Operational Utilization of High Resolution Ocean Surface Wind Vectors (25km or better) in the Marine Forecasting Environment

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LONG-TERM GOALS

The work proposed here seeks to exploit currently and soon to be available satellite ocean surface vector wind data in the operational weather forecasting environment. This work will build upon an ongoing effort to quantify the impacts of QuikSCAT ocean vector wind data in the operational short-term warnings and forecasts issued by the NWS Ocean Prediction Center (OPC), and extends the effort to include the NWS Tropical Prediction Center and OCENS, Inc, a small company specializing in ocean and weather monitoring tools and services for the commercial and recreational marine users. In addition to the standard 25km wind vector products from QuikSCAT, this effort will also investigate the impacts of higher spatial resolution wind vector products (12.5km and higher) and the wind vector retrieval capabilities of WindSAT, a polarimetric microwave radiometer.

OBJECTIVES

This effort aims to operationally generate and distribute a gridded wind vector analysis and forecast product out of the OPC and TPC to end user participants (US Coast Guard and OCENS Inc.) who will provide feedback on the product impacts and utility. The National Environmental Satellite, Data and Information Service (NESDIS) will generate and provide a gridded wind field product utilizing all available satellite remote sensing data to the MPC and the TPC. These gridded wind field products will cover the areas of responsibility (AORs) for OPC and TPC, and will serve as the basis for the gridded wind vector analysis and forecast products generated by OPC and TPC. We also seek to investigate improvements to the currently available standard wind vector product that will yield positive impacts in its operational utilization. In particular, ambiguity removal processing and quality flagging improvements in adverse weather conditions will be studied along with the potential of retrieving higher resolution (< 25km) wind vector products. While the ADEOS-II satellite mission ended prematurely, we will investigate the utility of having a co-located radiometer with the scatterometer in flagging and potentially correcting rain contaminated data. Also, aircraft scatterometer data collected during the hurricane season experiments on the NOAA P-3 aircraft will be also be used to help quantify the impacts of rain on scatterometer ocean surface measurements. Additionally, the launch of WindSat in January 2003 represents the first polarimetric radiometer in space designed for retrieval of the ocean surface wind vector. After WindSat's calibration/validation period, the ocean vector wind data retrieved from it will be compared and integrated with the scatterometer wind vector products. Attempts will also be made to improve the spatial resolution of WindSat products where it is feasible.

APPROACH AND WORK PLAN

The work proposed here involves exploring the benefits to operational weather forecasting of high-resolution ocean surface wind vector data through an end-to-end operational demonstration project. Existing vector wind products will be utilized, and potential new products will be investigated from current and future satellite sensors. The observations themselves will be gridded by ORA and used by forecasters at the Ocean Prediction Center and the Tropical Prediction Center to regularly issue a gridded high-resolution wind analysis product over their areas of responsibilities (AORs). These gridded products will be provided operationally to the US Coast Guard for use in their Search And Rescue (SAR) mission, and to OCENS, a commercial company specializing in weather, earth and ocean monitoring services (www.ocens.com). Both the Coast Guard and OCENS will provide feedback on the utility of these data.

Specifically,

- Investigate the potential of higher resolution, less than 25km, wind products from QuikSCAT.
- Evaluation of benefits for having a coincident passive sensor with a scatterometer (AMSR and SeaWinds on ADEOSII) in wind retrieval performance and its use as a quality control to maximize impacts in data assimilation. This will be off-line and lower in priority task given the failure of ADEOSII.

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-Evaluation of ocean vector wind data from WindSat and integration into operational ocean surface wind vector product stream including investigating higher resolution, less than 30km, wind products.
-Identify the utilization of QuikSCAT wind vector at TPC and quantify its impacts.
-Gridded high resolution surface wind fields over OPC AORs...edited and quality controlled by OPC forecasters as a routine product.
-Operational delivery of gridded winds by OPC to the US Coast Guard for their Search and Rescue (SAR) mission with feedback of utility.
-Operational delivery of gridded winds by OPC to OCENS, Inc. with feedback of utility.

To accomplish these objectives we established a National partnership among the following organizations. These organizations have demonstrated experience in remote sensing of the ocean surface wind vector, near real-time processing and distribution of this data, application and utilization of these data in the operational environment.

-NOAA/NESDIS/Office of Research and Application - Paul Chang
-NOAA/NWS/NCEP/Ocean Prediction Center - Joseph Sienkiewicz
-NOAA/NWS/NCEP/Tropical Prediction Center - Richard Knabb
-Brigham Young University - David G. Long
-US Coast Guard
-Navy/Naval Research Laboratory - Peter Gaiser
-OCENS, Inc. - Mark Freeberg

The effort proposed here will develop an end-to-end process for the operational utilization of satellite observations, and will address the end-to-end utilization of remote-sensed ocean vector wind data. Ocean vector wind data is currently in available from NASA's QuikSCAT mission and will also be available from future satellite sensors such as WindSat, ASCAT on METOP, and CMIS on NPOESS.

WORK COMPLETED

The standard operational QuikSCAT wind vector product has a spatial resolution of 25km x 25km. However, the measurement methodology of QuikSCAT allows for wind vector retrievals at better spatial resolutions at the cost of a noisier retrieval. ORA worked with QuikSCAT group at JPL to implement 12.5km spatial resolution processing operationally at NOAA. The initial validation results of this wind vector product showed that improvements were required in the ambiguity removal processing and rain flagging, which were subsequently modified. The validation of the new 12.5km wind vector products yielded results acceptable for operational distribution and utilization. Figures 1 and 2 contain plots for an example set of QuikSCAT wind vector retrievals at the standard 25km, the improved 12.5km spatial resolutions. The 12.5km wind vector retrievals clearly show more detail than the standard 25km product. And while the original 12.5km product clearly contained errors in the wind vector retrievals, such as along the swath edges, the improvements made in ambiguity removal and rain flagging clearly yield a quality product as seen in figure 2. The new 12.5km QuikSCAT wind product is now available within the operational environment (NAWIPS/NMAP) of the Ocean Prediction Center and the Tropical Prediction Center. Another product that was made operationally available within NAWIPS was the 25km ambiguity plots. The wind vector retrieval process generally results in up to four possible solutions. In some cases it can be helpful to view all the possible solutions versus only the chosen solution to ascertain features such as the storm center properly.

