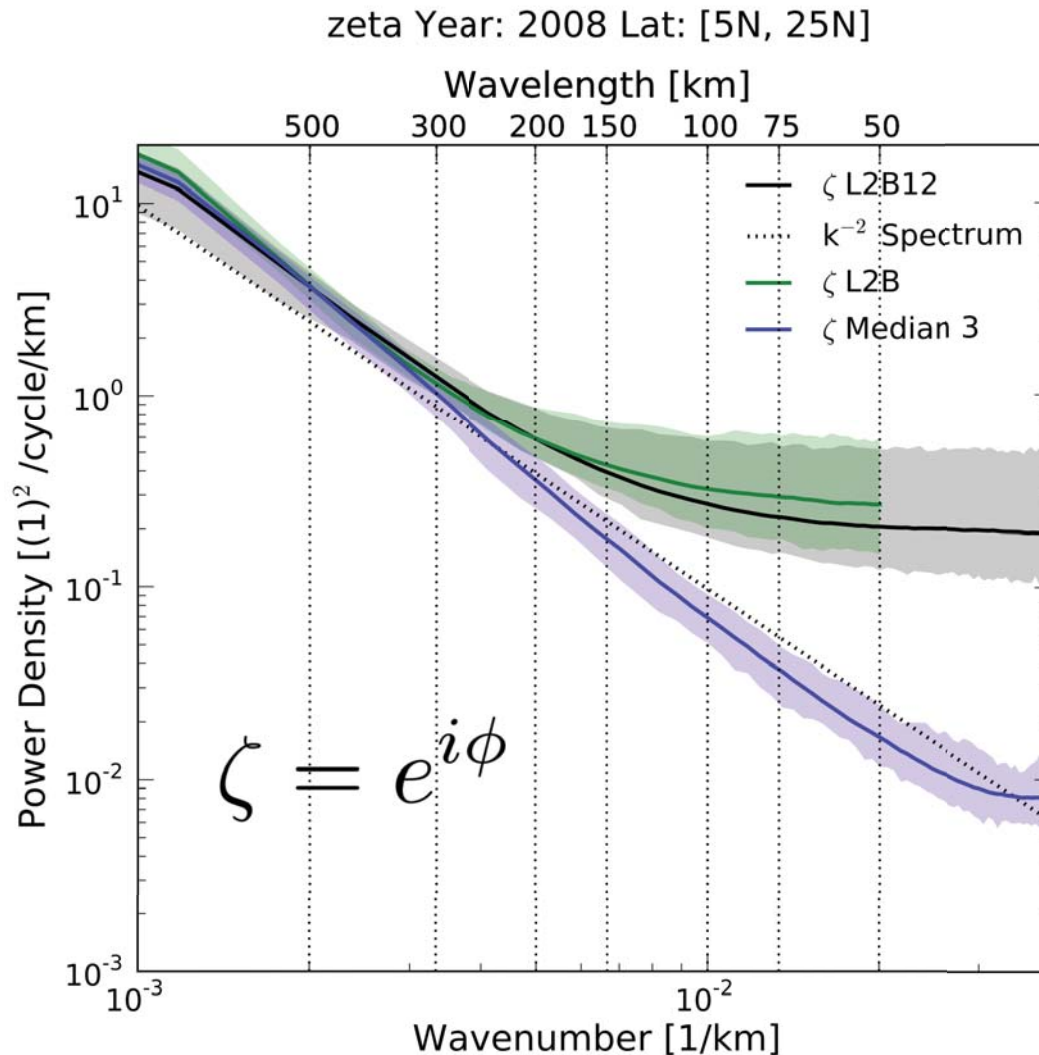
Median 3 Filtered Direction - ECMWF Direction
