Expanding the use of NRT altimeter data at NOAA/NCEP

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OUTLINE

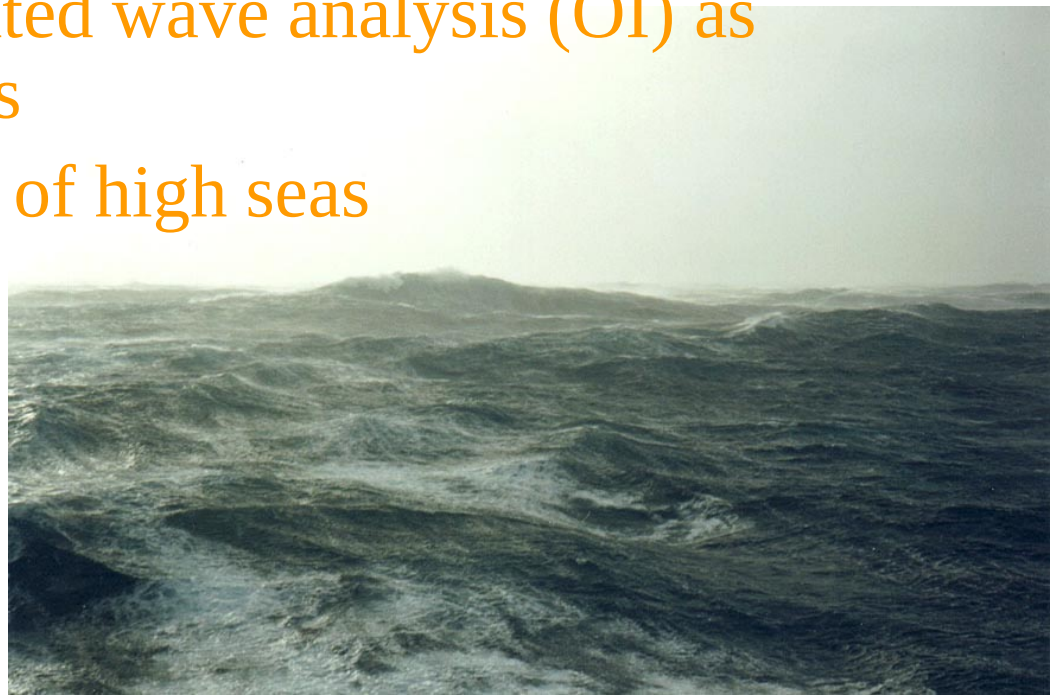
- Introduction to altimeter use at NCEP
- Study components – WWV apps
  - NASA ROSES project Accelerating Operational Use of Research Data
  - Data quality, data access, timing, coverage, alternate products
  - A different sort of OSTST EO activity
- Conclusions