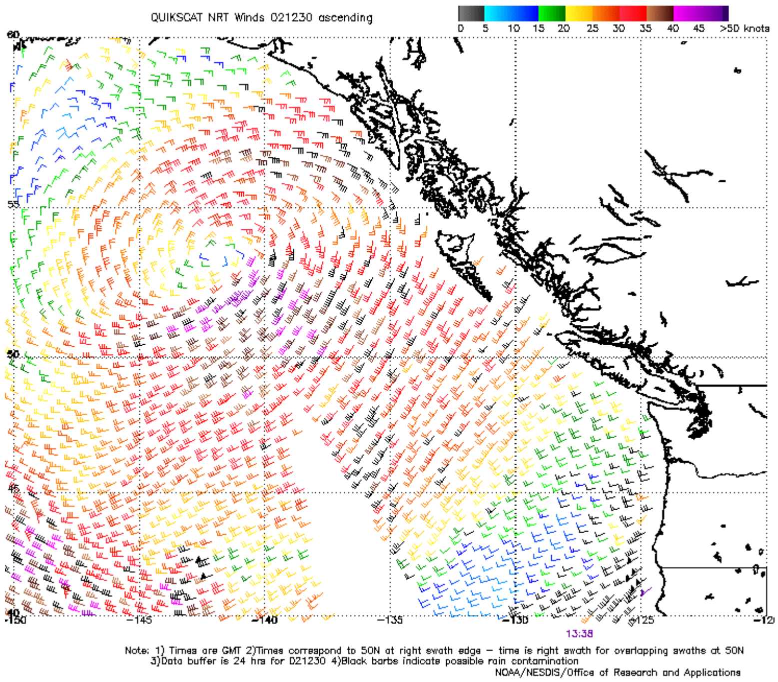

Figure 1: Standard 25km spatial resolution wind vectors from QuikSCAT.

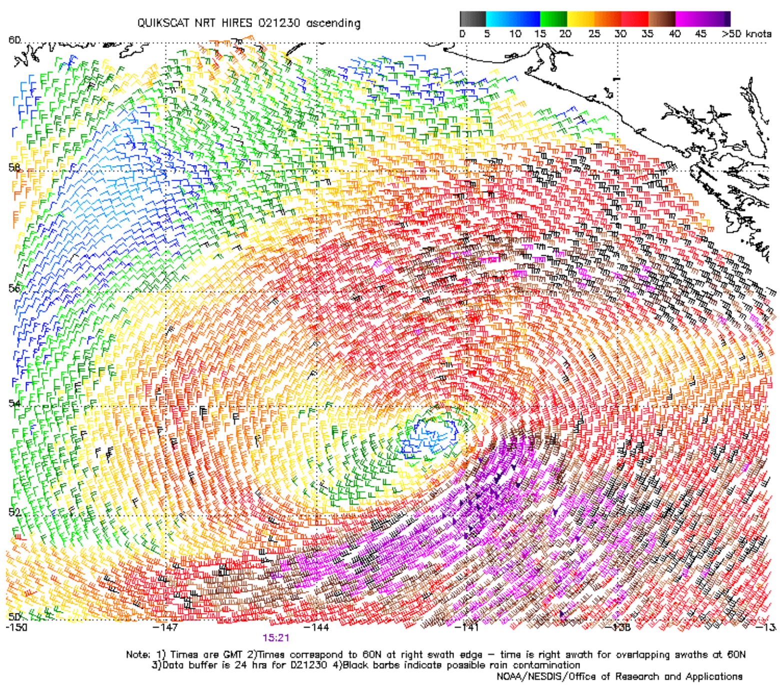

Figure 2: Improved 12.5km spatial resolution wind vectors from QuikSCAT.

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Even higher spatial resolutions products from QuikSCAT are being pursued by the Center for Remote Sensing at BYU. The spatial sampling of the QuikSCAT backscatter measurements can support reconstruction of finer scale backscatter values which can then be used to estimate the near surface wind vector field at an ultra high-resolution (pixel spacing of 2.5km). The ultra-high resolution wind retrievals have been implemented in the operational QuikSCAT processing stream for storm specific regions similar to the high resolution normalized radar cross-section (nrcs) product.

