Coastal Scatterometer Winds Working Group

IOVWST Meeting 2016
Sapporo, Japan

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The Coastal Working Group currently has 3 sub-groups.
2 groups are developing parallel SCIENCE and APPLICATIONS examples.

Each example indicates a need for higher Spatial and/or Temporal resolution of scat winds.

1) Strong winds within a few km of the coast
Steve Morey, Dmitry Dukhovskoy

* science questions:
  - How do wave-current-wind interactions affect storm surge? (S, T)
  - In landfalling storms, why does the wind field within ~25 km of coast sometimes increase and sometimes decrease? (S, T)

* applications:
  - Coastal flooding forecasts & timing of peak storm surge relative to high tide (T)
    [regional models need scat winds every ~90 min to avoid bias?]
  - Search and rescue (S, T)
  - Siting wind farms (S)
  - Oil spill trajectories/persistence (S, T)

Presentation at this conference:
Alberto Rabaneda:
Development of a tool for offshore wind resource assessment for wind industry (talk Thursday)

2) Atmosphere-ocean coupling within ~50 km of the coast

Larry O'Neill, Melanie Fewings

* science questions:

- Does SST-wind coupling in coastal upwelling regions enhance or suppress upwelling and relaxation events? (S, T)
- In wind features tied to orography, how does the SST-wind coupling differ from the 1-way coupling assumed in the open ocean? (S, T)
- Does SST-wind-current coupling at submesoscale features like fronts and filaments lead to enhanced upwelling on small scales? (S, T) *[models are ahead of observations]*
- In productive island wakes, is upwelling due more to wind wake or oceanic wake? (S, T)

* applications:

- Fish catch enhanced at fronts (S)
- Hypoxia and fish die-offs in upwelling systems (S, T)
- Nutrient supply to fisheries via submesoscale features (S, T)

Presentations at this conference:

Renato Castelao:

Winds, eddies, and fronts in Eastern Boundary Currents (poster Thursday)

Kayla Flynn / Melanie Fewings:

SST anomalies during wind relaxations in California Current System (poster Thursday)

Melanie Fewings:

Wind stress and curl anomalies along western North America during 2014-16 (talk Thursday)

other possibilities:

Polar lows (not coastal)