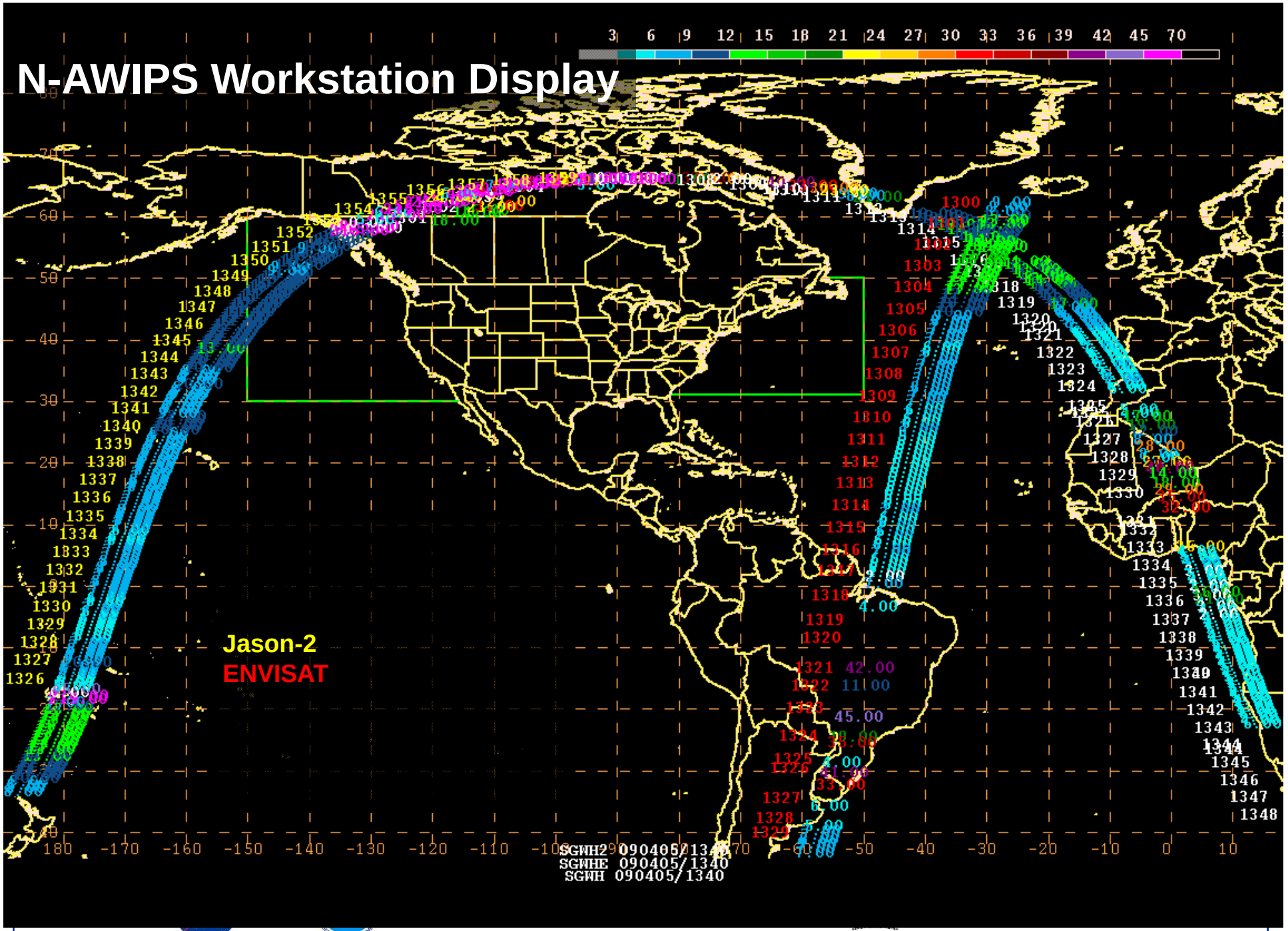
Problem statement

- Altimeter data usage at NCEP limited at project onset
- Altimeter WWV data viewed as less essential in forecast applications due to coverage, but desired
- Altimeter WWV most essential in forecast guidance (WAVEWATCH III)
- Loss of QuikScat plus more altimeters in tandem -> interest, attention, requirement for effort and collaboration in forecast area