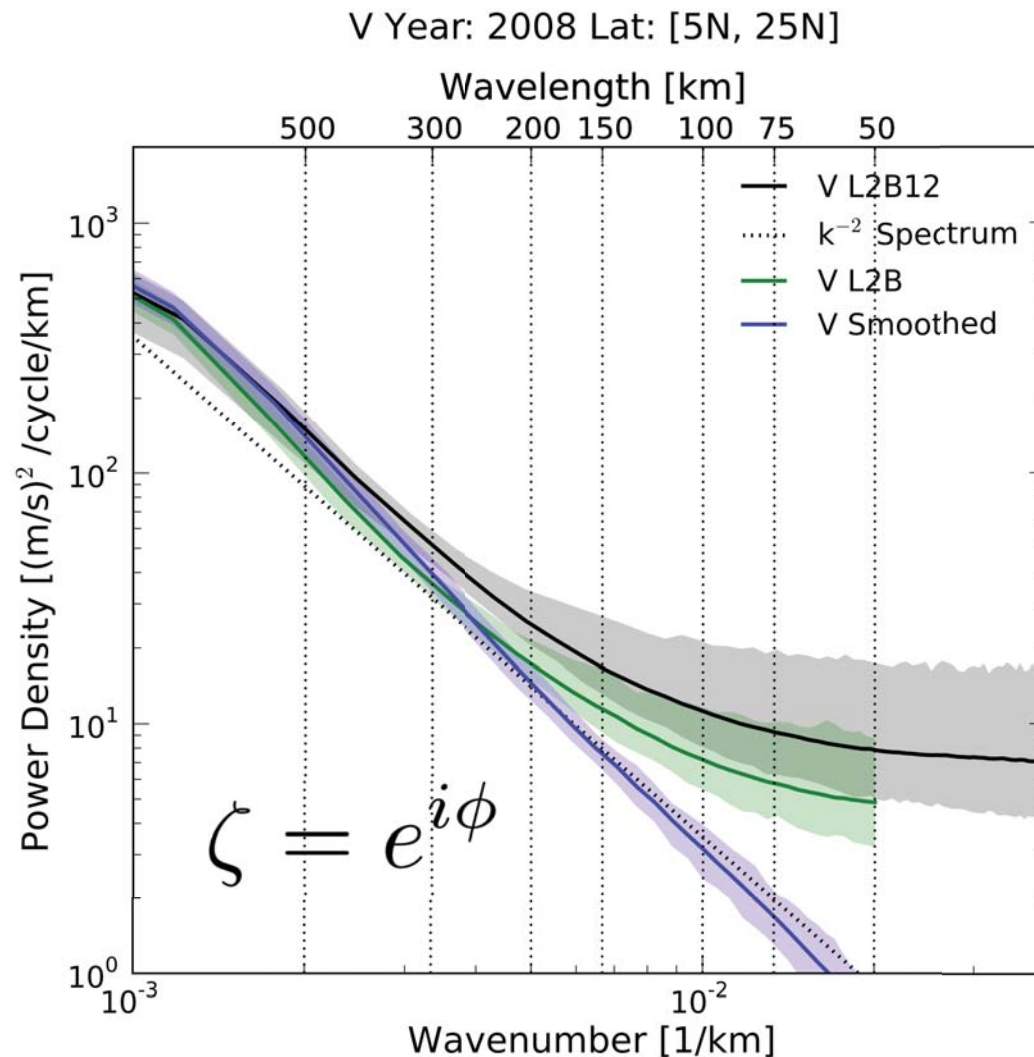
zeta Year: 2008 Lat: [5N, 25N]