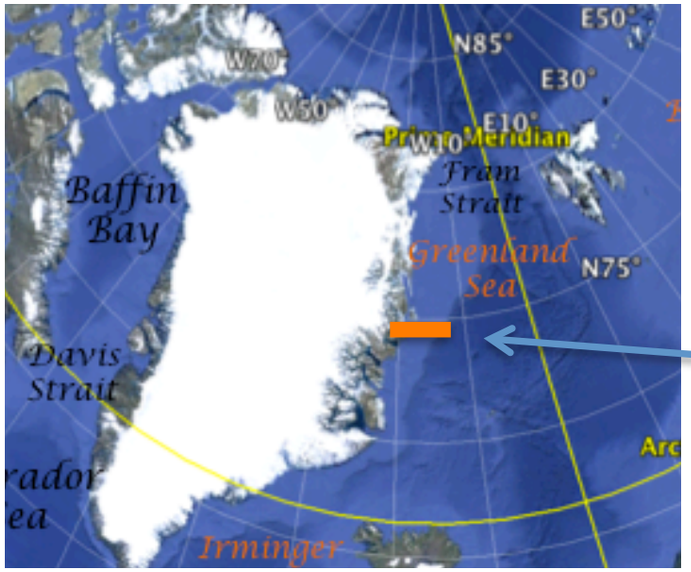
Sea ice

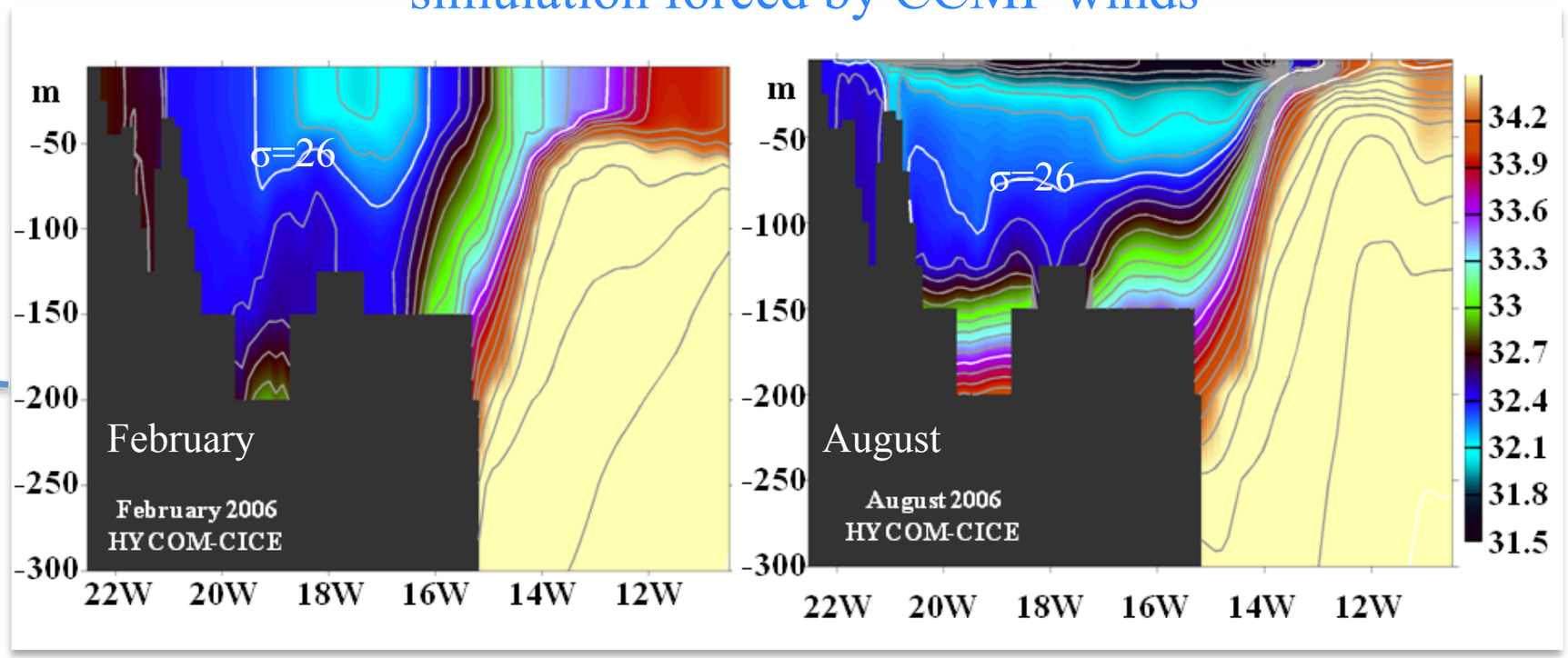
2) Atmosphere-ocean coupling within ~50 km of the coast

Ekman Straining of the East Greenland Current in Winter

Dmitry Dukhovskoy

Salinity and σ_0 isopycnals from HYCOM simulation forced by CCMP winds





How does variability of northern winds influence thermohaline processes in the EGC and western Nordic Seas?

- The EGC is the main route of freshwater export from the Arctic Ocean to the North Atlantic.
- The northern winds dominate the western part of the Nordic Seas in winter, when winds are downwelling favorable for the eastern coast of Greenland
- Northern winds steepen the front, deepen and narrow the buoyant coastal current reducing stratification within the current
- In summer, northerly winds subside and downwelling abates

A 3rd sub-group pursues the production and use of coastal scat products with global coverage.

3) Methods for improving Scat resolution / applications near coast

Julia Figa-Saldaña, Bryan Stiles

* Methods for producing "coastal" products from existing missions:
  - Coastal ASCAT (Eumetsat/OSI-SAF) (S)
  - NOAA coastal products (S)
  - Stiles et al. QuikSCAT/OSCAT/ASCAT product in progress (S)

* How should "coastal" products be validated?
  Need global product so many users can validate it regionally against buoys, land winds, etc.

* Future missions:
  - Advocate for little/no on-board aggregation to permit high-resolution reprocessing (S)

Presentations at this conference:

Jur Vogelzang / Ad Stoffelen:
Resolution enhancement for ASCAT (talk Wednesday)

