NOAA Assessment of the Oceansat-2 Scatterometer

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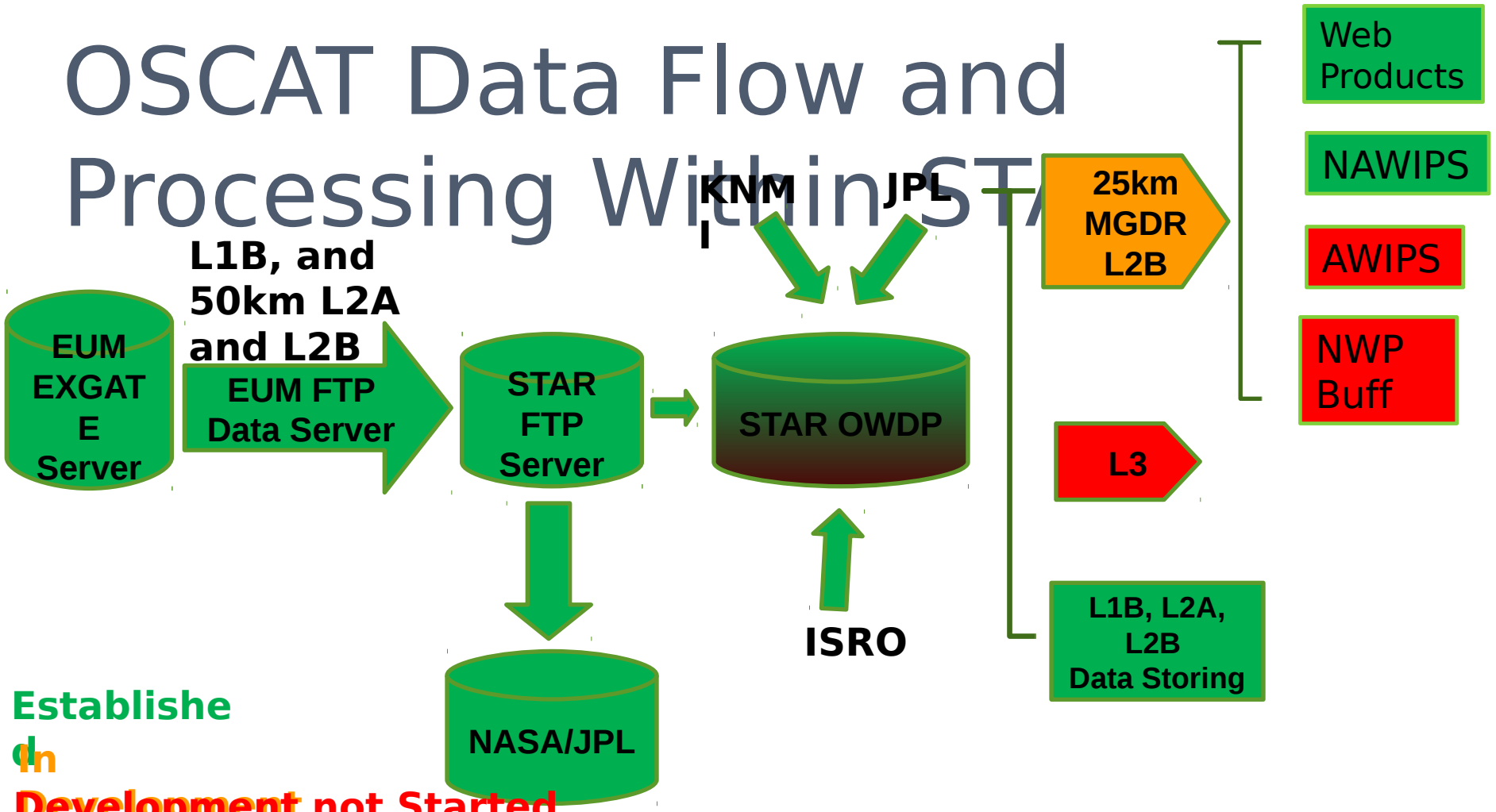
Introduction

- 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



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!