Even though a very smaller (37.5 km) filter length was used, the outlier rejection properties of the non-linear median filter cleaned up the spectrum at medium to high frequencies,

V Year: 2008 Lat: [5N, 25N]

To have a consistent resolution, a 5-point Hamming filter [0.08,0.54,1,0.54,0.08] was used in the speed. Half-power point ~40 km.

The largest impact in on the V-component of the velocity (more sensitive to direction errors due to predominance of U). The U componenent also improves significantly, but not as dramatically.
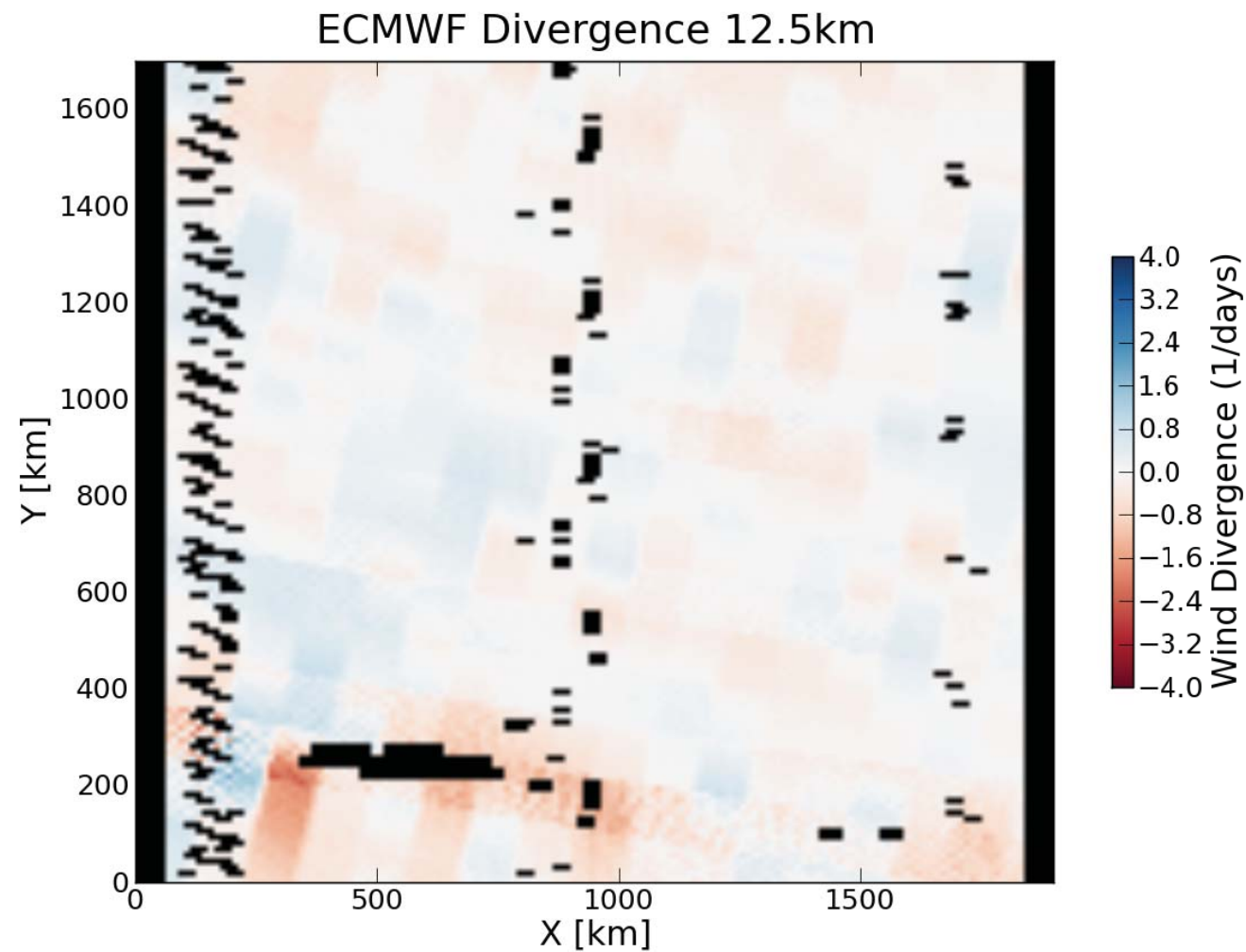
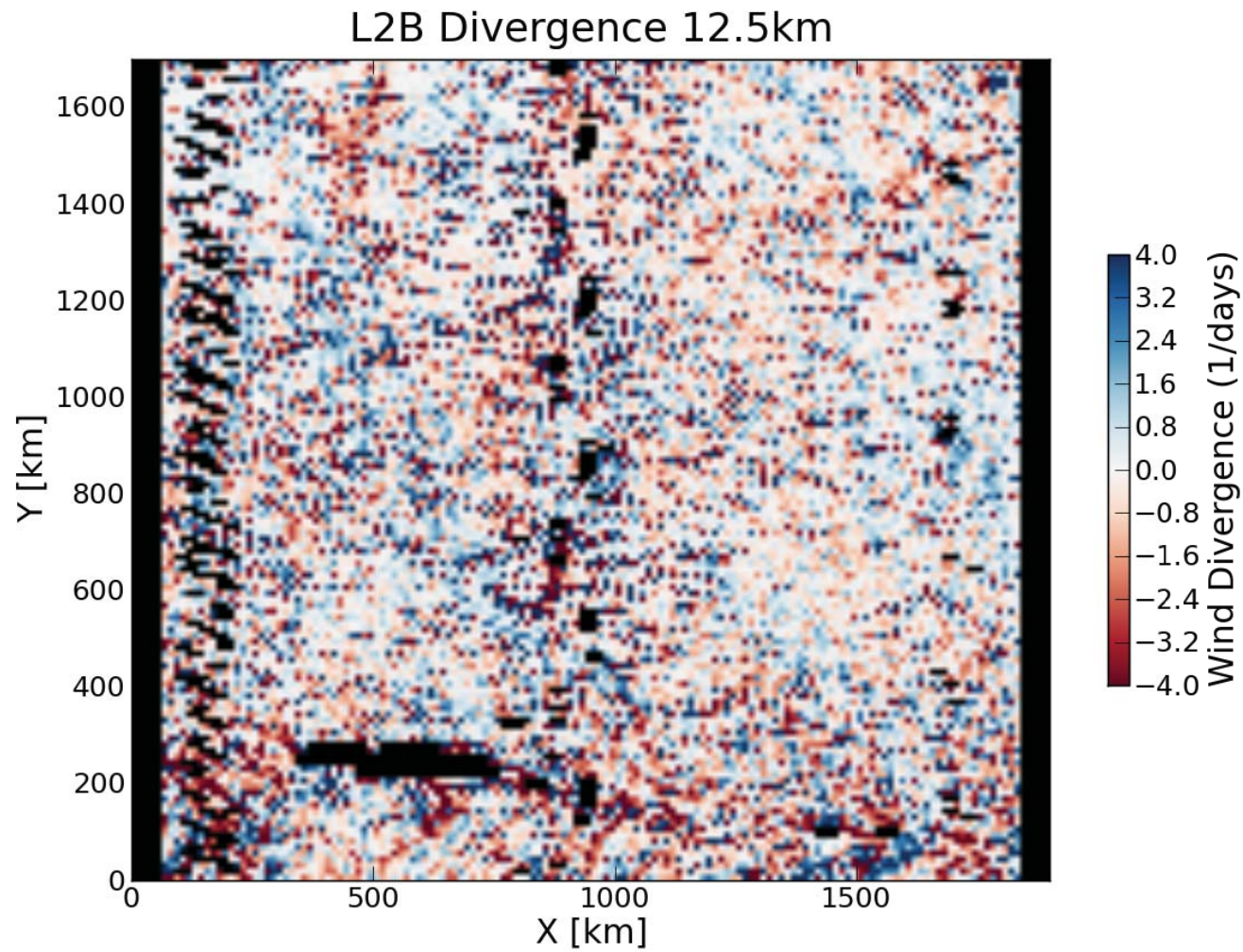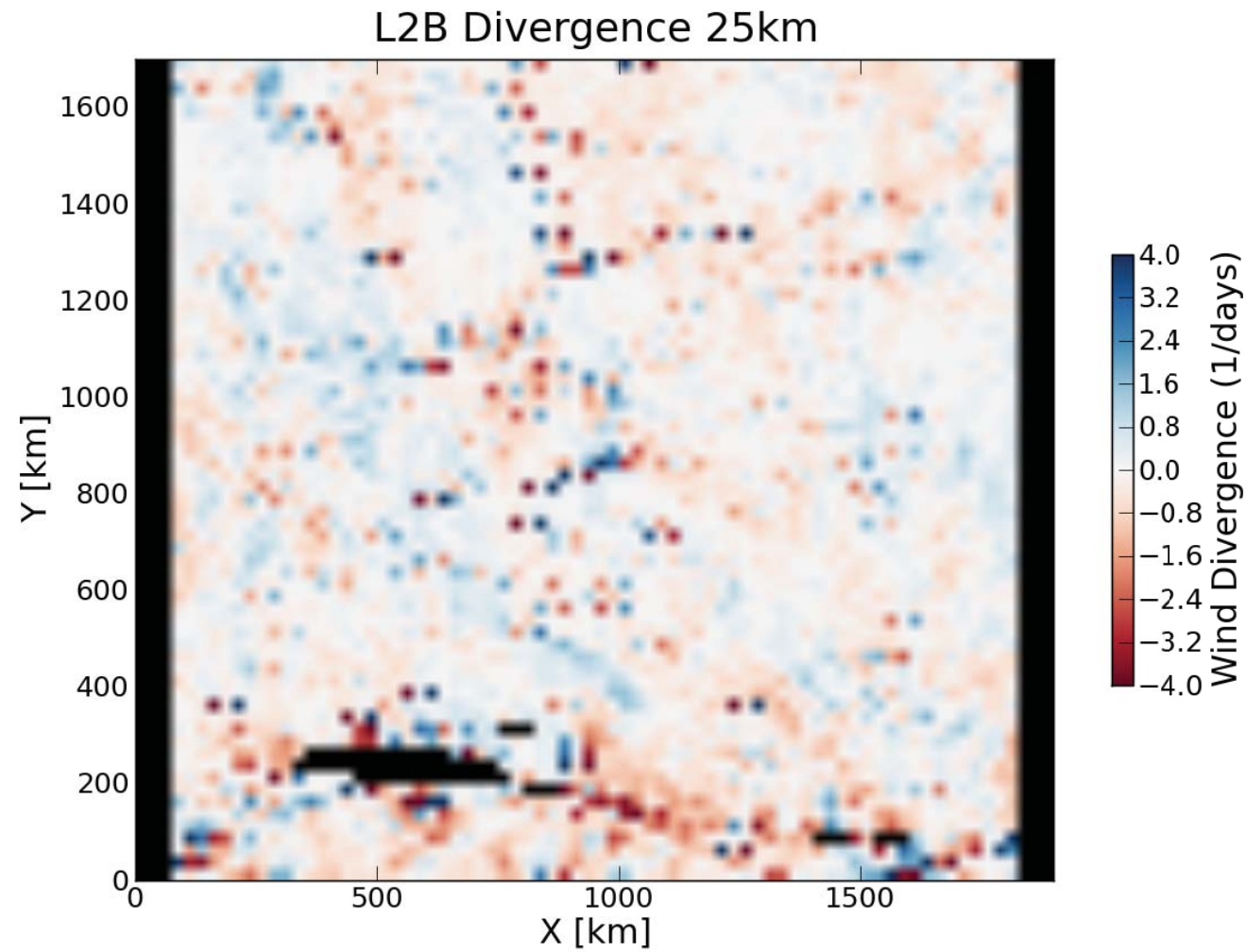Hamming 5 Filtered Speed Mean: 8.5 m/s