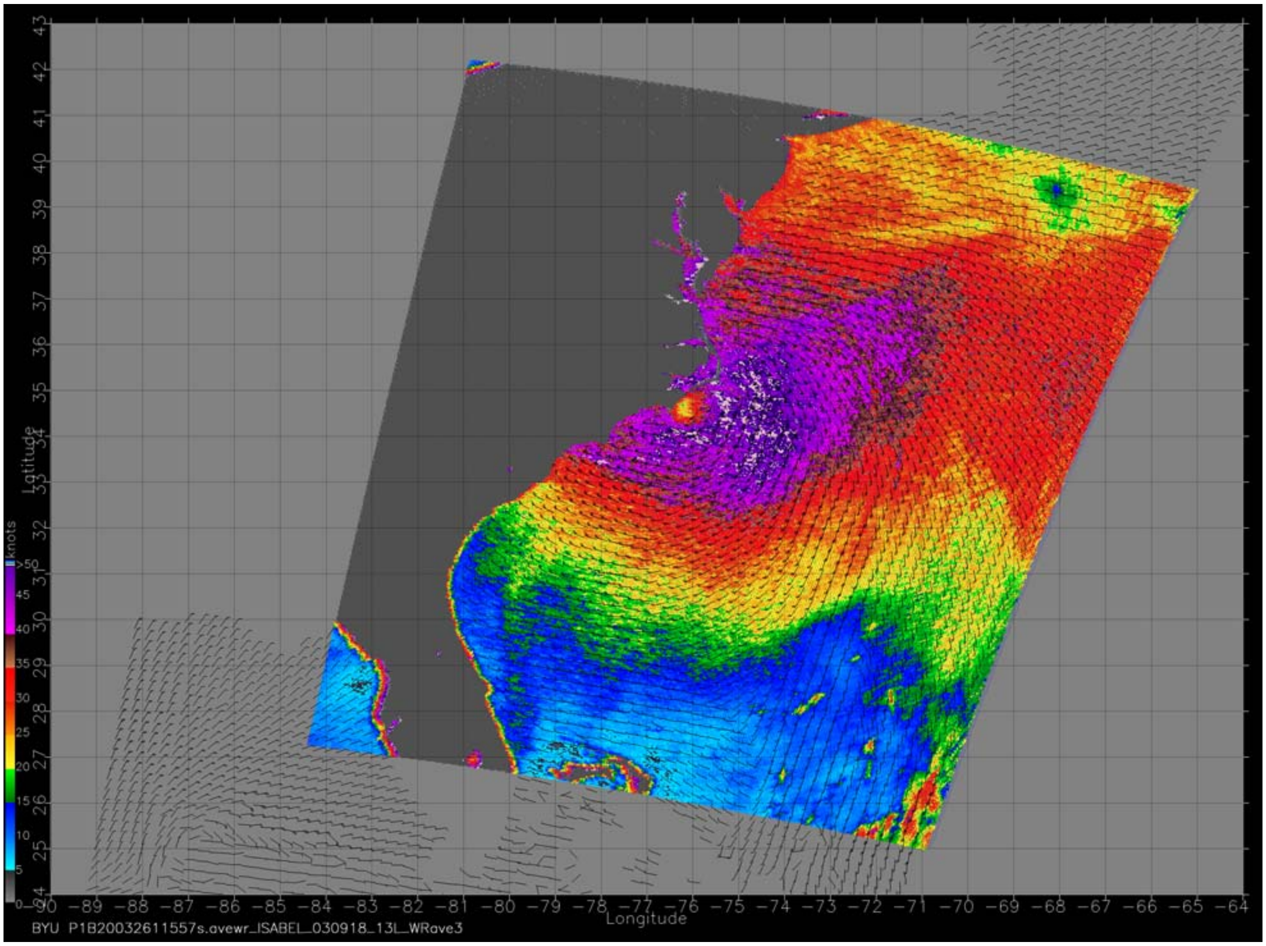

Figure 3: Ultra high resolution wind speed retrievals from a QuikSCAT pass over Hurricane Isabel

Ocean vector winds from the QuikSCAT scatterometer became available on the World Wide Web from the NOAA Ocean Prediction Center in gridded form in April of 2004. The data is in the form of a global grid at 1/3 of a degree resolution. The data is available in GRIB1 format at: MPC Experimental Gridded Products. The original gridded wind field consisted of a 9-hour composite of the near real time QuikSCAT winds. This was upgraded to a 32 hour composite in November 2004 at the request of customer feedback. To date ocean sailors appear to be the most frequent users of these gridded wind fields. The data files can be downloaded by sailors at sea via satellite communications and displayed using weather routing software. Sailors compare the QuikSCAT gridded winds to numerical model output to aid in safety and tactical decisions.

The availability of QuikSCAT winds has heightened the awareness of OPC forecasters to extreme winter cyclones with winds in excess of hurricane force intensity (32.7 m/s). Before QuikSCAT there was no observing tool or system that consistently measured winds in excess of Hurricane Force over

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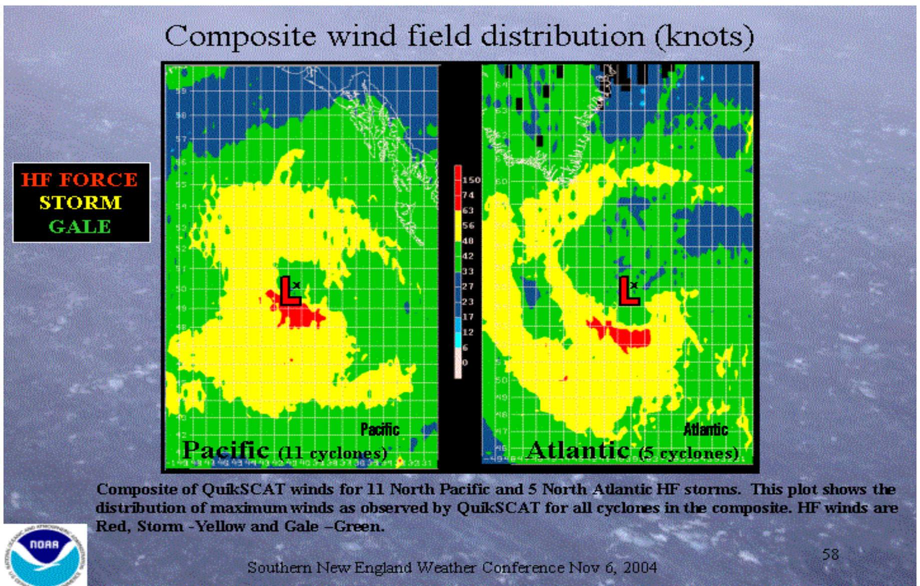
such a large area as the 1800 km wide swath of QuikSCAT. The gridding technique developed for QuikSCAT has been applied to create composites of maximum wind in association with extreme ocean storms. The goal of this project was to examine the distribution of extreme winds within ocean stormsand to provide forecasters a simple conceptual model to better anticipate where within a mature cyclone extreme winds would occur. Two composites of maximum wind speed using the QuikSCAT 25 km winds as a basis are shown in Figure 1. The Pacific composite (a) was created using winds from eleven different ocean storms. Six storms (b) were used for the Atlantic basin composite. Both composites show winds in excess of hurricane force were found within a crescent shaped area to the south of the mature low center. This area is typically on the cold side of the surface occluded or bent-back front in a region of very strong cold air advection.



*** ARABI1um wind speed for 11 North Pacific and 5 North Atlantic extreme extratropical cyclones. Composites are low pressure relative having used the position of the low as the center point. Hurricane force maximum winds are shown in red.**

Using QuikSCAT derived winds OPC forecasters have observed significant wind speed gradients across strong sea surface temperature gradients. Operational numerical model winds do not typically forecast such sharp wind gradients across sea surface temperature fronts. To address this forecast challenge, differences between QuikSCAT 25 km winds and numerical model short term forecast winds from three sources: eta 10 m winds, GFS 10m, GFS 9950 sigma layer (approximately 30 m in height) have been calculated for both the western North Atlantic and eastern North Pacific. These difference fields are available to OPC forecasters in near real time. In addition, 30 day wind bias fields are calculated daily for each numerical model based on four different atmospheric boundary layer stability regimes: very stable, slightly stable, slightly unstable, and very unstable. These wind speed biases are then applied to the model wind fields described above and used by forecasters as an additional guidance tool. The bias corrected forecast wind fields will be evaluated this winter season

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by the OPC forecast staff.