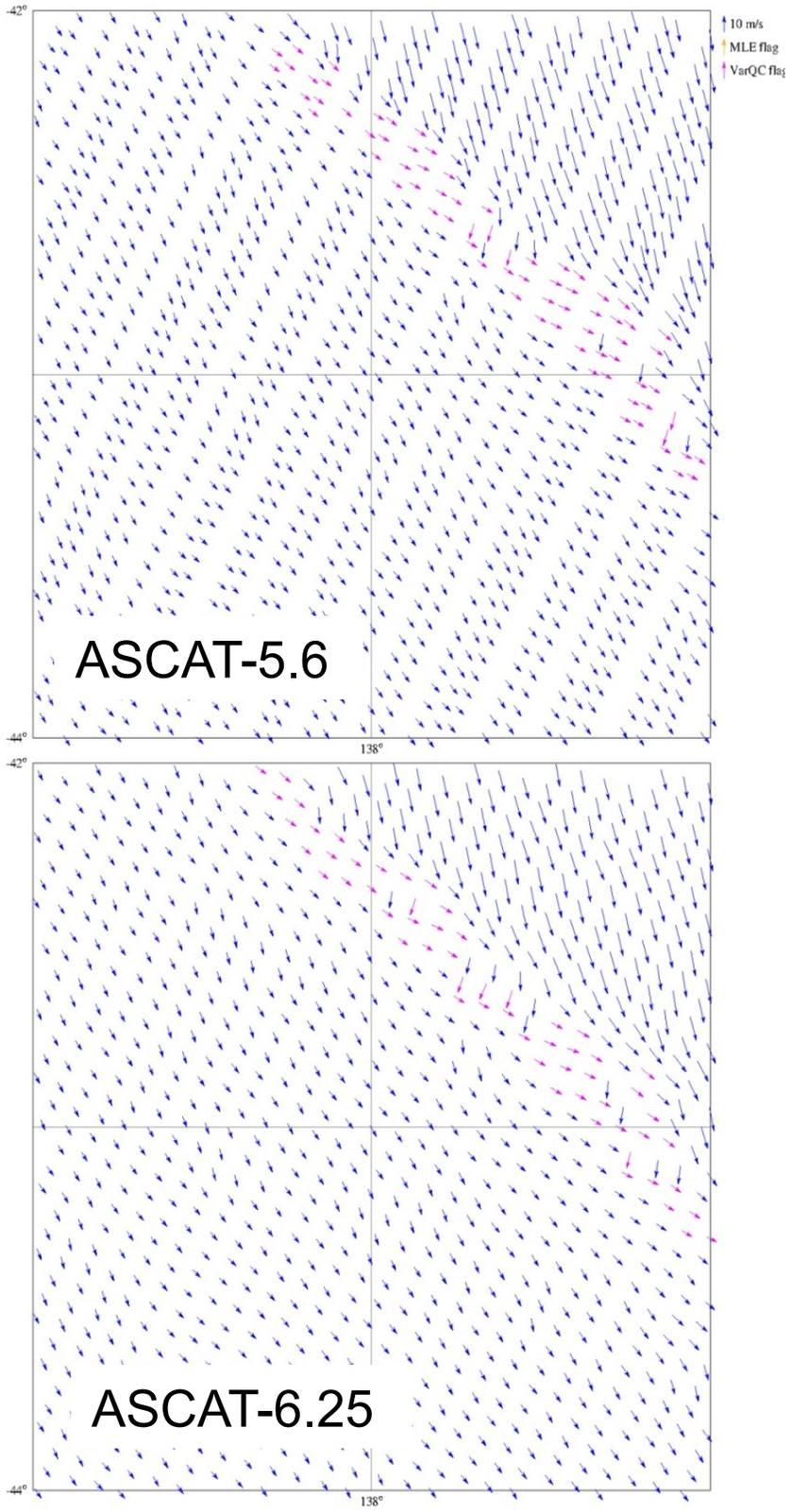
Bryan Stiles:
Discovering a decade of coastal winds from scatterometers (talk Wednesday)

Ted Strub:
Evaluation of coastal scatterometer products (poster Wednesday)

Steve Morey:
Interannual variability of global coastal upwelling… (talk Thursday)

3) Methods for improving Scat resolution / applications near coast

Resolution enhancement for ASCAT (talk Wednesday)