ECMWF Divergence 12.5km
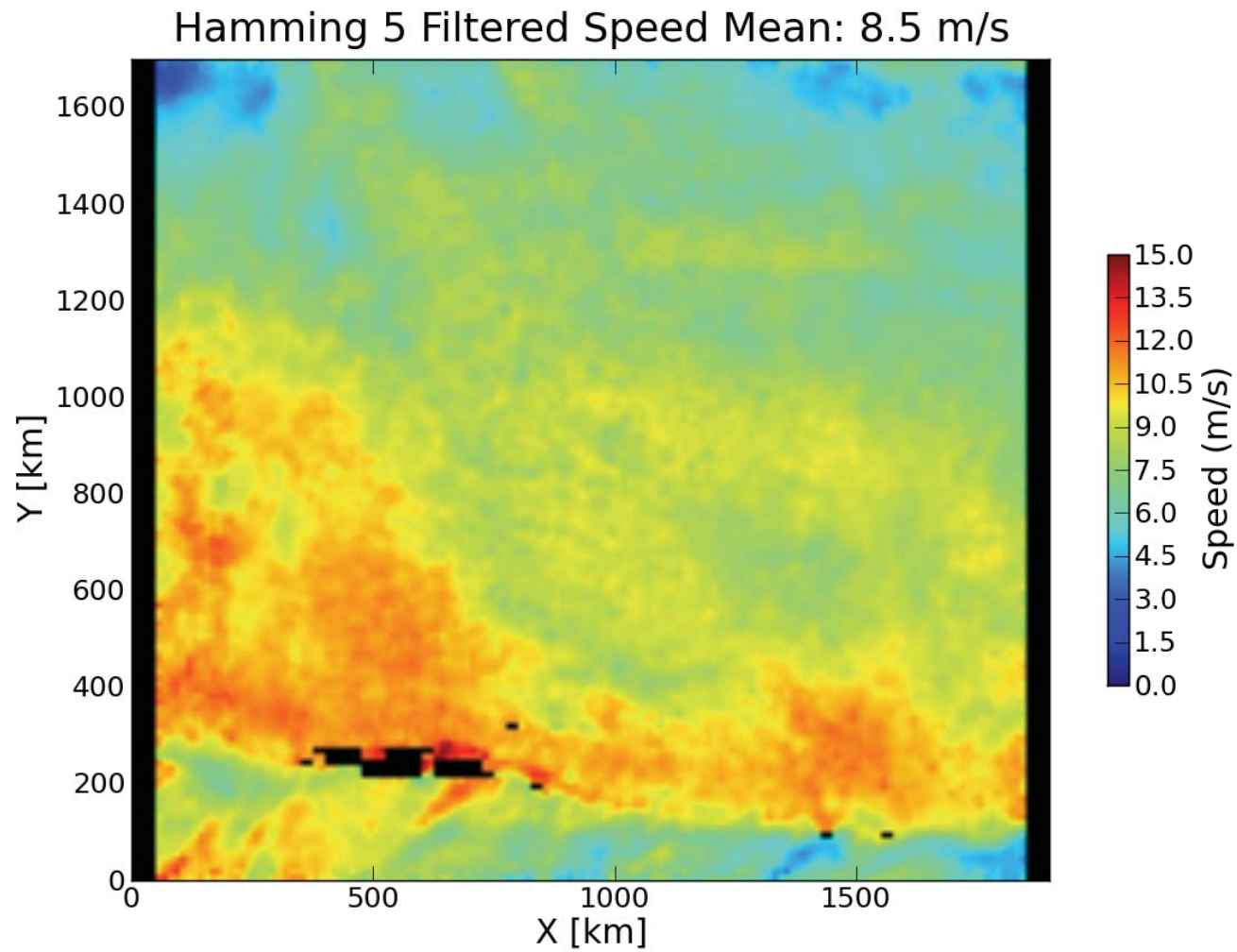
L2B Divergence 12.5km