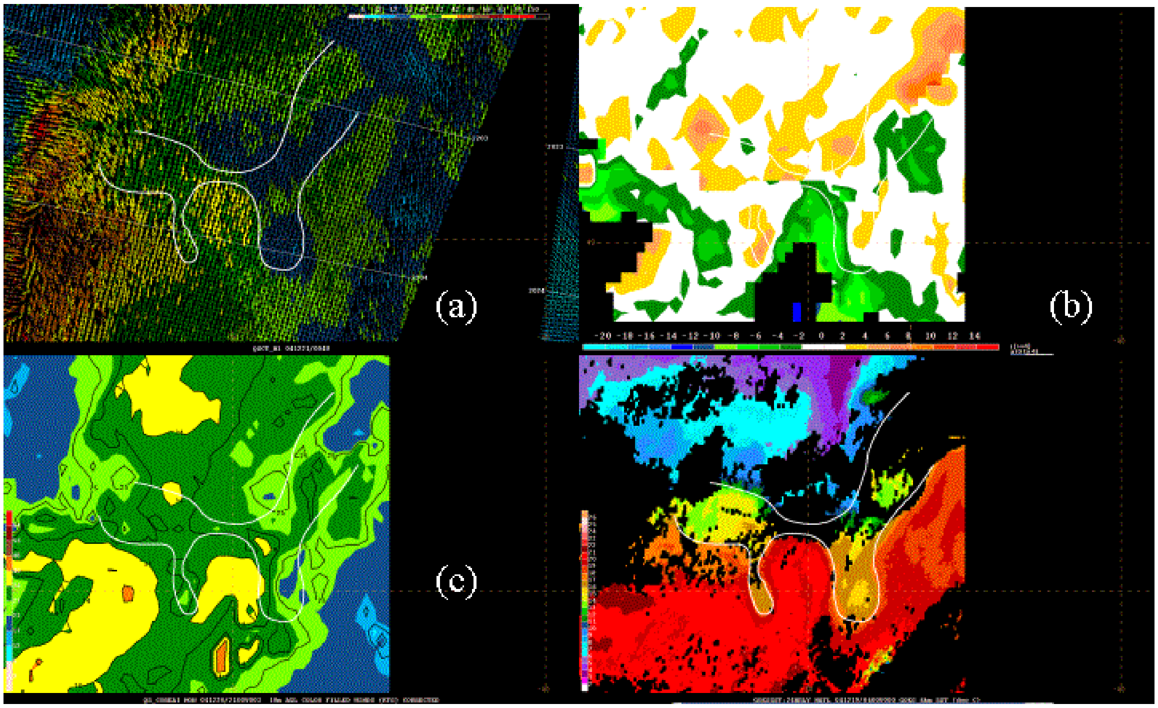

Figure 2. 12.5 km QuikSCAT winds for 2203 UTC 20 Dec 2004 for the North Atlantic centered near 42N 49W (a). Wind speds are defined by the color bar in the upper left of (a). 30 day wind speed bias correction based on the difference between 25 km QuikSCAT winds and 10m NCEP ETA winds (b). Warm colors (positive) indicate an overforecast by the ETA as shown by the color bar in (b). Areas of cool colors indicate an underforecast by the model. Bias corrected winds from the ETA (c). GOES SST composite for the date indicated (d) showing an amplified Gulf Stream.

Several projects are planned for the coming year. A QuikSCAT based gridded wind field will be developed for the western North Atlantic and Caribbean using the 12.5 km resolution winds. This is to fulfill customer requests. We also hope to expand our processing of wind speed difference fields to include the Gulf of Mexico, western Caribbean, northeast tropical Pacific, Gulf of Alaska and Bering Sea. We also will composite maximum wind speeds for extreme storms using the 12.5 km QuikSCAT winds in order to better define the typical distribution of extreme conditions with HURRICANE FORCE extratropical cyclones.

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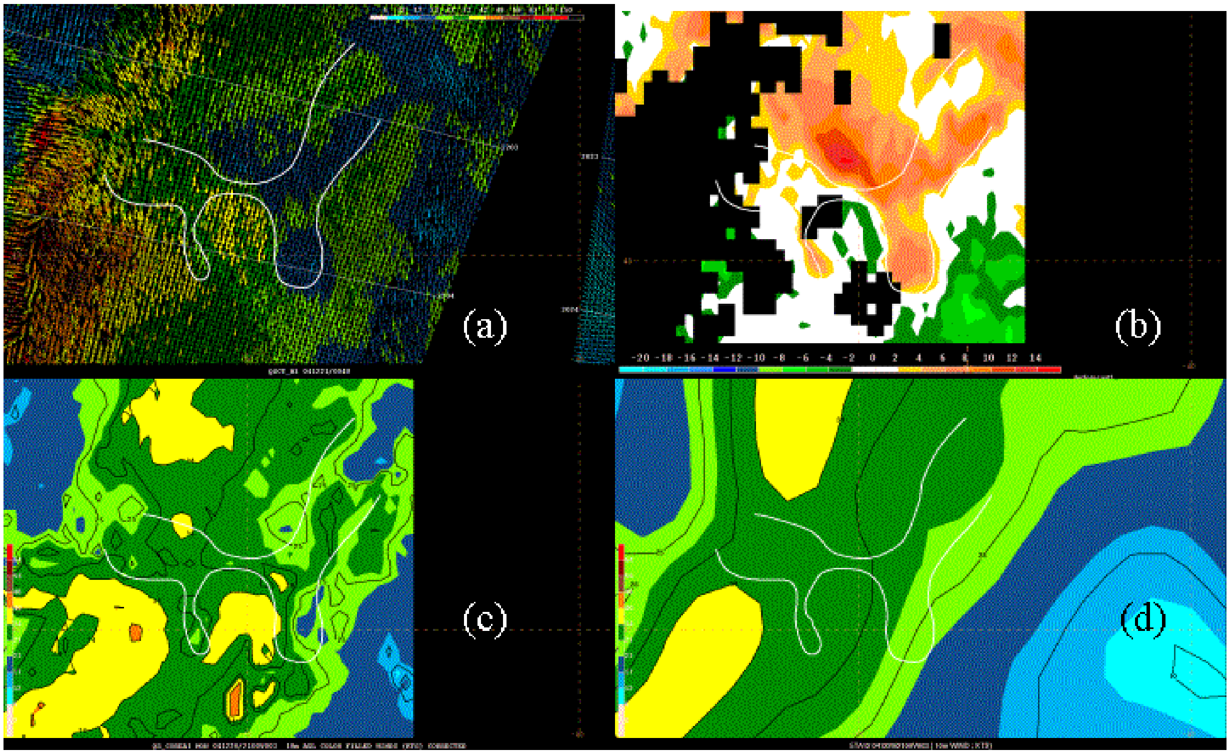

Figure 3. As in 2 except wind speed difference (knots) between NCEP ETA 10m winds and 25 km QuikSCAT for 2203 UTC 20 Dec 2004. Wind speed difference is shown by the scale at the bottom of (b). Warm colors represent an overforecast by the 10m ETA. Cool colors show areas of underforecast winds. The bias corrected 10m ETA winds are shown in (c). Non-bias corrected 10m ETA winds are shown in (d).