NWP SAF
Numerical Weather Prediction

Ad Stoffelen and Jur Vogelzang, KNMI
Isabel Monteiro, IPMA

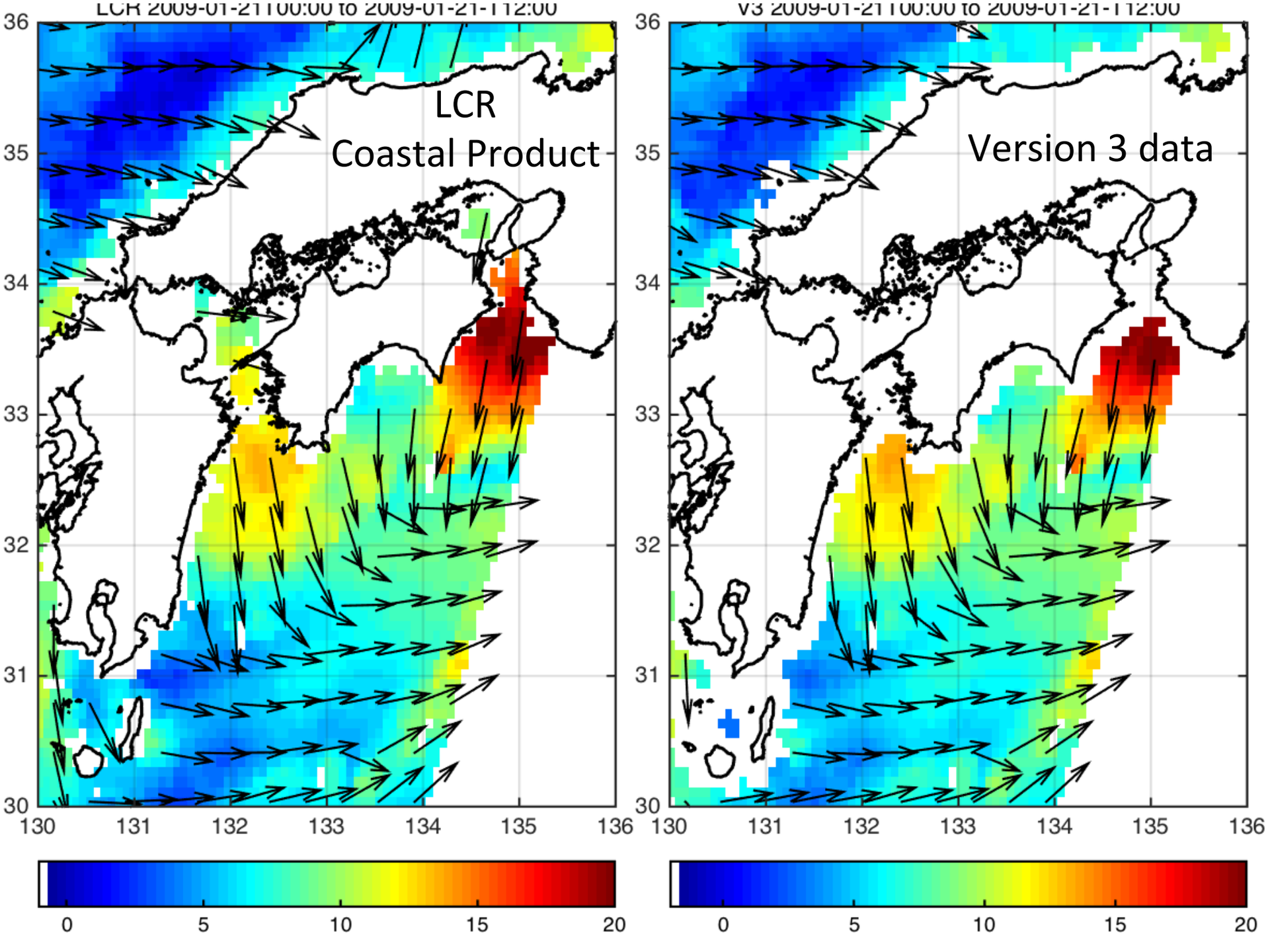
- ASCAT-6.25 will become operational very soon (grid size 6.25 km; spatial resolution 17 km)
- ASCAT-5.6 products under study (average grid size 5.6 km): spatial resolution 19 km but better buoy comparison
- Spatial resolution estimated from extent of Cumulative Spatial Response Function by Richard Lindsley
- Coastal validation along Iberian coast in collaboration with IPMA

3) Methods for improving Scat resolution / applications near coast

Bryan Stiles: Discovering a decade of coastal winds from scatterometers (talk Wednesday)

QuikSCAT coastal data product using Land Contribution Ratio

Bryan Stiles and Alexander Fore (*JPL),* Ted Strub and Corinne James (*OSU)*



Southern Japan, QuikSCAT data Jan 21, 2009 6:00 PM

- Swath (L2B) netcdf files with LCR processing available now for all QuikSCAT orbits 1999-2009.
- Geographically gridded data on a 0.075 degree grid available in 1-2 months, need to discuss format with potential users.

EUMETSAT coastal wind products update

- Lindsley et al. paper on Spatial Response Function for ASCAT 'slices' and Land Contribution Ratio (LCR) for ASCAT **has been accepted**

- Now implementing a LCR field in the operational ASCAT 'slice' Level 1 products.

