2.5 RECENT DEVELOPMENTS IN QUIKSCAT NEAR-REAL-TIME PROCESSING AT NOAA/NESDIS

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1 INTRODUCTION

The QuikSCAT near-real-time (NRT) processing at NOAA/NESDIS has been operational since February 2000 and continues to be enhanced and maintained under Computer Sciences Corporation's (CSC) Central Satellite Data Processing (CSDP) contract. In addition to the originally planned ocean winds products, several new products have been added to the processing stream on an experimental basis. In this paper we describe additional QuikSCAT products such as the high resolution (12.5 km) wind product as well as Ice and Ocean image products that have been added to the processing stream and their impact on production. In addition, we describe forthcoming changes to be incorporated to accommodate the ADEOS-II mission which will be launched early next year.

2 NOAA/NESDIS QUIKSCAT NRT PROCESSING SYSTEM

2.1 NRT Data Processing

The QuikSCAT NRT processing system at NOAA/NESDIS continues to be enhanced in collaboration with JPL and NOAA/NESDIS. Details of the NRT processing system's data flow are contained in Augenbaum, et. al. (2001) and summarized in Figure 1. The main operational mission is to produce wind retrievals in 25 km resolution Wind Vector Cells (WVC) on an orbit by orbit basis within three hours of observation and to make them available in BUFR format. This product contains both the wind retrievals along with the sigma-0 values for each wind vector cell. An additional, winds only, solution is also produced and made available in a binary format.

Monthly latency and processing statistics have been tracked at NOAA since QuikSCAT went operational. Analyzing the monthly data for the last year shows that on average NOAA has received the data within 150 minutes of observation 85% of the time which meets the requirement. The end-to-end (observation to product available) processing times have been less than 190 minutes, 88% of the time. The NOAA only processing times have averaged less than 45 minutes 94% of the time.

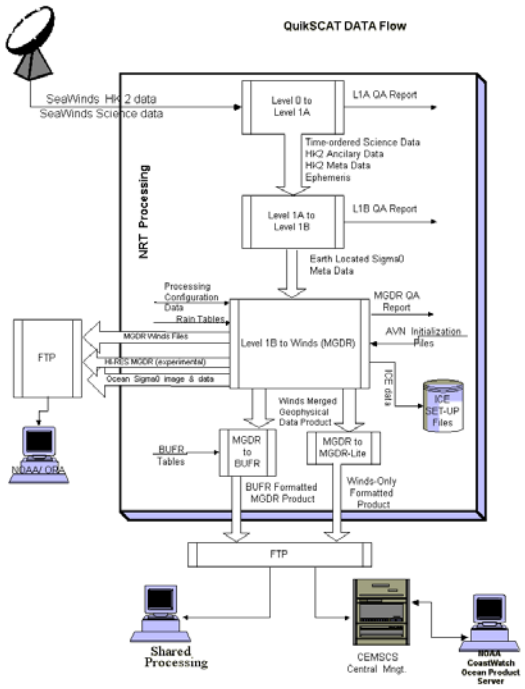

FIGURE 1. QuikSCAT Data Flow Diagram

2.2 New Products

Although some tradeoffs in resolution versus processing speed are made to the NRT processing of wind retrievals in order to meet the NRT operational requirements, the Level 1B (L1B) intermediate product can still be used to produce other high resolution products. After the operational requirements are met, the L1B intermediate product is used to generate high resolution wind retrievals, ice edge detection and ocean surface images.

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2.2.1 Ocean Sigma-0 image

The most recent product added to the processing stream is an Ocean Sigma-0 image, based on image processing algorithms developed by Dr. David Long of the BYU Microwave Earth Remote Sensing (MERS) Laboratory (www.mers.byu.edu/Seawinds-1.html). The NRT processing system produces high resolution (on a 2.5 km swath based grid) Normalized Radar Cross Section (NRCS) or Sigma-0 images using AVE resolution enhancement and also gif formatted images on an orbit by orbit basis. Dr. Paul Chang (NOAA/ORA) has set up a QuikSCAT Storms web page at http://manati.wwb.noaa.gov/cgi-bin/qscat_storm.pl to make the Sigma-0 images available over areas of storm activity. A sample image of storm GABRIELLE, off the coast of Florida, is displayed in Figure 2. Currently, only the vertically polarized, forward look measurement from QuikSCAT is produced. The idea here is that looking at the scatterometer data in this way, rather than the calculated, wind retrievals, might provide additional uses for QuikSCAT data. For comparison purposes, the QuikSCAT wind retrievals for Storm GABRIELLE are displayed in Figure 3.