Wind data provided by the QuickScat scatterometer offer the potential to radically transform the reliability of wind information critical to successful and safe voyaging in the ocean. OCENS role in NA03NES4400003 is to coordinate QuickScat wind data distribution, validation and market analysis. Included in this role is the development of an effective means of retrieving and disseminating QuickScat data, the viewing of QuickScat data in a manner that recognizes its unique data characteristics, the validation of QuickScat data usability and reliability against other available wind products and the reporting of such information back to the project team for iteration and product improvement.

<u>Quikscat Data Relay</u>

QuickScat GRIB data modified to include U/V wind factors as well as variables describing the time latency of the data and rain contamination in the data began to flow from NOAA to OCENS servers in November 2003. Due to heavy loads on the existing OCENS server, a new dual processor Free BSD server was configured and put into production by OCENS to handle Quikscat end user requests. The existing GRIB code base was ported from Linux to FreeBSD and tested over several months before being put into production.

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Once at the OCENS servers data were split into static geographic regions conforming to the geographic sub-groups existing in the OCENS WeatherNet data service. OCENS WeatherNet is designed to deliver a wide range of weather and ocean data to remote at-sea users through limited satcomm and other wireless bandwidths. Users select the product(s) of interest to them by dragging the products into a download folder. WeatherNet then auto-dials through the vessel's satcomm or other phone system and pulls the requested data from the OCENS servers. Once data has been deposited on the end-users computer, WeatherNet auto-disconnects from and terminates the satcomm connection.

Data within WeatherNet are subdivided by category of data (eg. weather charts, satellite imagery, GRIB data, etc) then by geographic area and specific product (see Figure 1).

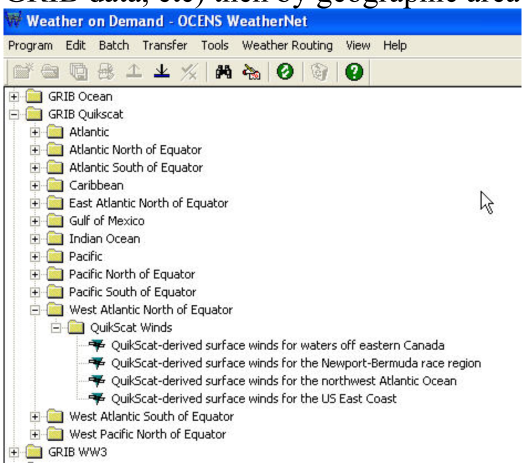

Figure 1: QuikScat data in static WeatherNet geographic regions

OCENS also incorporated Quikscat data into WeatherNet's GRIB Interactive category (Figure 2). WeatherNet's Interactive categories are designed to allow users to customize the location and size of the area of interest to them for certain types of information. For example, if end-users have selected Quikscat data from the GRIB Interactive category they can receive Quikscat files customized to the location of interest and spatial coverage relevant to them by simply entering in the centerpoint lat/lon of that location before submitting their WeatherNet data request. Alternatively, they can pop-up a world map within WeatherNet and scribe with their cursor the area of interest to them on this interactive map.

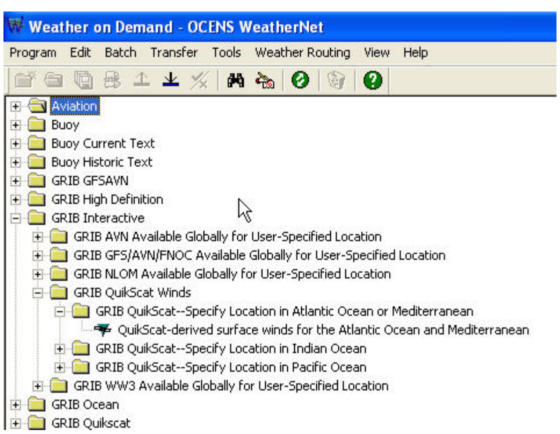

Figure 2: QuikScat in GRIB Interactive category of WeatherNet.

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Data Display and Viewing

Extant GRIB viewers are not able to display factors such as time latency or rain contamination which are important issues to the correct and careful interpretation of QuikScat data. As such, extensive amounts of work were conducted by OCENS to appropriately incorporate QuikScat data into its GRIB Explorer software. GRIB Explorer is a robust GRIB viewing package designed by OCENS to simply but powerfully handle the full array of meteorological and oceanographic GRIB data available today. Written to operate on Windows OS, GRIB Explorer also is integrated with WeatherNet so that GRIBs downloaded via WeatherNet can be automatically displayed and viewed in GRIB Explorer without additional user interaction.

The initial or alpha integration of QuikScat with GRIB Explorer was completed in early-April, 2004. This version of GRIB Explorer was distributed to a small group of users for testing and evaluation. Comments received from this alpha level of testing were incorporated into a beta version completed in early May which in turn was passed back to the testers. Minor changes suggested by this round of testing were included in the QuikScat-included version of GRIB Explorer released to the general public in mid-May concomitant to a new release of WeatherNet containing the aforementioned static and interactive QuikScat categories. OCENS at that time broadcast via email to all WeatherNet users a notice describing QuikScat data and its availability in WeatherNet. Furthermore, OCENS issued an Update File List notice within all WeatherNet downloads and continued to issue this update to users until they had updated the content library to the version containing QuikScat data.