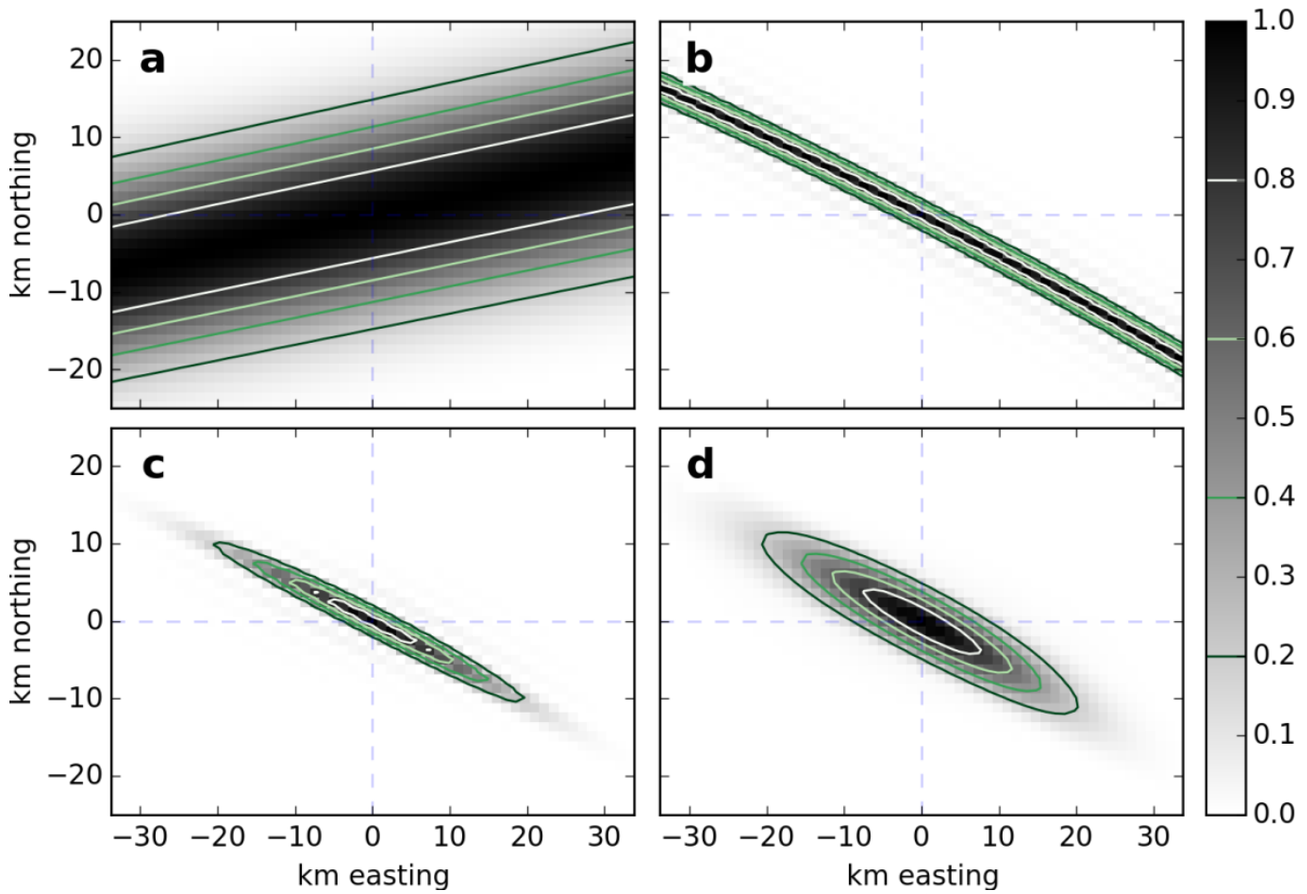
- NRCS values in 'coastal' products from KNMI have been examined globally over land and sea ice and look good

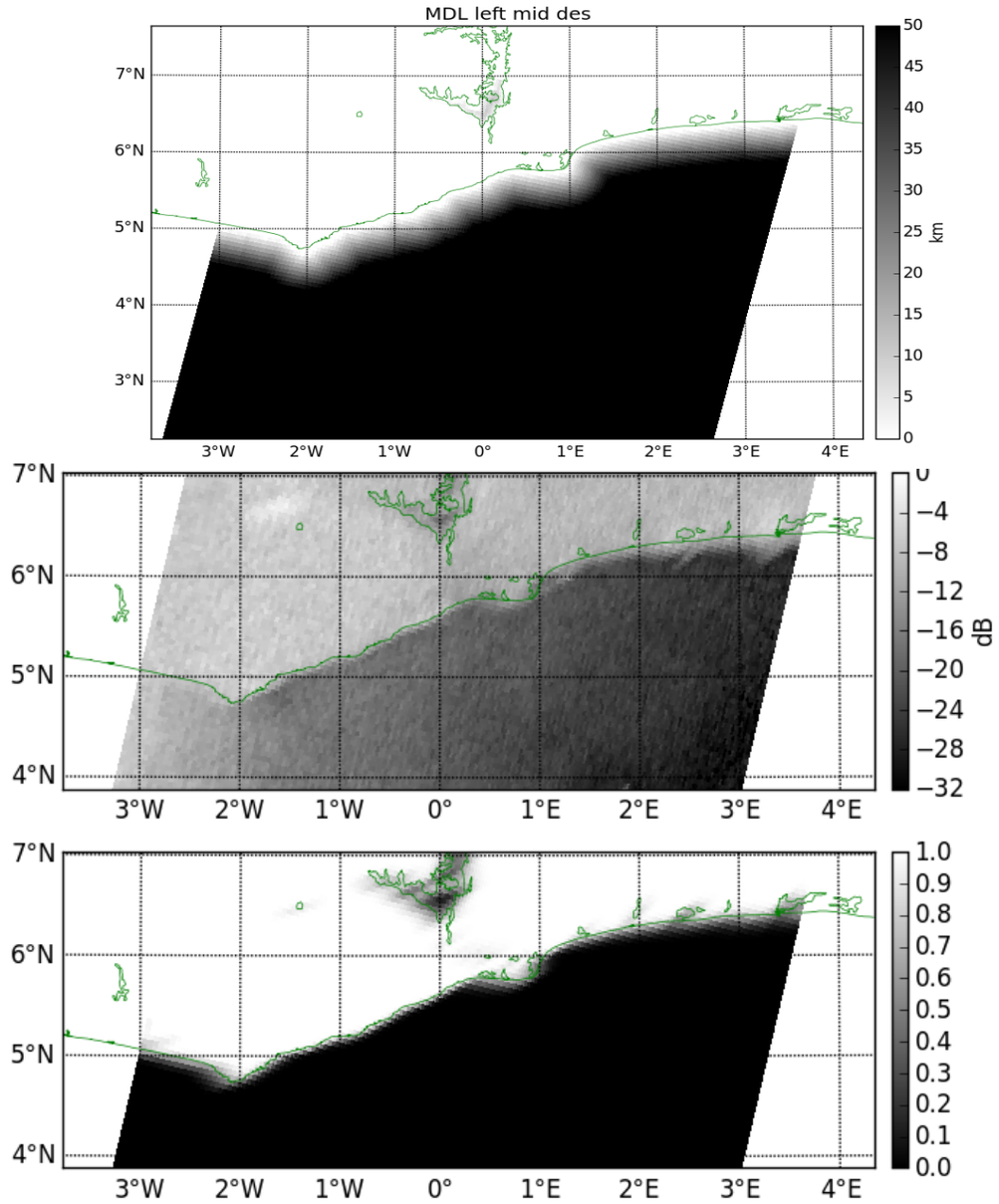
- So, now implementing coastal processing in the ASCAT Level 1 processor; will activate for 12.5 km products