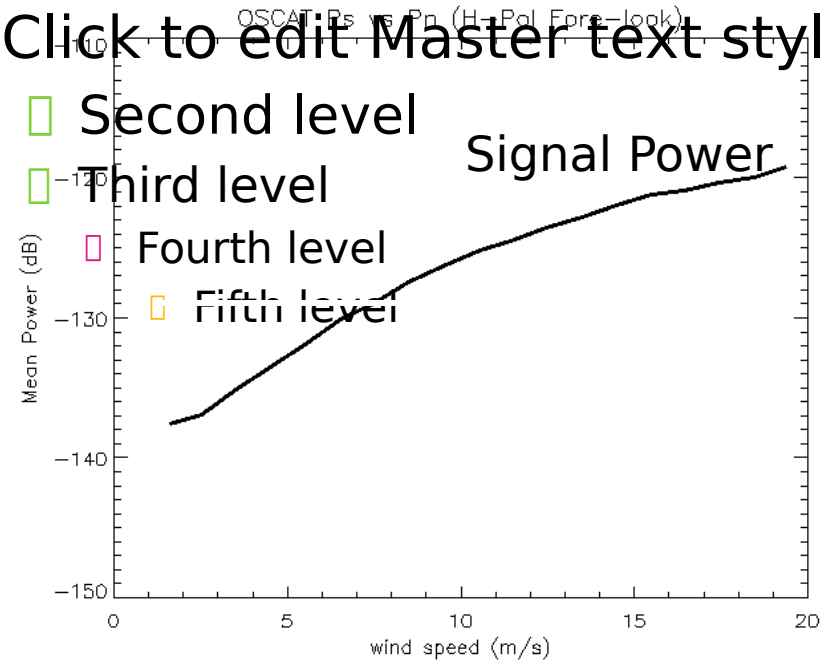
$$P_{signal} = X_s \cdot \sigma_s^{\,0}$$

$$SNR_s = \frac{P_{signal}}{P_{noise}}$$

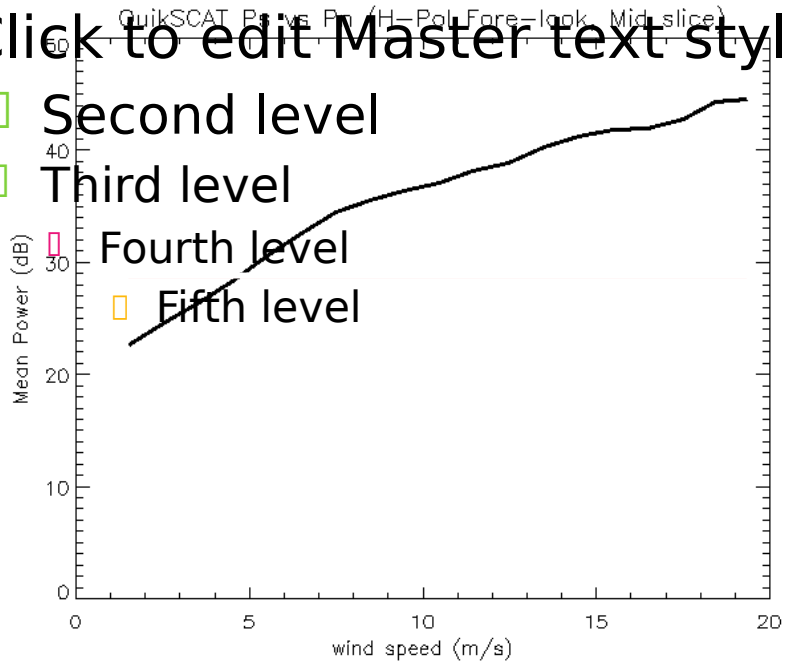
$$P_{noise} = \frac{X_s \cdot \sigma_s^{\,0}}{SNR_s}$$