GRIB Explorer deals effectively with the twin issues of latency and rain contamination that dominated Year 1 technical discussions associated with QuikScat display. Figure 3 is a QuikScat image covering a portion of the US East Coast and displayed in GRIB Explorer. Time delays owing to different orbits are depicted with different colors so that users can very quickly identify the relative age of the QuikScat info they are viewing. To suggest caution, older data are depicted in shades of red and orange. More recent data are displayed in hues of green and blue. Furthermore, a movable palette is displayed within the chart that associates these colors with the age of the depicted QuikScat information.

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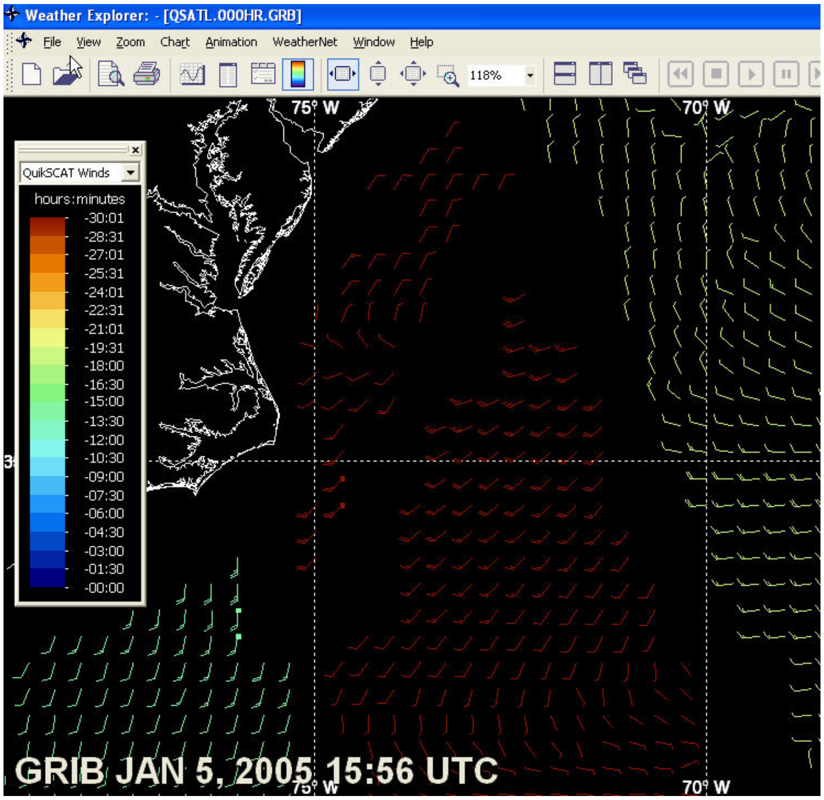

Figure 3: QuikScat data offshore the US East Coast displayed in OCENS GRIB Explorer. Note differentiation of QuikScat data latencies in GRIB Explorer through color-coding of age differences.

Figure 4 demonstrates how GRIB Explorer deals with the rain contamination issues affecting QuikScat data. Note the cursor location in the shaded area in Figure 4 south of the Chesapeake and southeast of the bottom right corner of the latency palette. The cursor is pointing to rain contaminated QuikScat wind flags which are denoted in GRIB Explorer by a solid ■ at the base of the wind flag. Additional rain contaminated flags can be observed in the shaded area northeast of the 35N/65W intersection. Further rain contamination insights are provided through cursor tracking. As the cursor is moved across an image, cursor tracking at the base of the GRIB Explorer screen identifies a rain contaminated data point with a Yes/No comment. Note that because all data points in GRIB Explorer are interactive, the lat/lon at the cursor point and the range and bearing from the user's current location to that point is also displayed at the base of the GRIB Explorer screen. This allows for quick integration of QuikScat GRIB data into vessel routing and passage-making decisions.

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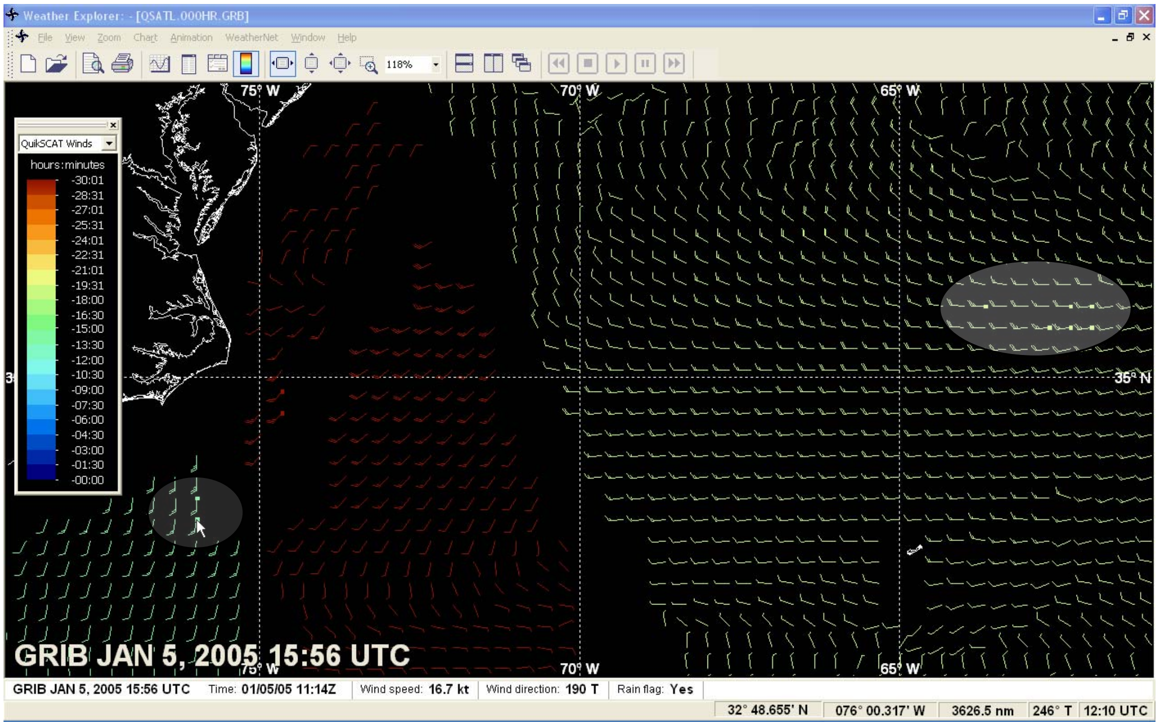

Figure 4: Display of rain contaminated QuikScat wind flags in OCENS GRIB Explorer.