3) Methods for improving Scat resolution / applications near coast

Richard Lindsley, Craig Anderson, David Long, Julia Figa Saldaña, Ad Stoffelen

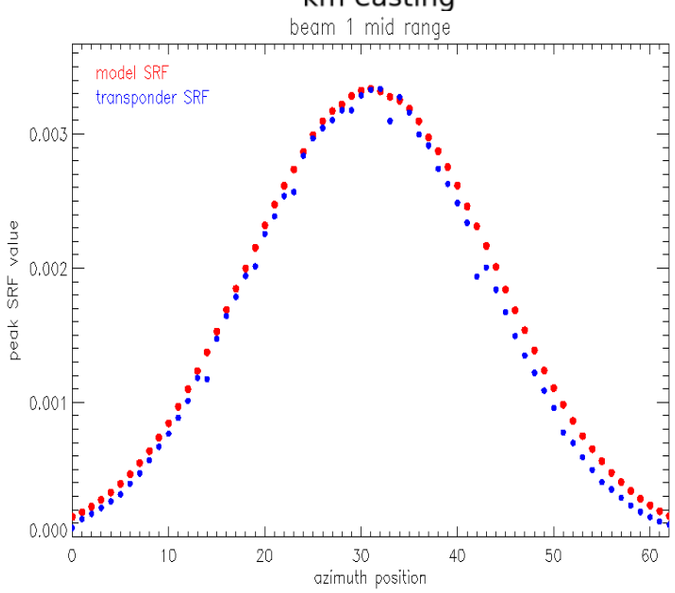
Progress in the modelling and validation of the ASCAT Spatial Response Function and land flag





Lindsley & Anderson 2015:
A Parameterized ASCAT Measurement Spatial Response Function

accepted manuscript



See for more details in this session:
✓*Lindsley&Anderson poster*
✓*Stoffelen&Figa Saldana presentation*

