 Operational Utilization of Ocean Surface Vector Winds From RapidScat

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What is Ocean Surface Vector Wind Scatterometry
What is RapidScat
Utilization Examples
- Extratropical Cyclones
- Tropical Cyclones
Surface roughness is related to the normalized radar backscatter cross-section, $\sigma^0$, and depends upon the friction velocity.
What is RapidScat?

- First Earth science dedicated instrument on the ISS
- Hardware built by JPL from left-over components from the QuikSCAT scatterometer
- Conically scanning dual-polarized Ku-band radar
- A gap filler to mitigate the loss of the NASA QuikSCAT mission and compliment the international scatterometer constellation
  - Launched September 21, 2014
  - Data production started October, 2014
  - Will operate through early 2017
  - Overlaps with EUMETSAT ASCAT
  - Will overlap with ISRO’s ScatSat-1 mission
ISS-RapidScat Objectives

• Provide ocean vector winds to improve weather forecasting and complement data collected by the international ocean vector winds constellation.
  – The tropical coverage of the ISS will provide additional observations of storms that may develop into hurricanes or other tropical cyclones (typhoons, etc.)

• Provide direct wind cross-calibration for the international ocean vector winds constellation.
  – The ISS orbit will enable coincident measurements in space and time with each of the satellites in the constellation (ASCAT, OSCAT, QuikSCAT, and, ScatSat)

• Improve estimates of the global diurnal ocean vector wind cycle and determine the semi-diurnal cycle.
  – Variation of wind across different times of the day may be the cause of major discrepancies between measurements and models.
Ana Best Track Intensity
1800 UTC 8 May
45 kt/1000 mb
34-kt wind radii: 100 100 80 100

Higher resolution retrievals show higher winds in general, both in and outside of rain

Descending Passes

Provided in near real-time for:
• NAWIPS environment for the NWS National Centers
• The JSCDA for data assimilation
• Web portal for NWS WFO’s and broader community

http://manati.star.nesdis.noaa.gov/rapidscat
NOAA users are currently using ASCAT-A, ASCAT-B, and RapidScat in their operations.

ISS orbit provides swaths cutting SE/NW or NW/SE across the extratropics and tropics.

These orbits cut across ASCAT swaths and help fill gaps in coverage especially at lower latitudes.
Daily Coverage - ASCAT and RapidScat

Image courtesy of NASA/JPL
RapidSCAT Use for Extratropical Cyclone Observations
The RapidSCAT Orbit Aligns with Extratropical Storm Tracks
Hurricane Force Wind Observations in Extratropical Cyclones

**WARNING CATEGORIES**

**Pre-QSCAT**
1. GALE 34-47 kt
2. STORM >48

**QSCAT ERA**
1. GALE 34-47 kt
2. STORM 48-63 kt
3. HURCN FORCE ≥ 64 kt

- **25 km QuikSCAT**
  - Available in N-AWIPS Oct 01

- **12.5 km QuikSCAT**
  - Available May 04

- **ASCAT available in N-AWIPS**

- **ASCAT-B available in N-AWIPS**

**Improved wind algorithm and rain flag Oct 06**

**QuikSCAT ceased operations**

**OSCAT available in N-AWIPS**

**ASCAT-B available in N-AWIPS**

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**Atlantic**

- **2001-02**: 23
- **2002-03**: 24
- **2003-04**: 23
- **2004-05**: 22
- **2005-06**: 33
- **2006-07**: 37
- **2007-08**: 39
- **2008-09**: 45
- **2009-10**: 40
- **2010-11**: 33
- **2011-12**: 33
- **2012-13**: 30
- **2013-14**: 27
- **2014-15**: 31

**Pacific**

- **2001-02**: 14
- **2002-03**: 15
- **2003-04**: 15
- **2004-05**: 14
- **2005-06**: 15
- **2006-07**: 51
- **2007-08**: 49
- **2008-09**: 45
- **2009-10**: 45
- **2010-11**: 40
- **2011-12**: 40
- **2012-13**: 47
- **2013-14**: 55
- **2014-15**: 55
“...very dangerous conditions -- winds to 75KT, phenomenal seas to 44FT -- continue this eve beneath intense 963mb low...”

April 16th, 2015

SEVIRI RGB Airmass image of intense, dangerous hurricane force low across the Atlantic
03/03/2015 hurricane force winds detected in south quadrant of 952mb low by RapidScat. OPC analysis upgraded to indicate HF status.
RapidSCAT Use for Tropical Cyclone Observations
Tropical Cyclone Ana
May 7th – 10th, 2015
Ana Best Track Intensity
1800 UTC 8 May
45 kt/1000 mb

RapidScat

High rain-flagged wind retrievals (50-55 kt) in deep convection southeast of center

GCOM-W1 AMSR rain rates > 5 in./hour
Subtropical Storm Ana
RapidScat Pass 1840 UTC 8 May

Ana Best Track Intensity
1800 UTC 8 May
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Higher resolution retrievals show higher winds in general, both in and outside of rain
Subtropical Storm Ana
RapidScat Pass 1840 UTC 8 May

Ana Best Track Position
1800 UTC 8 May
31.6°N 77.4°W

Center is quite apparent in ambiguities and in weaker winds

25-km Ambiguities
Ana Best Track Position
1800 UTC 8 May
31.6°N 77.4°W

Center is quite apparent in ambiguities (31.7°N 77.4°W)

Rain blocking of ambiguities seen east of center where southerly flow is expected

25-km Ambiguities
Satellite OSVW data are deeply integrated into NOAA’s National Weather Service (NWS) marine, tropical and extratropical cyclone operations

- Timely and open data availability
- User training
- Data in their workstation environment

Near real-time RapidScat 12.5km products are available in the NWS NAWIPS/NMAP environment and are being used to support the forecasting, analysis and warning process at NOAA.

The ISS orbit provides a unique opportunity to cross-calibrate satellite scatterometers and characterize the diurnal variability of OSVW.
CEOS Ocean Surface Vector Wind - Virtual Constellation (OSVW-VC)
Satellite constellation status and outlook – NRT data access

Source: WMO OSCAR database and direct interactions with agencies
Questions?

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