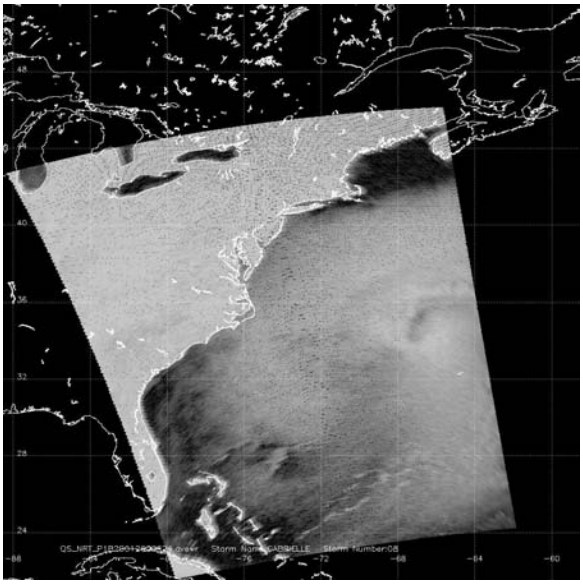

FIGURE 2. Sample Sigma-0 image of Storm GABRIELLE off of Florida Coast

2.2.2 Ice Images

The Ice image products are also based on algorithms developed by Dr. David Long (BYU) and have been produced operationally since June 2000. The NRT image processing software generates a set of "AVE" enhanced resolution images from the L1B data files. Recently, the Scatterometer Image Reconstruction (SIR) processing routines that produce the .ave and .sir images have been updated to produce sharper images. The large polar images use the AVE method while the special regions, which are smaller, use the full SIR resolution enhancement. We are currently producing daily ice image products for the Alaska, Antarctic, Arctic, North Pacific, Ross Ice Shelf and Weddel Sea regions. These products are available on a daily basis at http://manati.wwb.noaa.gov/cgi-bin/qscat_ice.pl. Further documentation is available at ftp://www.osdpd.noaa.gov/pub/seawinds/Ice_doc.txt

In addition, the National Ice Center produces their own images from the .sir data. They are currently distributing near-real-time ICE images of the northern and southern hemisphere. Their products are available at www.natice.noaa.gov/science/products/qs.html

2.2.3 High-resolution wind retrievals

In addition to the above products, the L1B product is also used to produce high resolution wind retrievals with a 12.5 km resolution. This product is currently considered experimental, and it has not yet been validated.

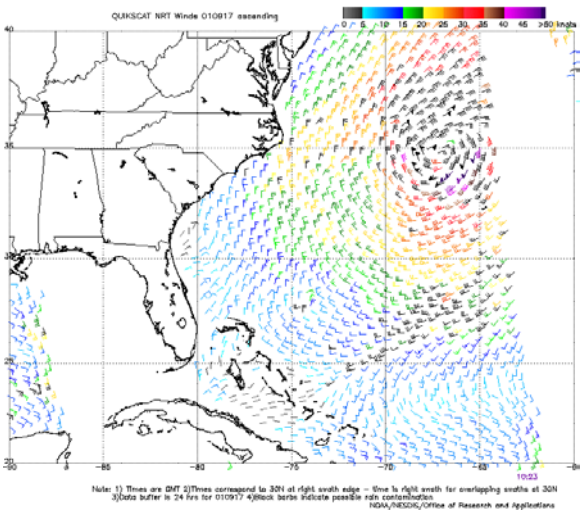

Figure 3. Wind retrievals for Storm GABRIELLE

3 ADEOS-II PROCESSING

One of the most anticipated changes for the QuikSCAT processing system is the launch of a second Seawinds instrument on the Adeos-II spacecraft, scheduled for February 2002. The result of this will be a second QuikSCAT data stream to be processed in near-real-time.

At present the NOAA/NESDIS QuikSCAT NRT processing system consists of dual, four-processor

SUN Enterprise 4500 Servers each equipped with 2.5 GB ram and 45 GB of disk storage. One machine functions as the primary processing server, and the other is used as a backup processing server. Failure of a successful push from CSAFS to the primary server automatically results in a push to the backup server. It is anticipated that the processing system configuration will be modified so that a separate SUN Enterprise machine will be available as the primary processing server for each data stream. One for Seawinds on QuikSCAT and one for Seawinds on ADEOS-II. There will be another machine to serve as a secondary, backup, processing server for both QuikSCAT and ADEOS-II. The current machines are also being upgraded to six-processors each to handle the additional processing that the new products have imposed.

The core processing software is being developed at JPL. The ADEOS-II processing will be similar to the QuikSCAT processing, with raw science files processed through to wind products. The main difference is that the ADEOS-II data stream will come directly from the ADEOSFS in Japan as opposed to the CSAFS at NASA/Goddard and it will not contain the HK bookkeeping files where we get the time data. HEOC (Hatoyama Earth Observing Center) time difference files will only be sent once per day. The time difference files will then be processed to produce the necessary time files.

The rest of the processing will follow that of QuikSCAT, as displayed in Figure 1. The file and directory structure of both processing systems is being reworked to provide clear identification and separation between QuikSCAT and ADEOS-II components. A conversion routine has been written to convert QuikSCAT telemetry data to ADEOS-II so that testing of the ADEOS-II processing software can begin in the near future. Both QuikSCAT and ADEOS-II processing software are being updated to incorporate improved algorithms developed over the past two years since QuikSCAT has been operational.

4 CONCLUSIONS

QuikSCAT near-real-time processing has been operational since February 2000 and continues to meet NOAA's mission requirements of near-real-time data processing within 180 minutes of observation 85% of the time. Over the past year, the system has been enhanced to include additional products that our customers have found to be useful. While requiring additional processing resources, these additional products do not detract from the core operational mission in any significant way. Plans are in place for major upgrades in the processing system in both hardware and software to accommodate the forthcoming ADEOS-II data stream.

5 REFERENCES

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