L2B Divergence 25km

Median 3 Direction Filter, Hamming 5 Speed Filter Divergence
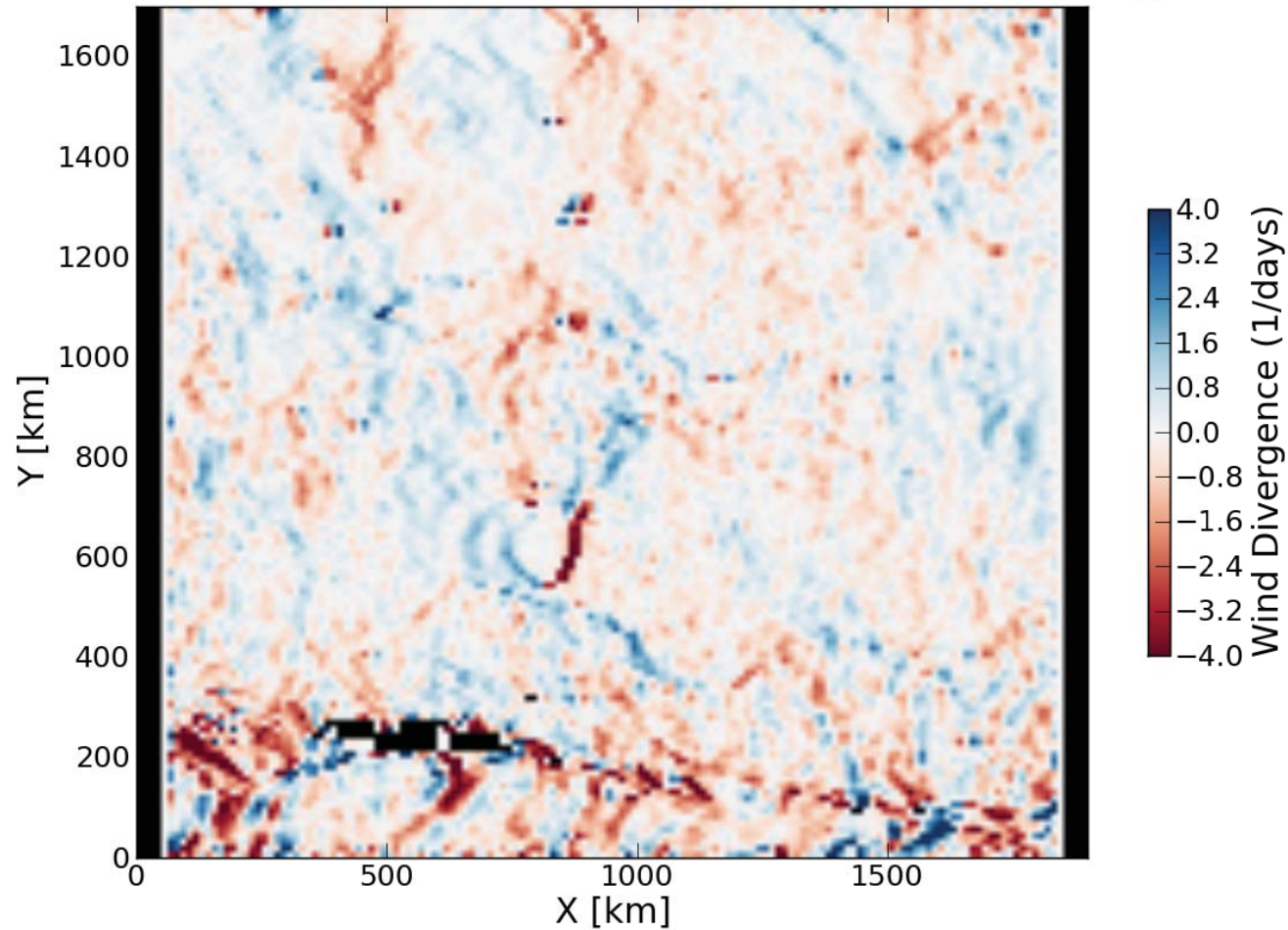
- En el año pasado hemos avanzado la parte técnica del Escaterómetro de Dos Frecuencias (EDF)

- During the past year we have advanced the technical part of the Dual Frequency Scatterometer (DFS)

- Un equipo científico internacional , con miembros de la NOAA, NASA, y JAXA se han puesto de acuerdo sobre los requisitos científicos

- An international science team, with members from NOAA, NASA, and JAXA have reached an agreement on the science requirements

- Sinembargo, la misión GCOM-W2 ha sido postpuesta por la JAXA a causa de motivos financieros en el presupuesto japonés

- However, the GCOMW-W2 mission has be postponed due to budget problems by the Japanese government

- Todos los participadores en la misión GCOM-W2 se mantienen optimistas acerca del futuro a largo plazo de la misión

- All participants of the GCOM-W2 mission remain optimistic about the long-term feasibility of the mission