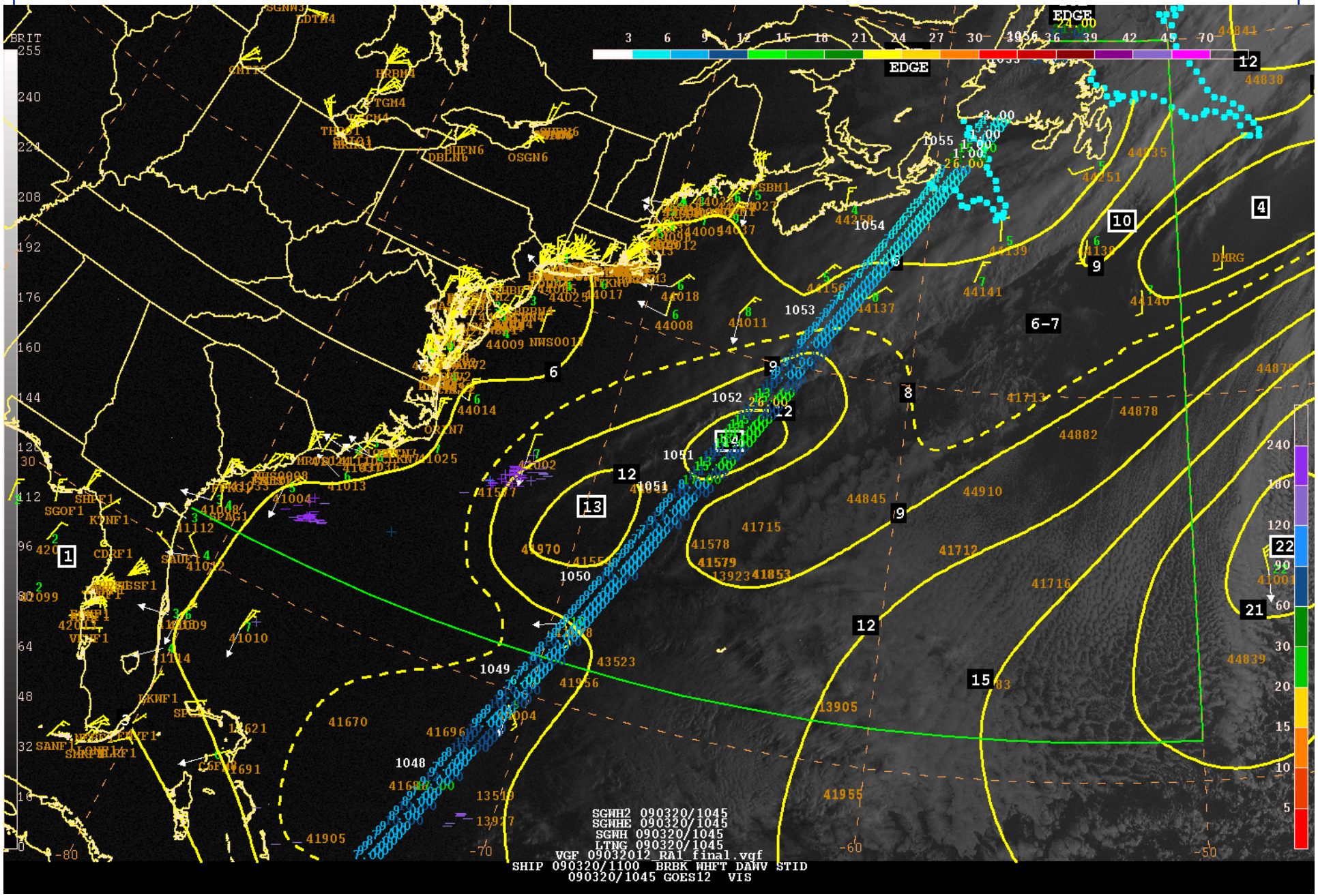
Altimeter SWH in OPC Operations

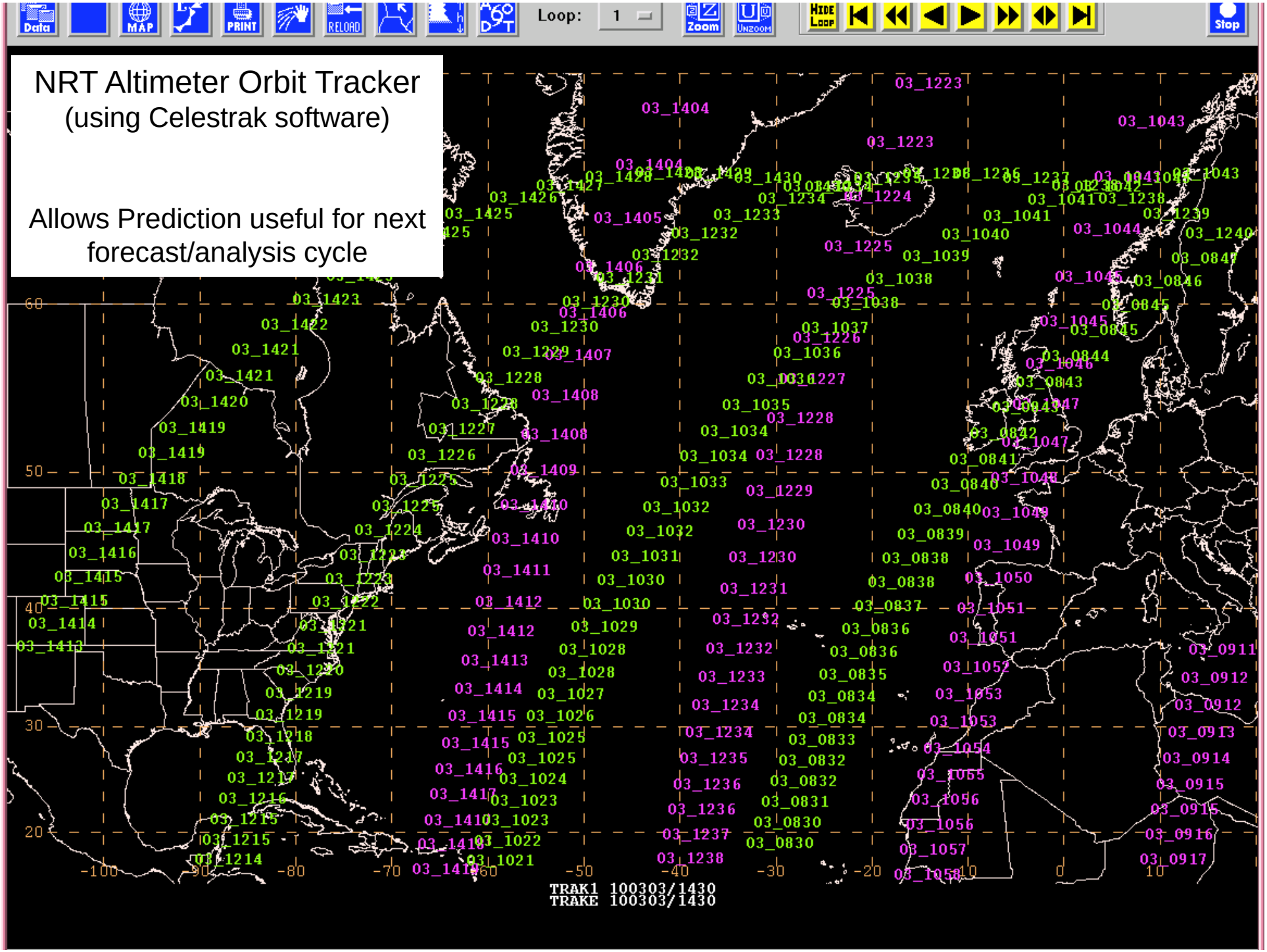
- NRT observations: Integrated into N-AWIPS operational workstations
- Diagnostics: Validate wave model output in real time
- Data source for automated wave analysis (OI) as guidance for forecasters
- Of interest: validation of high seas wave forecasts



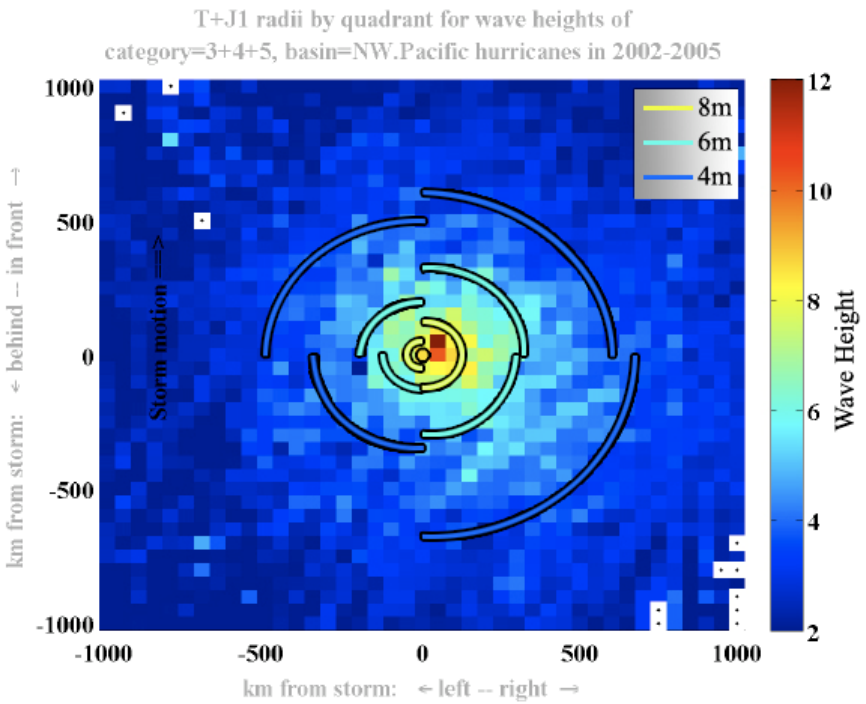

N-AWIPS Workstation Display
3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 70
Jason-2
ENVISAT
SGWH2 090405/1340
SGWHE 090405/1340
SGWH 090405/1340

