NOAA Assessment of the Oceansat-2 Scatterometer

Seubson Soisuvarn
Khalil Ahmad
Zorana Jelenak
Joseph Sienkiewicz
Paul S. Chang
Introduction

- NOAA has been receiving day old OSCAT data via ISRO dedicated FTP server since September 2010
- NRT OSCAT data flow from ISRO to EUMETSAT commenced in February 2011. Since then EUMETSAT has been receives 12-14 orbits per day. In March 2011 NRT OSCAT data flow began at NOAA via EUMETSAT dedicated FTP server
- NOAA is currently receiving all three levels of OSCAT data: L1B, L2A and L2B
  - L2A and L2B
    - Gridded @ 50 km WVC
  - Latest data as of February 2011 was used in analysis
  - Near real-time received through EUMETSAT
- Collocation of GDAS wind vector was done for L1B (slice) and L2A (composite) Sigma0
OSCAT Data Flow and Processing Within STAR

- EUM EXGAT E Server
- EUM FTP Data Server
- NASA/JPL
- STAR FTP Server
- STAR OWDP
- Web Products
- NAWIPS
- AWIPS
- NWP Buff
- L1B, and 50km L2A and L2B
- L3
- L1B, L2A, L2B Data Storing

Established In Development not Started
L1B
Signal & Noise Power

- Calculates Signal power (echo after noise subtraction) and Noise power from the following formulation
- Plot as a function of wind speed
- Signal is below noise level @ winds < 7.5 m/s in a mean!

\[
P_{signal} = X_s \cdot \sigma_s^0
\]

\[
SNR_s = \frac{P_{signal}}{P_{noise}}
\]

\[
P_{noise} = \frac{X_s \cdot \sigma_s^0}{SNR_s}
\]
Signal & Noise Power

**OSCAT**

**QuikSCAT**

![Graphs showing signal power vs. wind speed for OSCAT and QuikSCAT](image-url)
Signal & Noise Power

OSCAT

QuikSCAT

Noise Power

Low SNR

Signal Power

~7.5 m/s
Slice & Composite bias

\[ \sigma_{comp}^0 = \sum_{s} \frac{X_s \sigma_s^0}{\sum_{s} X_s} \]

- Second level
- Third level
- Fourth level
- Fifth level

\[ \text{OSCAT \sigma_0 \ bias (H-Pol \ Fore\-look)} \]

\[ \text{Mean \ Stdv \ ---} \]

\[ \text{slice \ ---} \]

\[ \text{composite \ ---} \]

\[ \text{X factor} \]

wind speed (m/s)
L1B → L2A (NOAA)
Use QuikSCAT wind processor as a starting point
- Process OSCAT data from Level 1B
- Grid Sigma0 @ 25 km WVC (L2A)
ISRO derived WVC index \((i,j)\) from satellite position and velocity vectors (not currently available in routine L1B processing)

\[
\begin{align*}
\text{Inclination} & = 98.28 \, \text{deg} \\
\text{Semi-major axis} & = 7098.14 \, \text{km} \\
\text{Eccentricity} & = 0.00113 \\
\text{Equator crossing longitude (descending node)} & = \text{varied orbit-by-orbit}
\end{align*}
\]
Composite Sigma0 and STD

\[ \sigma^0_{comp} = \frac{\sum_S X_S \sigma^0_S}{\sum_S X_S} \]

We calculate standard deviation of each Sigma0 from the following formulation:

\[
\sigma^0_{STD} = \frac{1}{N} \cdot \sqrt{\sum_S \left( \frac{X_S \sigma^0_S}{\sum_S X_S} - \sigma^0_{comp} \right)^2}
\]
V-POL Sigma0 Residual

9-11 May 2011
IOVWST Meeting, Annapolis, MD, USA
We normalize the residual bias by the standard deviation calculated above:

\[ \text{bias}_{\text{norm}} = \frac{\sigma_{\text{comp}}^0 - \text{GMF}}{\sigma_{\text{STD}}^0} \]
Residual Bias after Normalization

9-11 May 2011

IOVWST Meeting, Annapolis, MD, USA
Summary and Conclusions

- OSCAT data has been flowing to NOAA in near real-time via EUMETSAT since March 2011

- OSCAT L1B/L2A investigation shows:
  - High wind retrievals from OSCAT would be valuable
  - Signal-to-Noise ratio is too low at low wind speeds < ~ 7.5 m/s
  - Sigma0 residual biases are significantly high at low wind speeds
  - Sigma0 are dependent on antenna scan position and ascending/descending orbit

- NOAA is developing enhanced L2A product from ISRO’s L1B
  - 25 km WVC grid
  - L2A product will contain standard deviation of composite Sigma0
  - Is proving to be useful parameter in definition of objective function normalization during retrieval process