Signal & Noise Power

OSCAT



QuikSCAT



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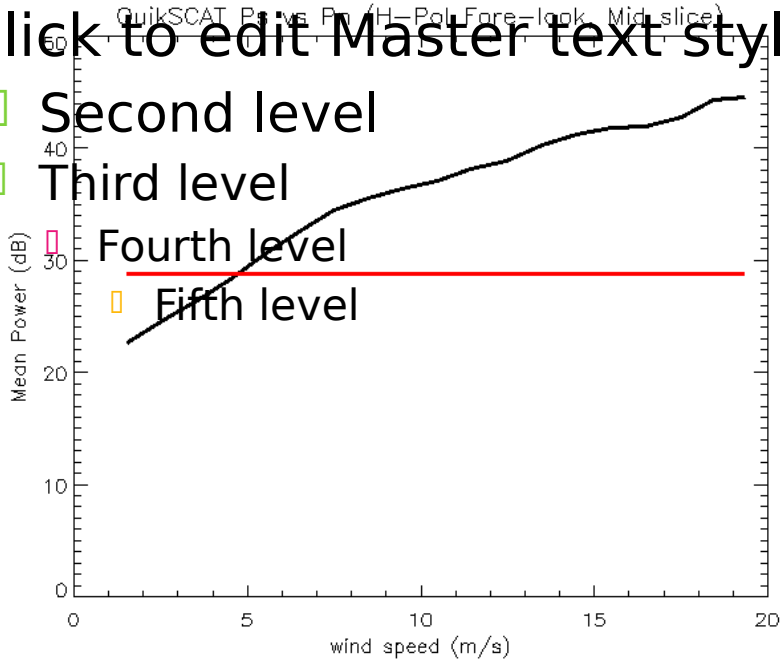
Signal & Noise Power