Additional source of data for forecaster analysis

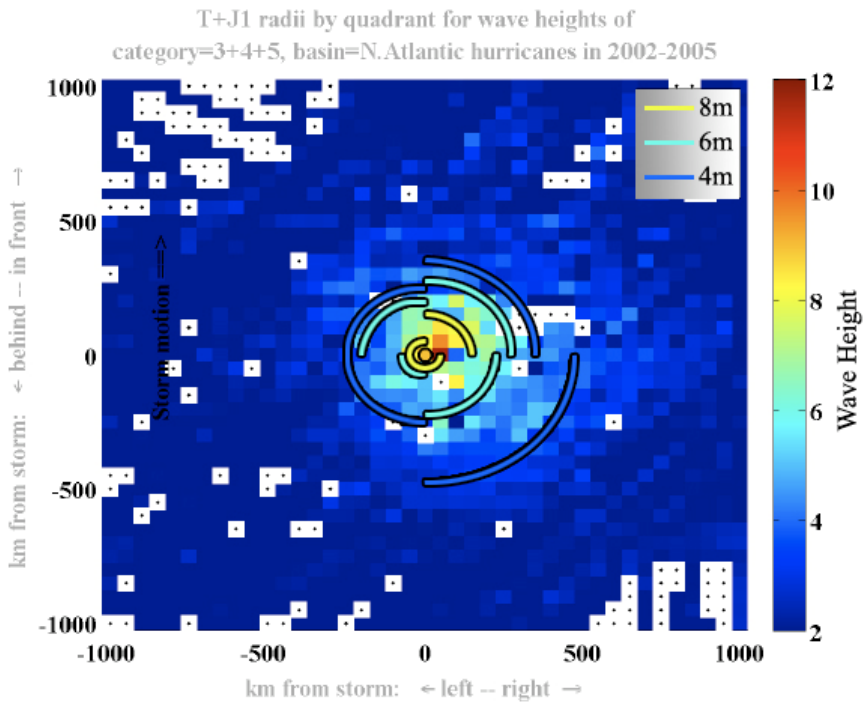



Data
MAP
PRINT
RELOAD
Loop:
1
Zoom
Unzoom
Hide Loop
Stop
NRT Altimeter Orbit Tracker
(using Celestrak software)
Allows Prediction useful for next forecast/analysis cycle
TRAK1 100303/1430
TRAKE 100303/1430

Value-added sea state analyses #1 – Tropical storm size climatology using Jason-1 (2002-2005)



N. PACIFIC



N. ATLANTIC

Also performed with similar spatial results for the radar cross section data

Osland K A and P. S. Callahan, Investigating hurricanes with altimeter data: methods and first results, manuscript submitted in 2010.

Value-added analyses #2 – Revised wind speed algorithm for gale to storm force (with Y. Quilfen)

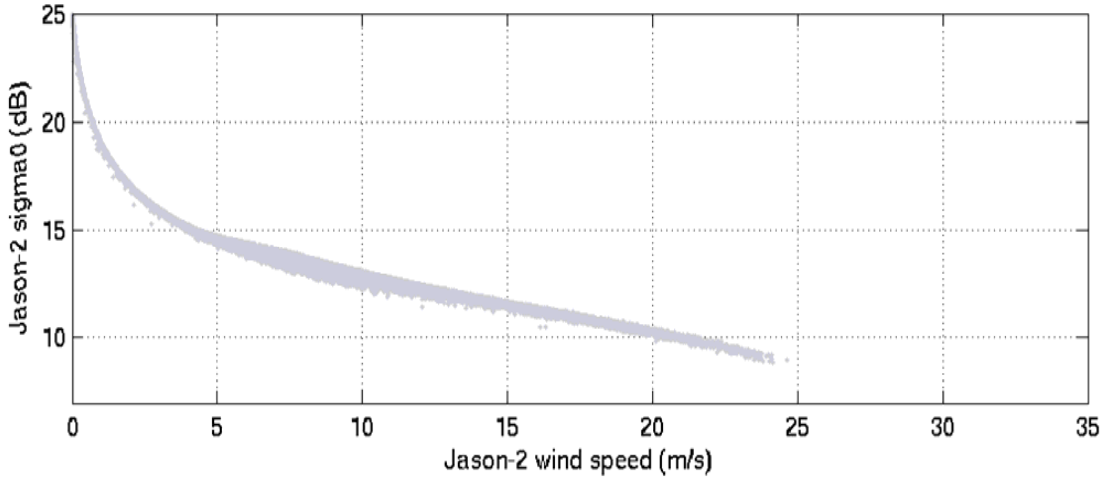
Issue:

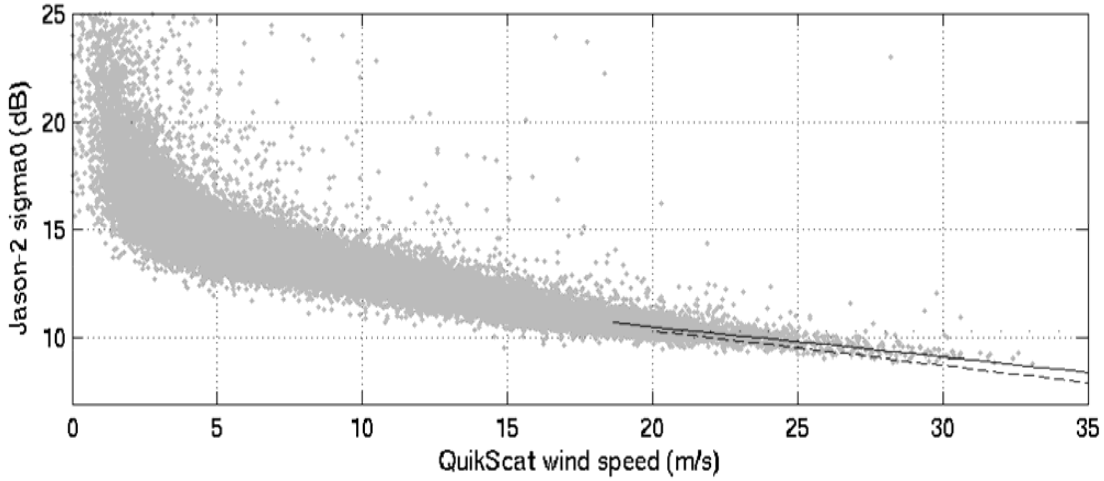
Altimeter GDR wind speed product not valid above ~ 18 m/s (gale is 18 -24 m/s)

Solution:

Revisit Young (1993) to tune/train a high wind speed 'branch'

Use QuikScat scatterometer high wind model – known and understood at NCEP





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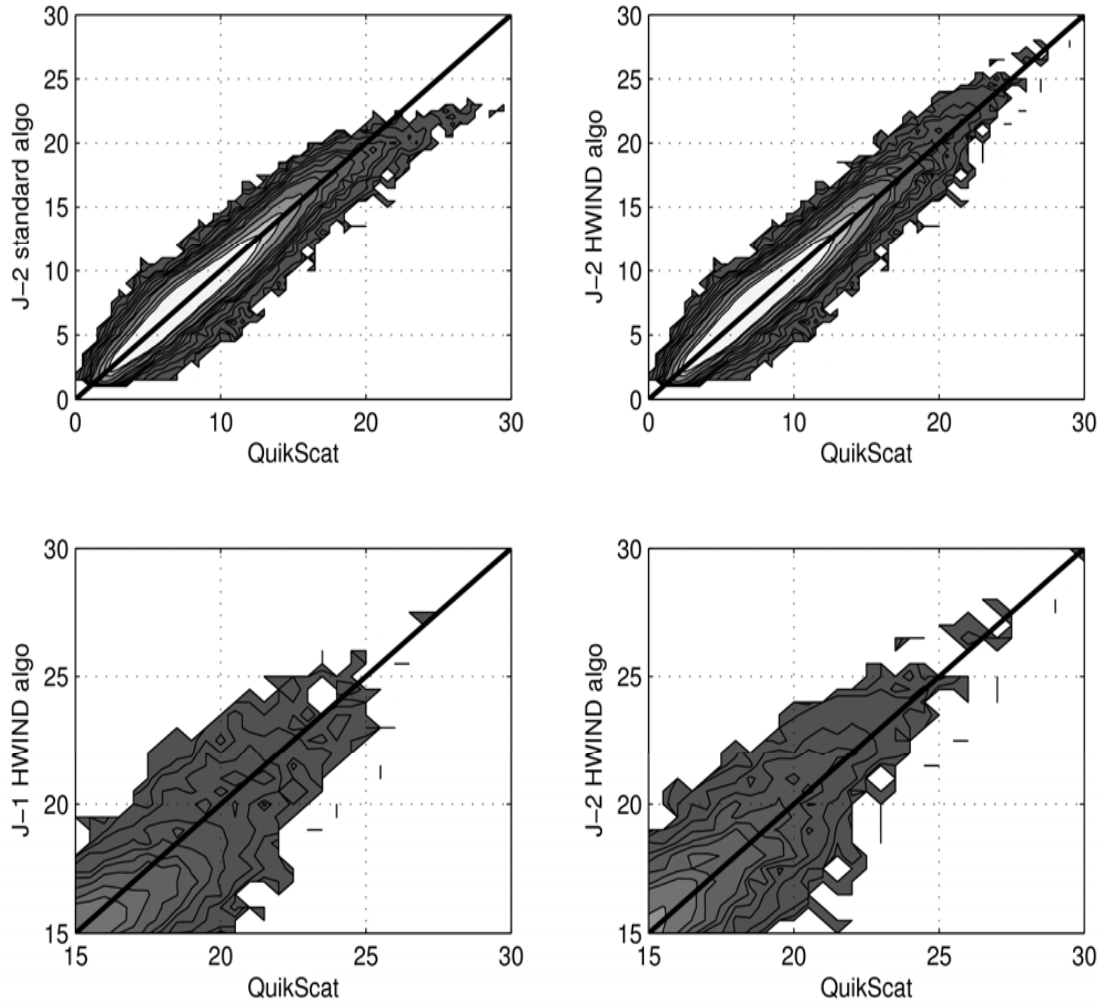
U_{10} = 96.98 – 7.32 * (NRCS + offset)