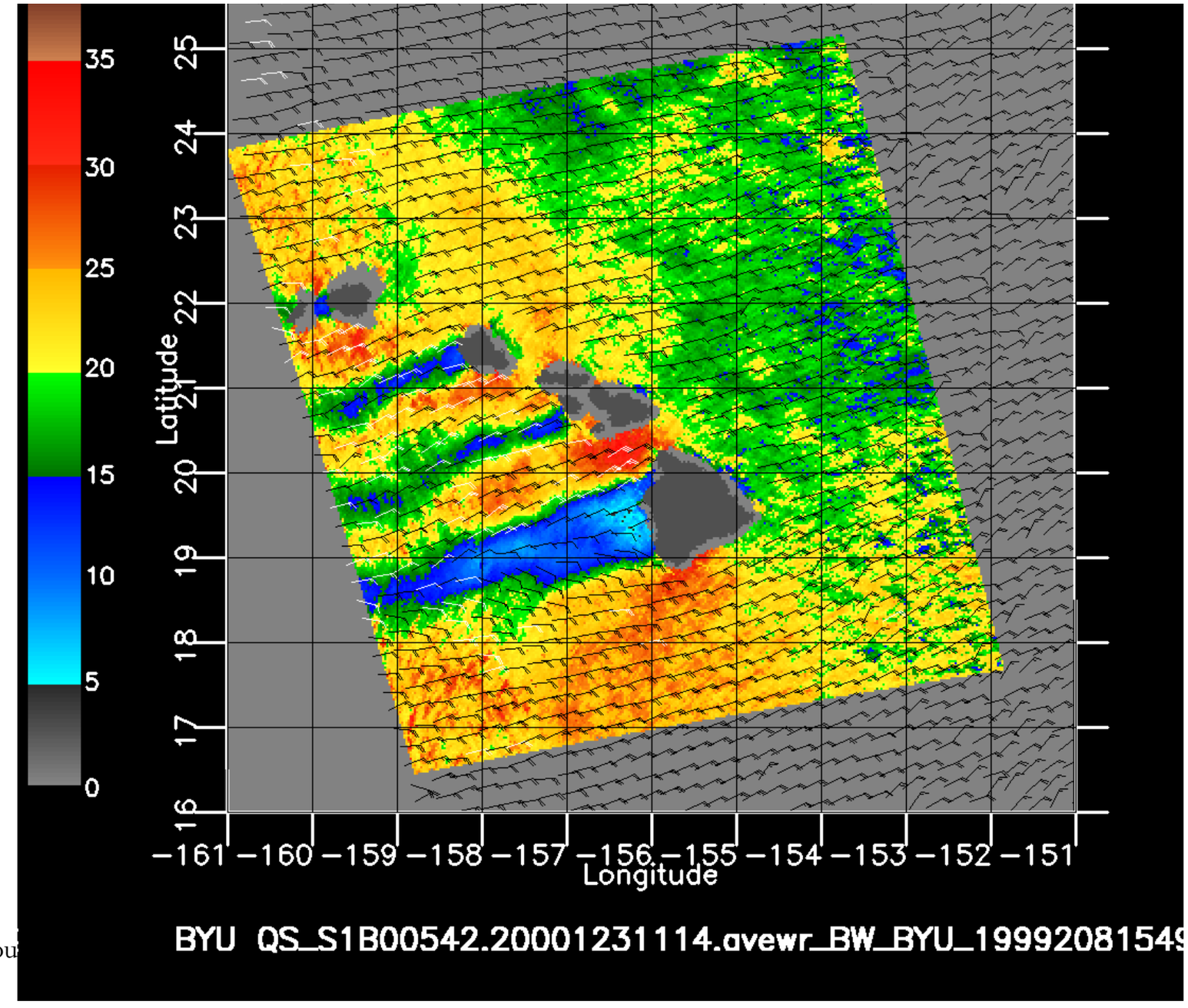
3) Methods for improving Scat resolution / applications near coast

David Long's group: combining Land Contribution Ratio and ultra-high resolution retrieval.
Also, in storms UHR helps to distinguish noise from rain contamination.

UHR wind speed after wind retrieval using a Land Contribution Ratio (LCR) discard threshold of -27dB

UHR (2.5 km) wind speed

25 km barbs



Land contamination eliminated

Can now see "stopping zone" in front of island

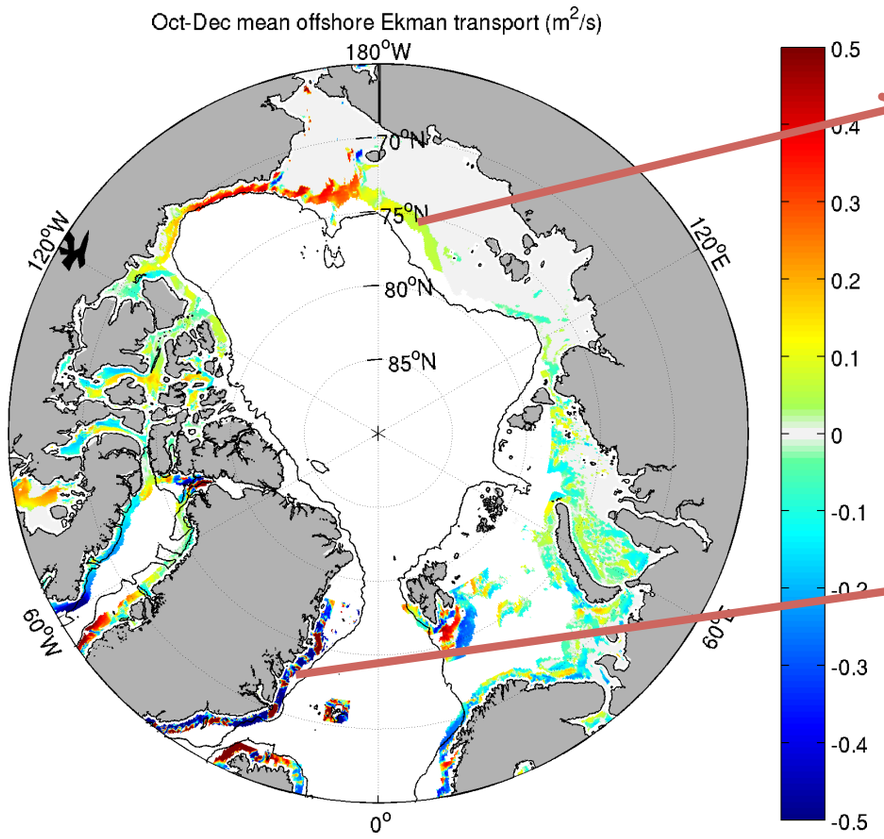
3) Methods for improving Scat resolution / applications near coast