OSCAT

QuikSCAT



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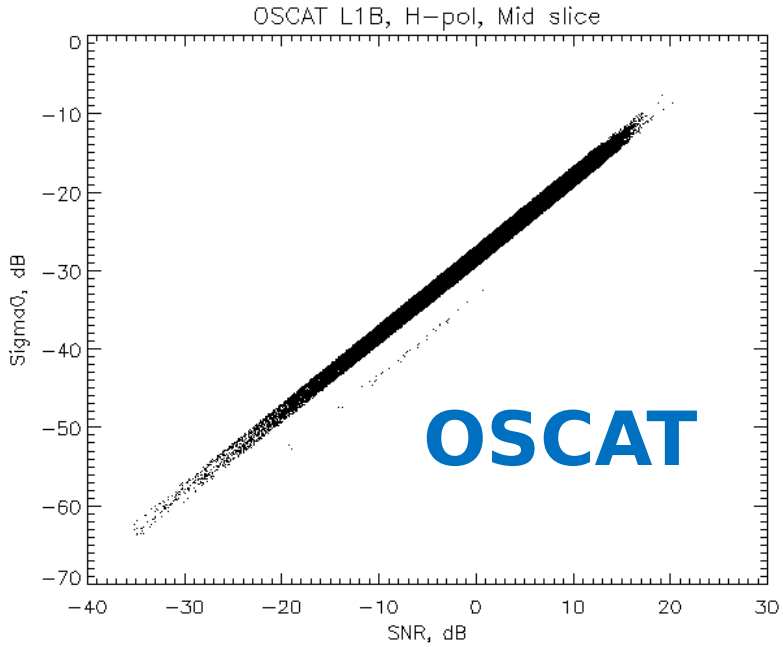
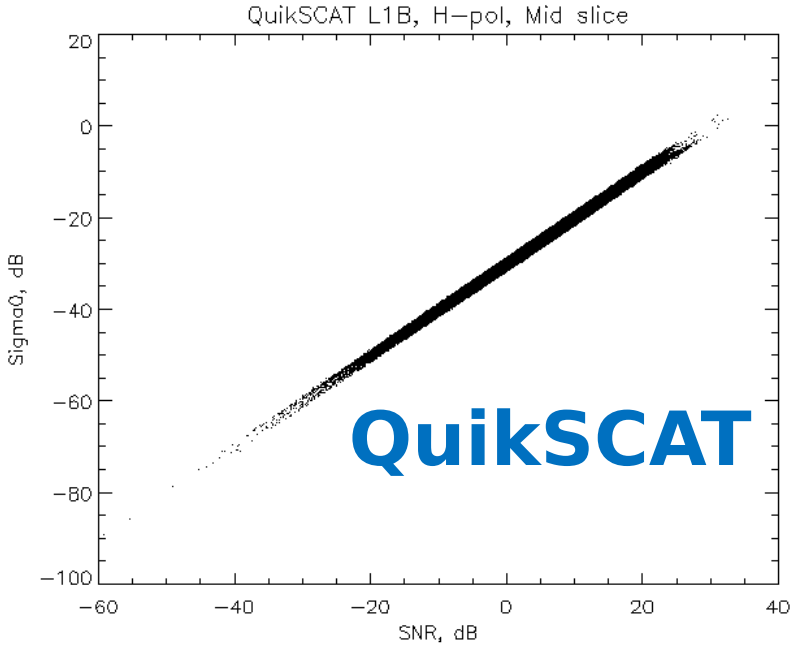