for NRCS < 10.7896 dB



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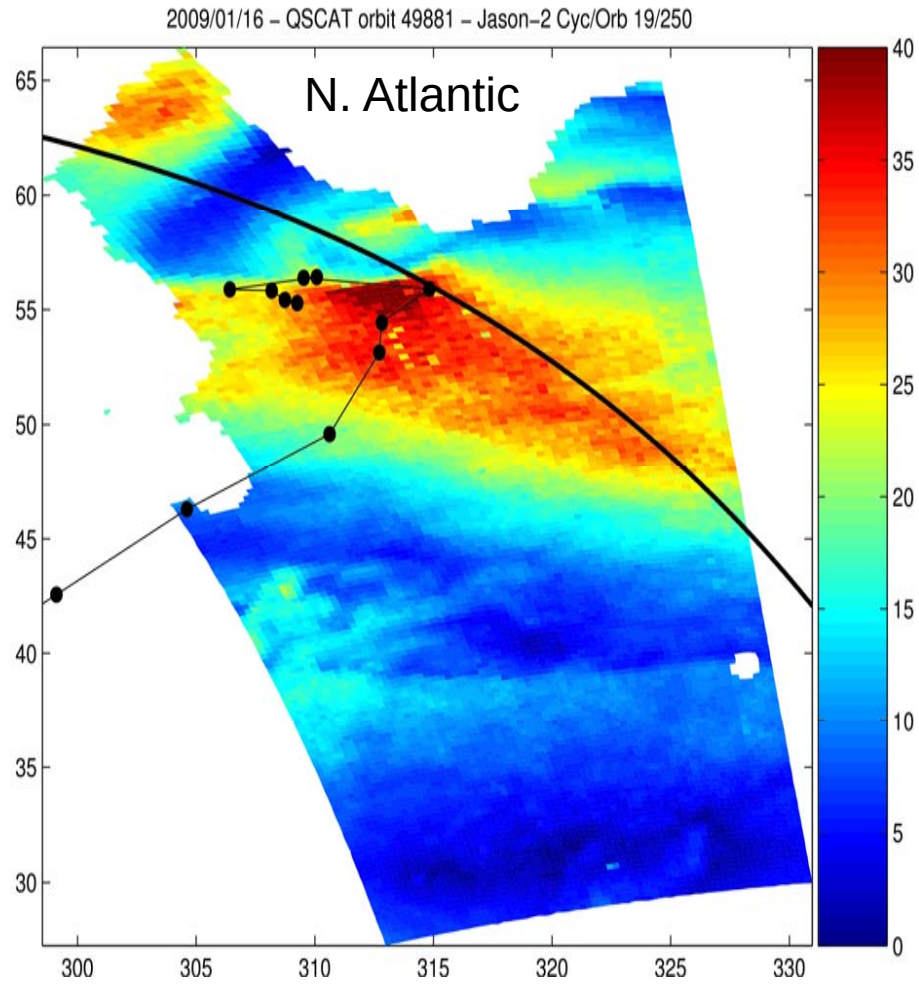