Usage of QuikScat was consistent in the summer months (see further discussion in Market Response section of this report) following the release of QuikScat integrated copies of WeatherNet and GRIB Explorer in late-May. Users, however, soon identified a deficiency of the QuikScat data 9 hour composites as presented through the WeatherNet portal. Because most at-sea and other remote users operate communications over very slow, low-data rate bandwidths, QuikScat files are geographically segregated in order to deliver to an end-user the minimum amount of data needed for their at-sea decision-making. Smaller data feeds mean shorter satellite connect times which mean substantial reductions in the communication expenses associated with those connections. This is an important reason that the GRIB Interactive categories within WeatherNet are so popular. With GRIB Interactive, users can obtain the area of exact and immediate interest to them and spend little if any connection time downloading portions of an area not relevant to their voyage plans. Unfortunately, with a 9 hour QuikScat composite, users were often requesting QuikScat data for geographic blocks within which there had not been a QuikScat pass in the previous 9 hours. These blank data sets were 'successfully' delivered to the end-users. However, as no data was received users were uncertain whether their request had been successfully processed and would often re-submit the request and incur additional satcomm connect costs before contacting OCENS or reviewing help information describing the situation.

OCENS raised the 9 hour compositing issue at an October technical meeting with NOAA in Camp Springs, MD. OCENS and NOAA discussed options to resolve the issue including moving to a 32-hour compositing of the data. Whereas both parties raised concerns about the availability of such old QuikScat data to end-users, OCENS pointed out that several of these users had specifically mentioned that they would rather see old data and decide how or whether to use it, than to receive no data at all. As such, a move to 32 hour compositing was agreed upon and after a period of testing, the 32-hour composites became available to end-users in November, 2004.

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User Feedback

Aside from the 9 vs 32 hour compositing issue, several users questioned why QuikScat data was not available for inshore areas inside of 60 to 90 nm offshore. Others noted skewing in the QuikScat data at the edge of the passes, sometimes by as much as 45 to 60 degrees from known trues. Skewing seemed to be most common when the edge of the data is near an island chain and that skewed data are generally the data points on the side of the island chain away from the bulk of the data. While skewing to the same direction appears consistent from day-to-day at the same time, the direction of the skew will frequently be opposite at a different time of day (perhaps due to the orbital direction of the satellite?).

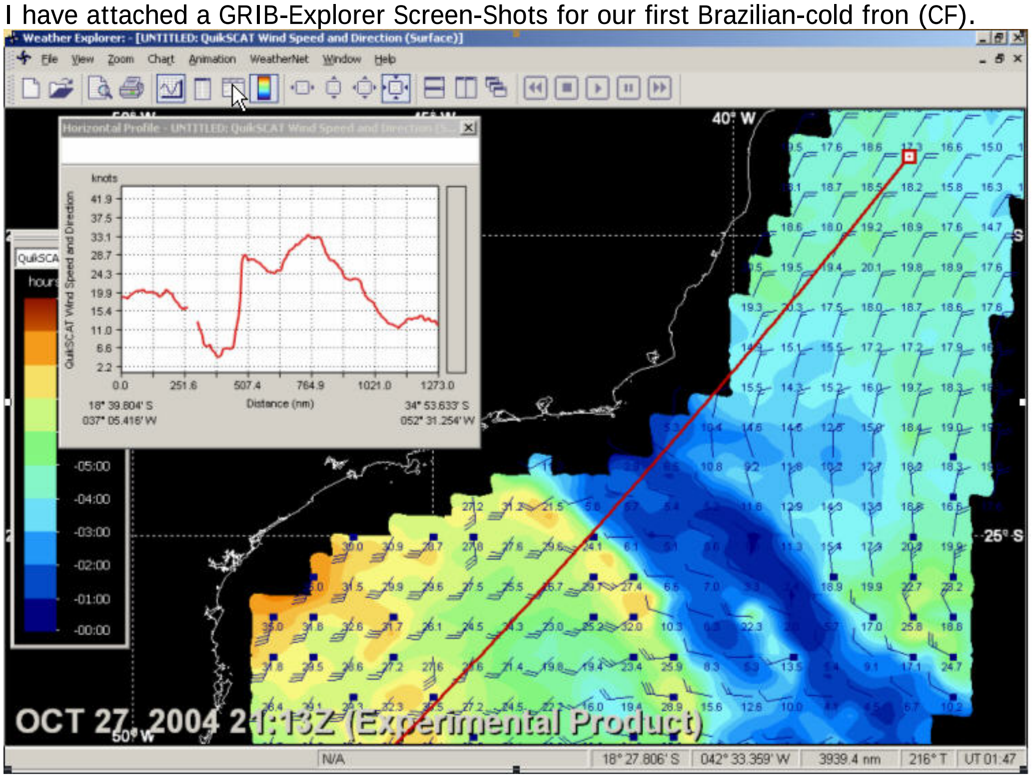
Users also requested a better means of predicting the age of QuikScat data available to them for their region of interest. OCENS is working to provide this information through the incorporation of a QuikScat orbital model in WeatherNet in 2005.

Lastly, a few Caribbean users requested higher spatial resolution data. A discussion of this opportunity through the incorporation of 12.5 km QuikScat looks for select areas was conducted at the October technical meeting in Camp Springs.

Most user feedback was very positive. A broad set of users find that the QuikScat data is most beneficial in areas where the weather is generally stable and use it to locate slight variations in wind patterns to enable optimum vessel routing. More advanced users have taken advantage of the availability of the QuikScat data to 'tune' GRIB wind forecasts produced by the GFS, AVN and/or WaveWatch II GRIB models. Most notably this practice was employed to startling success by the Spirit of Sark, a racing yacht participating in the Global Challenge Around-the-World Race. I quote from an email received from Simon Bell, Sark's navigator:

"Cold-Front Dissection:

I have attached a GRIB-Explorer Screen-Shots for our first Brazilian-cold fron (CF).