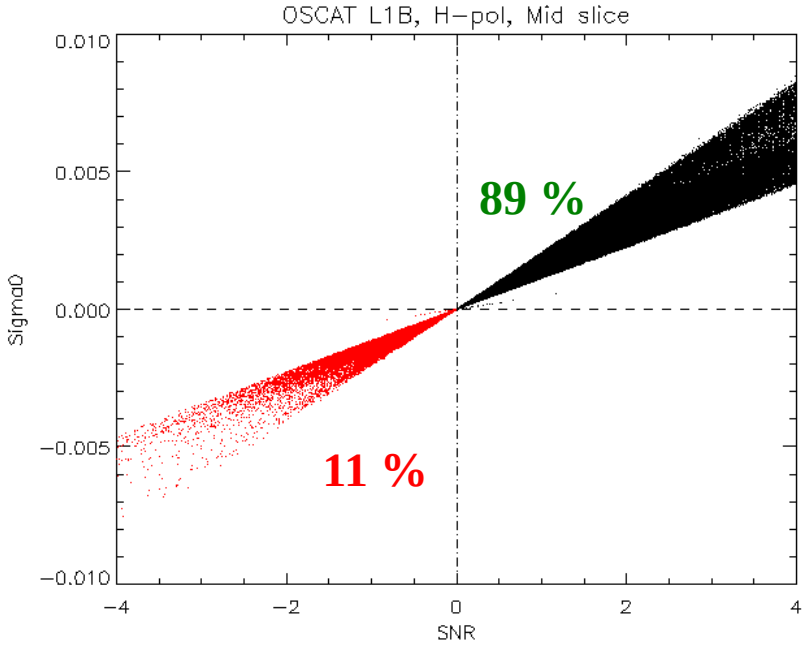
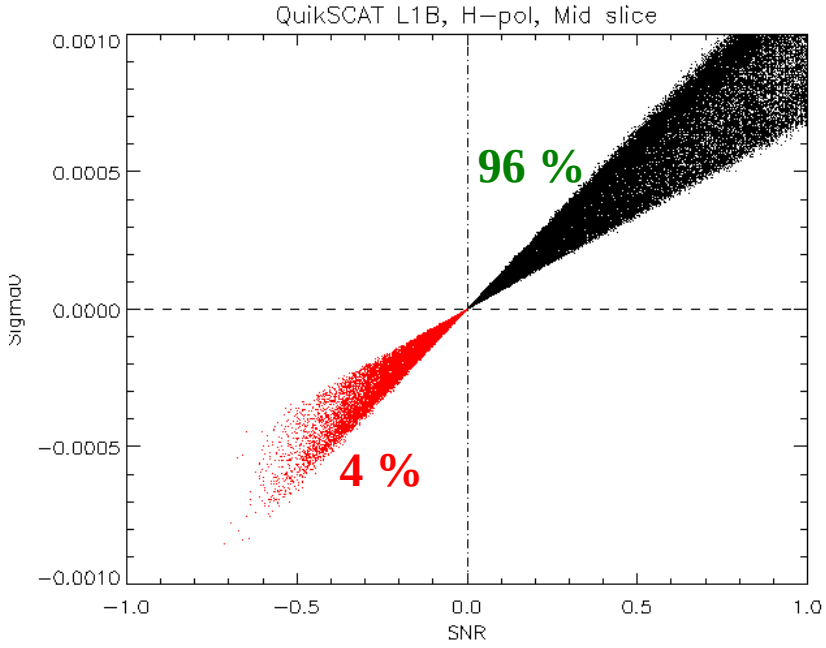
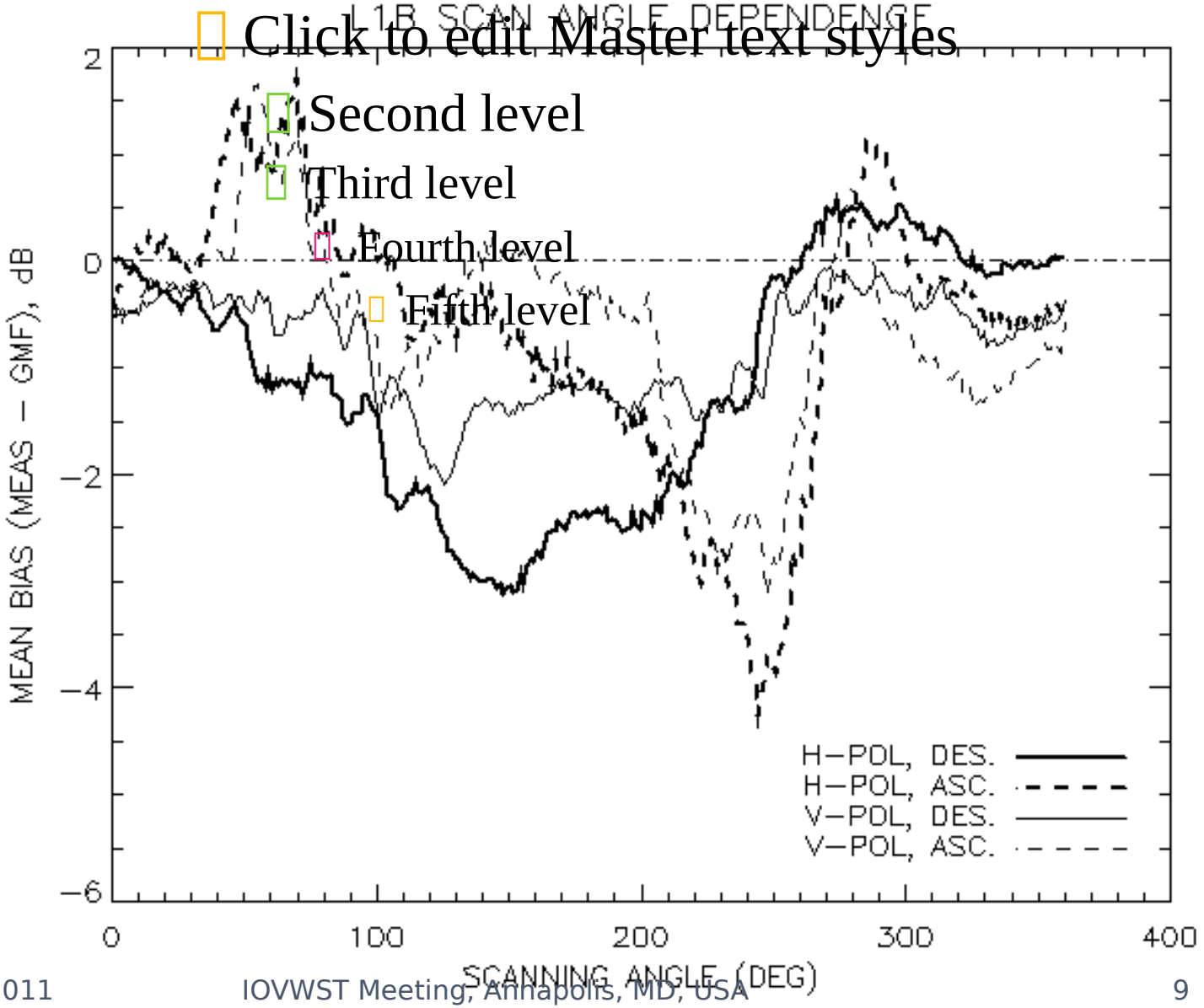