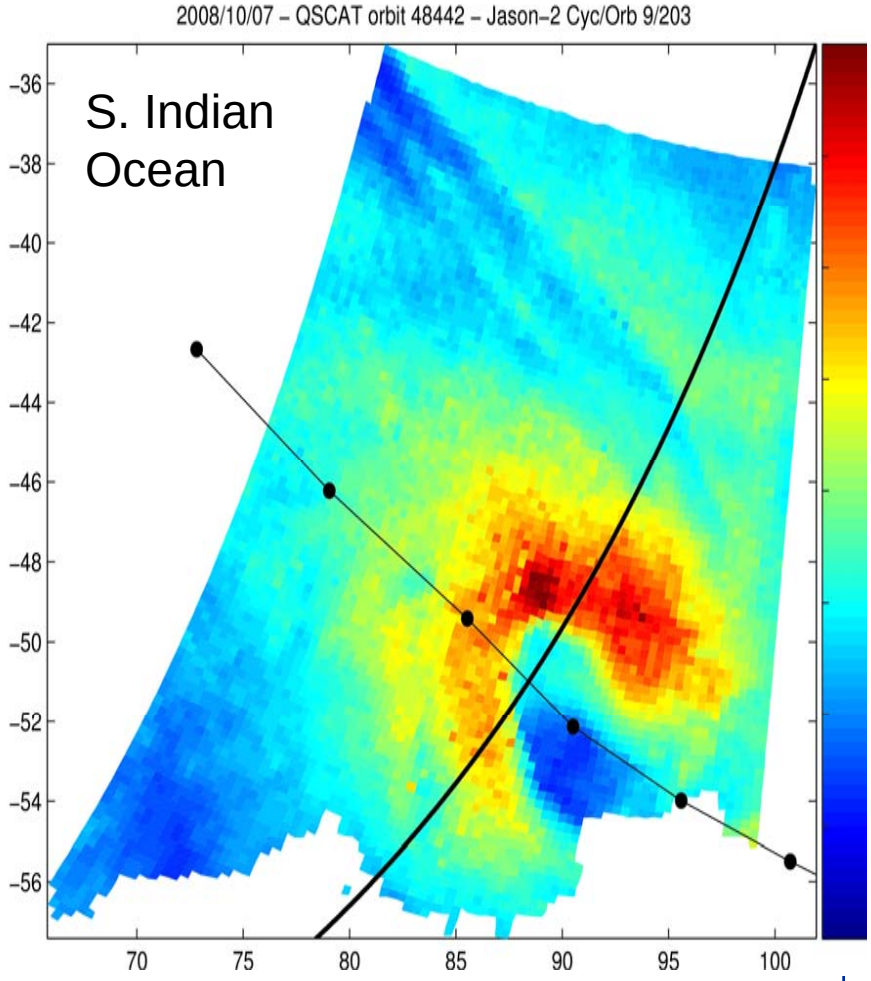

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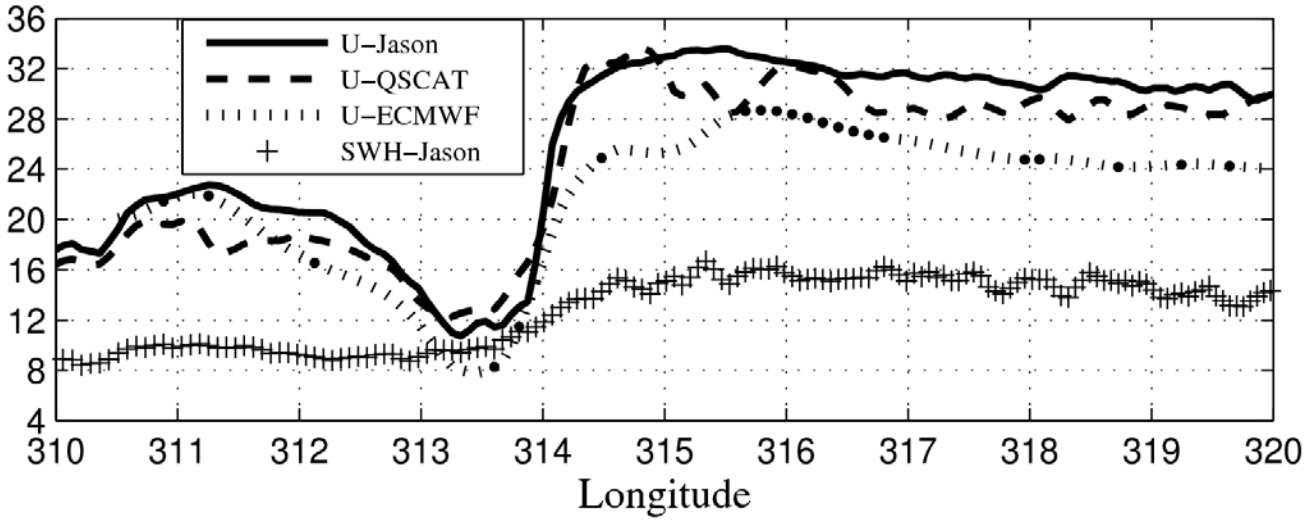
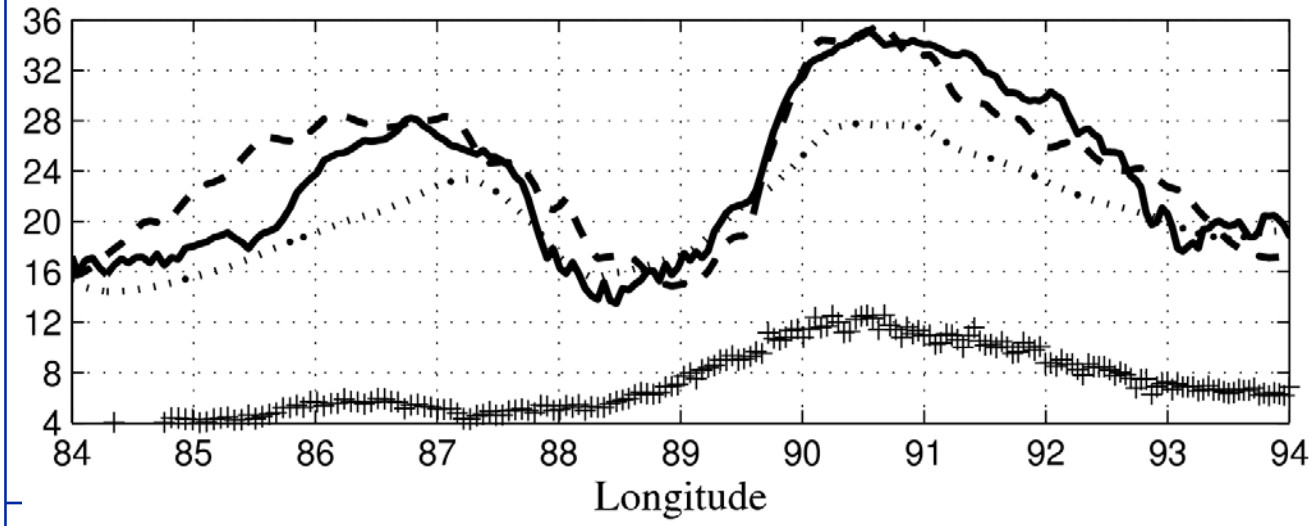
Value-added analyses #2 – Revised wind speed algorithm for gale to storm force





Algorithm linear and similar to Young 93

Easy to apply to J1,J2, RA2

Delivered to NCEP/OCP summer 2010

Results in:
Quilfen, Vandemark, Chapron, Feng, Sienkiewicz, Estimating gale to hurricane force winds using the satellite altimeter, JAOT in review, 2010.