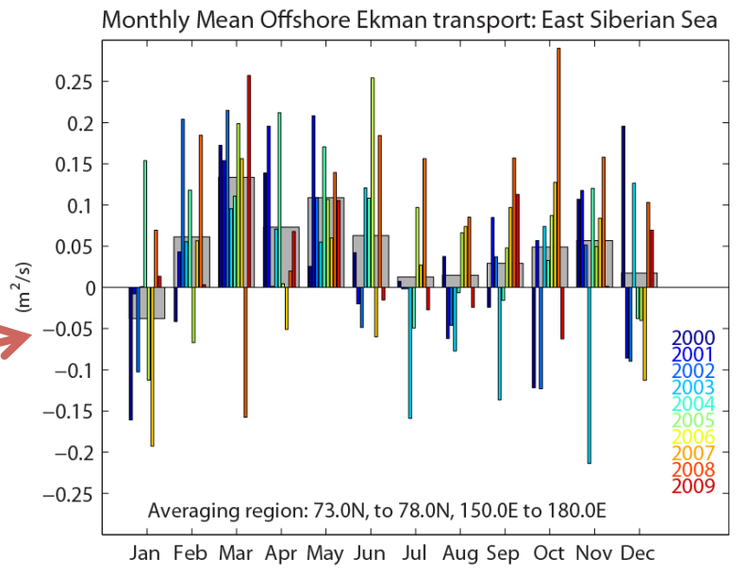
Global Coastal Upwelling Indices from Satellite Winds Steve Morey (FSU)

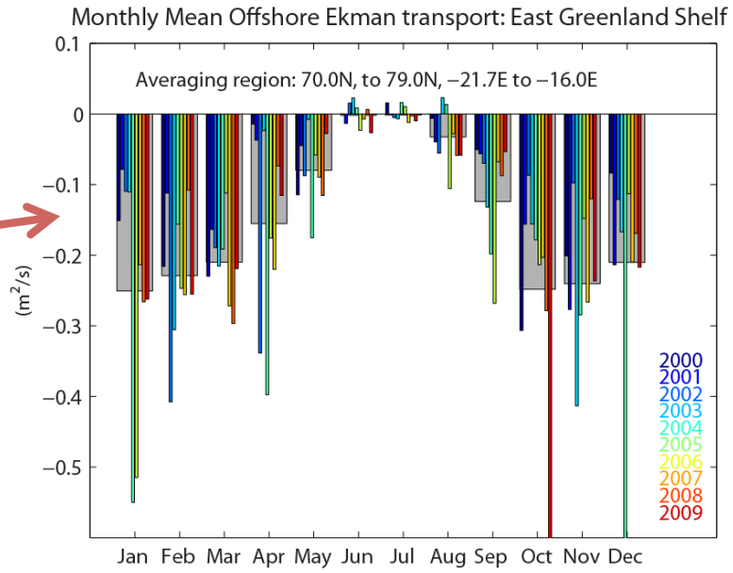
Overall Goal

Develop a new global database of coastal upwelling indices corresponding to the satellite wind record suitable for use in climate and ecosystem studies

Example: Mean Oct-Dec upwelling index map. Climatology (gray bars) monthly means for each year (colored bars) are shown for the East Siberian Sea and East Greenland Shelf.







Recent Updates

- A modification to the “classic” upwelling index accounts for the influence of remote upwelling signals (coastal trapped waves), extending applicability to more shelf areas with complex geometry.
- Global model data are analyzed to show areas where upwelling indices are strongly related to cross-isobath bottom velocities.
- Seasonal influences (changes in stratification) on the applicability of the upwelling indices are being determined.

Coastal Scatterometry Working Group

Discussion suggestions:

1) Goals: come up with
   - "good stories" in anecdotal form rather than science form
   - (multi-platform) climate applications in coastal regions

2) Future collaborative projects
   - work with Stress Working Group to address fetch-related effects on stress?
   - work with Stress Working Group on review paper?

3) Problems that need to be addressed?