OSCAT L1B, H−pol, Mid slice
Sigma0, dB
SNR, dB
OSCAT


QuikSCAT L1B, H−pol, Mid slice
Sigma0, dB
SNR, dB
QuikSCAT

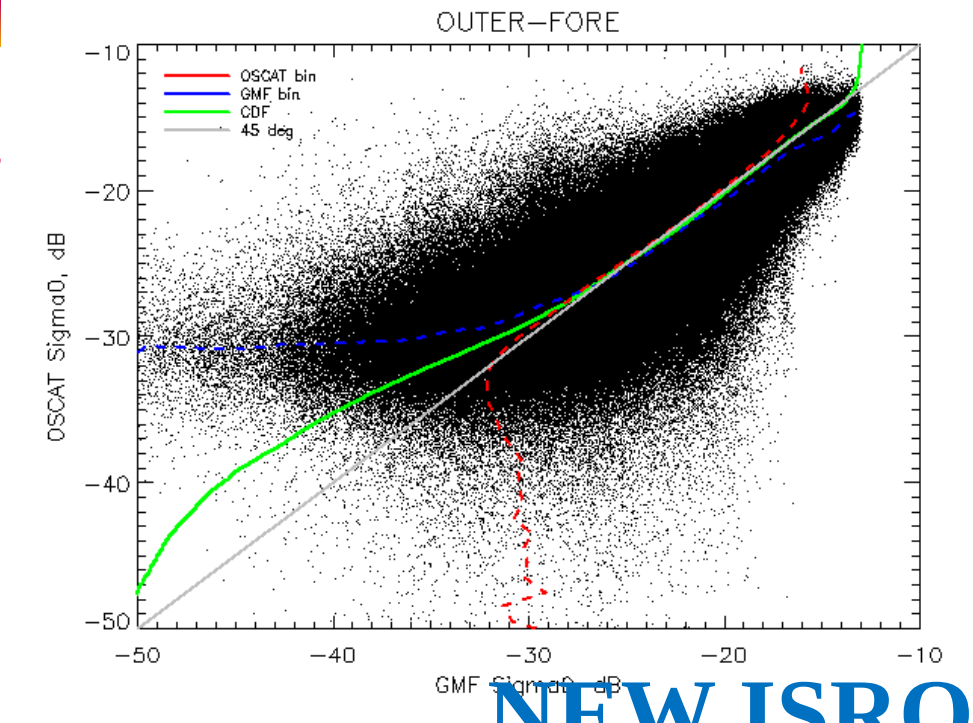

OSCAT L1B, H−pol, Mid slice