Value-added analyses #3 – Data access for NRT altimeter data: flat ASCII

Issue:

Altimeter OGDR wind and wave product is very simple but not trivial to access

Topic came up in our NCEP-NASA project and in IOC/IODE/WMO (EUMETSAT/NOAA) **Southern Ocean forecaster workshop** held Dec. 2009 (led by Stan Wilson and Julia Figa Saldana)

Forecasters from Chile, Argentina, Peru, Brazil, India, Fiji, South Africa, New Zealand, France, Spain, Norway, US, and Belgium

Value-added analyses #3 – Data access for NRT altimeter data: flat ASCII

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At right – NCEP chart for incoming altimeter OGDR -> display flat ascii files with latency etc…

Altimeter file information		Jason-1 GTS	Jason-1 NAVO	Jason-2 interim	Envisat NAVO	GFO NAVO	Envisat GTS[1]
Input NRT altim. wind/wave BUFR		OSDR[2]	SNAPS jogb*.bufr[3]	OGDR-BUFR[4] (prelim.)	SNAPS efgb*.bufr	SNAPS gogb*.bufr	1 June 2010
Data source for NCEP, Native file and native source		CNES	NAVO, OSDR, JPL pull	ESPC/DDS, GTS[5], OGDR-BUFR	NAVO, FDMAR, ESA pull	NAVO, NGDR-O, NOAA pull	ESA
NCEP Transfer method		GTS	ftp push	GTS	ftp push	ftp push	Not yet
NCEP/NCO decoder[6]		*dcigdr* IGDR decoder	*dcgffd* GFO-FD wind/wave decoder	none	*dcgffd* GFO-FD wind/wave decoder	*dcgffd* GFO-FD wind/wave decoder	TBD
NCEP tank filenames[7]		xx106 cajsww	xx110 njsnww	nonc	xx108 envsww	xx107 gfofww	TBD
Absolute latency[8] (hrs)	min.	0.75	0.84-1.1	92%< 3 hr in Aug2008[9]	1.7	1.2-4.2	TBD
	avg.	2.20	3.3-24.		3.2	6.2-9.8	
	max.	4.20	5.4-48		5.0	15.0	
Possible latency improvements		unlikely	N/A	Increase # of ground stations?	GTS soon? 2009?	low priority	TBD
Hourly ASCII NAWIPS files[10]		jason_yyyy mmddhh.sgwh	N/A	jason2*.sgwh	envi*.sgwh	gfo*.sgwh	Not yet

[1] Email between S. Wilson & H. Laur 20080911, now available in June 2010 via ftp or GTS.
[2] The EMC table for BUFR types has this listed at IGDR but this is not true. It is OSDR.
[3] These files are renamed at NCEP/NCO as jso_*.bf,gfo_*.bf , or enf_*.bf, directory= /oceano/
[4] OGDR-BUFR = OGDR-SSHA except the latter is in netCDF
[5] Trial period data flow method – see "ostm_ncep_brief_20080917.ppt", J. Lillibridge.
[6] Decoder name and description taken from "decoderlist.doc" of 14 Sep. 2008, Mainelli and Ator
[7] See Bufr Type 31: Oceanographic Data at --- http://www.emc.ncep.noaa.gov/mmb/data_processing/data_dumping.doc/table_1.htm
[8] Defined as time between receipt into tank and actual observation. Values provided for the period 20080910-20080914 by Jeff Whiting in email of 15 Sep 2008.
[9] From data shown in "ostm_ncep_brief_20080917.ppt", J. Lillibridge. Time is measured to the

Value-added analyses #3 – Data access for NRT altimeter data: flat ASCII

Solution:

One stop multi-mission flat ascii NRT wind wave product with simple documentation?
In the works – see Stan Wilson and/or Mark Bourassa

NGI
Northern Gulf Institute

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Building 1103, Room 233
Stennis Space Center, MS 39529
228.688.3099 Sharon Hodge

NGI Individual Grant Projects -- Proposal Development

NOAA Program Funding Contact: Dr. Stan Wilson, Senior Scientist, NOAA Satellite & Information Service, 1335 East-West Highway, SSMC-I Room 8110, 301-713-3389, stan.wilson@noaa.gov

Project Point of Contact: Dr. Mark A. Bourassa, Florida State University, 2035 E. Paul Dirac Drive, Suite 200 RM Johnson Building, Tallahassee, FL 32306-2840, 850-644-6923, bourassa@coaps.fsu.edu

Title of Proposal: *Development and Demonstration of a Single-Point-of-Access to Satellite Wind and Wave Products*

Period of Performance: July 1, 2010 to June 30, 2011

Cooperative Institute Task #:

2 – Collaborative Research Project with NOAA scientists

Summary

- Project completed and relatively successful for NCEP
- Final report available by contacting PI Zlotnicki or D. Vandemark (doug.vandemark@unh.edu)
- Data access for NRT altimeter wind and wave data could be better for “L3/L4” forecaster users
- One lesson learned – NRT wind and wave applications in the forecast offices well served by dedicated and perhaps formal contact with OSTST
  - Help in the OGDR access and data interpretation may go a long way

WAVEWATCH III™ Model Validation

- Model results are interpolated onto altimeter tracks
- Collocation done for 9 time periods:
  - Hindcast, Nowcast, and 1 – 7 day Forecast
  - Collocated points on land are ignored
  - Collocated model files archived for later analysis
- Altimeter data processing:
  - De-spiked to remove erroneous data (also gets rid of small islands that cannot be resolved by the models)
  - Remove outliers
  - Filter the data using a running average (optional)
- Error estimates developed using month long archives
  - Error maps developed using 3 month archives
- Assimilation of altimetry data planned for summer 2010

Upcoming Altimetric Missions

- Cryosat-2
  - European Space Agency mission
  - Delay-Doppler interferometric altimeter
  - Conventional open-ocean fast-delivery data
  - Launched 08-Apr-2010

- SARAL/AltiKa
  - French/Indian mission: CNES/ISRO
  - Ka-band vs. traditional Ku-band altimeter
  - Launch in late 2010 / early 2011
  - A.O. for data access - Operational Applications