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Using we were able to Calibrate our GFS Grib-file vs QuikScat and determine how far ahead/behind the GFS-Forecast was. From this, we could estimate our ETA at the Cold-Front. We were also able to "see" inside the Cold-Front and understand
the structure of the Front and what conditions we could expect.
We were able to see from the Screen-Shots that we
could expect the Wind to drop & Back as we approached the CF
and then jump to 30kts from the SW at the Front. Using this
info we flew our Spinnaker to within 30 seconds (emphasis added) before the SW-Wind hit...and WOW did it hit :)

We were also able to understand the dynamics of the Cold-Front.
The weather-forecasts reported a Cold-Front at Location XY heading
SE and moving NE at 10knts. By observing the QuikScat Data over
time, we understood that the situation was MUCH more complicated!
The N-side of the CF is driven by the NW-Wind and features on the
N-Side therefore drift SE along the Cold-Front with this Wind.
Then the whole Cold-Front does indeed Track NE...and combining
this with the Drift we understood that features drift West!
On the S-Side of the CF the opposite is true...features on the
S-Side are driven by SE-Wind and therefore drift NW along the CF.
Then with the whole Cold-Front Tracking NE...and combining
this with the Drift we understood that features drift North!
This helped us understand (too late) how to line-up on Gates
thru the Cold-Front when one presented itself."

Spirit of Sark subsequently won the rugged Buenos Aires to Wellington 3rd Leg of the Global Challenge while making extensive use of QuikScat data acquired through WeatherNet and displayed in GRIB Explorer. Similar tuning techniques were employed by racers participating in the Newport-Bermuda, Annapolis-Bermuda, Pacific Cup, and Vic-Maui races held this past summer. Better testimony to the benefits and utility of QuikScat data to the marine market would be difficult to find. Creating a means of enabling less technically proficient users to tune their wind forecasts en-route with QuikScat information becomes an area of clear development opportunity.

Usage Statistics

Presently, WeatherNet offers some 20,000 wind and weather products in its content library. Perspective on the relevance of QuikScat data to the marine market can be gained by investigating how QuikScat data is being retrieved relative to the pool of other wind and general weather products available in OCENS WeatherNet. Consequently, OCENS has reviewed archived records of WeatherNet downloads by month since the release of QuikScat data in late May. Several findings are noteworthy:

Wind products are the most frequently downloaded products in WeatherNet. Three of the top 10 products downloaded between June and November were wind-related products;

QuikScat downloads ranked 57th out of all types of WeatherNet products and 14th out of all wind-related WeatherNet products;

The volume of QuikScat downloads grew from 1.25% of total kilobytes of wind data downloaded through WeatherNet in June to over 6% in November;

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QuikScat data was downloaded more for the Northwest Atlantic region than for any other region. Northwest Atlantic QuikScat downloads accounted for 56% of all QuikScat downloads.

The average size of a downloaded WeatherNet wind product is 26 kb. The average size of a downloaded QuikScat file is 14 kb. This suggests that WeatherNet has successfully removed any barrier to the use of QuikScat data by marine users that could be attributed to excessive file size.

On average, WeatherNet users spend an average of just over $6 per month on wind products and the per piece value of downloaded wind products are over 75% higher than that of non-wind products. Clearly, marine users are willing to pay more for wind products which they consider critical to their voyaging needs. Of course, QuikScat products are provided to WeatherNet users at no charge (aside from the separate communication expenses these users incur when using a satcomm for their connection).

Given the small file size of QuikScat data, the premium marine users place on quality wind data and the QuikScat 'value-add' relative to the tuning of GRIB wind forecasts, revenue opportunities for QuikScat data should be better than those associated with conventional wind products.

TPC has commenced an effort to determine how QuikSCAT wind vector data are currently being used at TPC, and how to best quantify the impacts of this data type in TPC's mission. In the course of this effort, deficiencies in the currently available data are also being identified and addressed where possible by working with the other NOPP partners and the ocean vector wind remote sensing community in general. TPC's approach to determining the utilization of these data and quantifying the impacts of this data is similar to that taken by OPC as part of another NOPP project. TPC is also studying ways to improve the utilization of QuikSCAT in the tropical cyclone environment to help TPC forecasters more fully utilize these data.

WindSAT is a polarimetric microwave radiometer launched by the Navy on the Coriolis mission. WindSAT is a first of its kind sensor launched into space on 06 January 2003 to demonstrate and better understand the wind vector retrieval capabilities of a polarimetric radiometer versus those from scatterometers such as QuikSCAT. WindSAT is a risk reduction mission for the CMIS sensor, which will be responsible for meeting the Nation's ocean wind vector retrieval requirements in the NPOESS era. The initial WindSAT calibration and validation effort was completed in the fall 2004. Currently, preparations are underway to implement WindSat processing in near real-time. This will allow ocean vector wind data from WindSAT to be brought into this NOPP effort to be evaluated and integrated into the operationally available data streams.

RESULTS

A high quality 12.5km wind vector product from QuikSCAT was developed and validated, and is currently being put into operational production.

Ultra high-resolution (2.5km) wind speed retrievals from QuikSCAT were demonstrated to be possible and have been implemented in the operational processing stream

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A 25km wind vector product in GRIB format was demonstrated and is being routinely generated at OPC

OCENS developed a prototype viewer for the GRIB wind vector product which has been tested in several races over the past year with positive feedback.

First TPC QuikSCAT wind vector data use survey completed by forecasters
- QuikSCAT data is used during the forecast cycle about 75% of the time
- When QuikSCAT data changed the wind analysis/forecast the winds were adjusted higher about 65% of the time
- It was also helpful in identifying front, trough and ridge locations and confirming wind areas
- The major shortcoming identified was lack data over areas of interest due to no coverage or data latency issues.

IMPACT AND APPLICATIONS

National Security

Any improvements in short-term warnings and forecasting in the marine environment through utilization of satellite ocean vector wind data would certainly benefit any Naval operations and thus National Security or Homeland Defense.

Economic Development

Commercial interests in remotely-sensed ocean surface wind vector data do exist, and initial surveys conducted by OCENS, Inc. show that high quality ocean surface wind data is lacking but desired by commercial and recreational users in the marine environment.

Quality of Life

Any improvements in short-term warnings and forecasts through utilization of satellite ocean vector wind data would benefit commercial and private interests in the marine environment.

TRANSITIONS

RELATED PROJECTS

Scatterometer-derived Operational Winds, Surface Pressures and Rain,
Principle Investigator J. O'Brien, FSU, funded by the NOPP
- identify utilization of QuikSCAT data at OPC and quantify the impacts of this data at OPC.

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