Sigma0
SNR
89 %
11 %

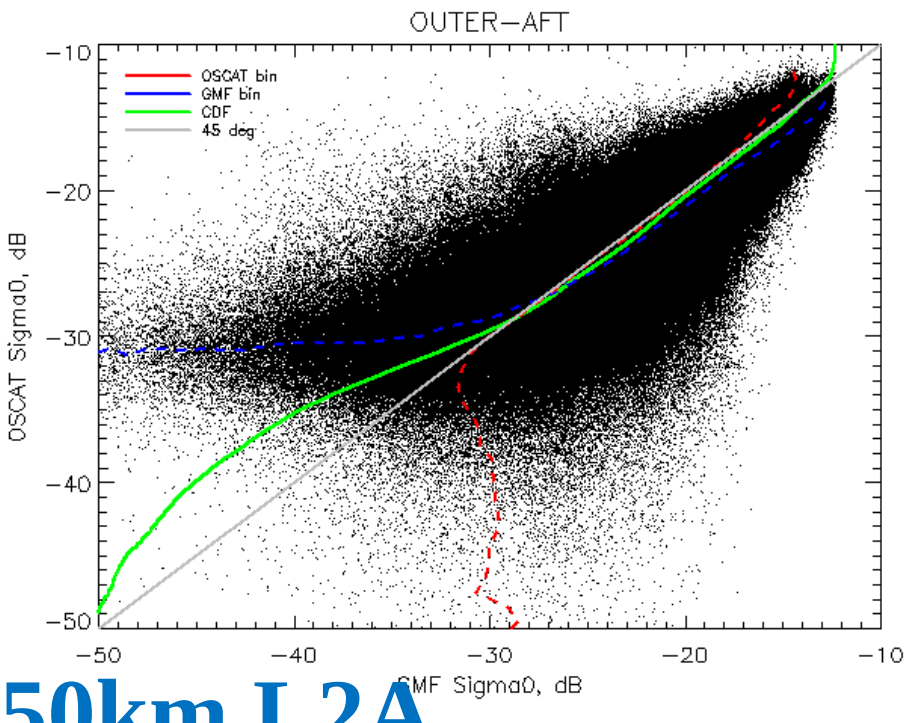

QuikSCAT L1B, H−pol, Mid slice
Sigma0
SNR
96 %
4 %

Scan Angle Dependence

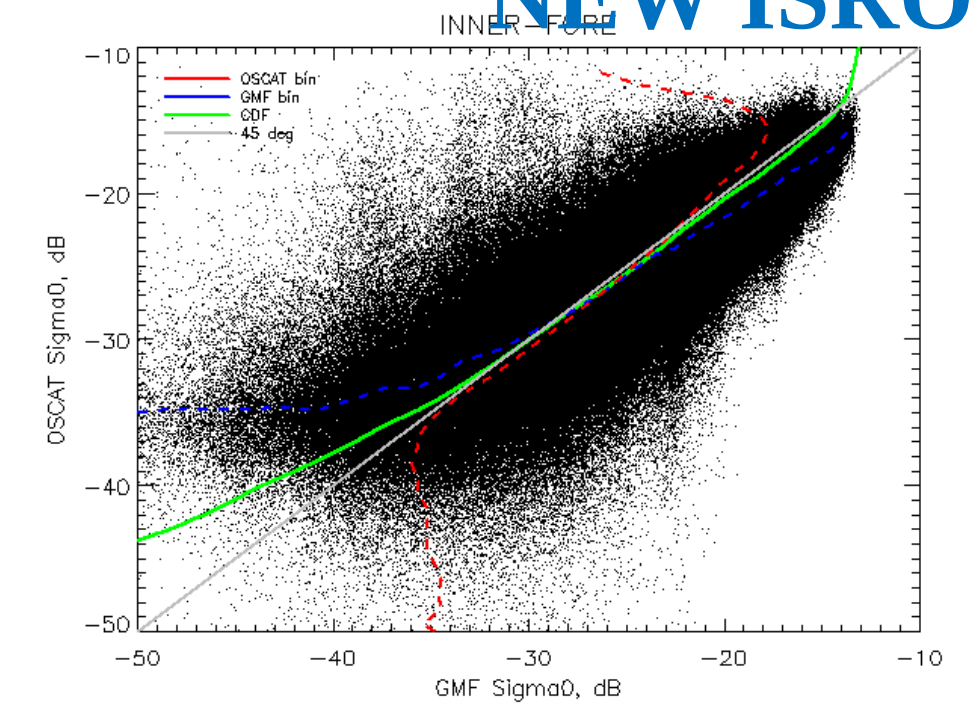


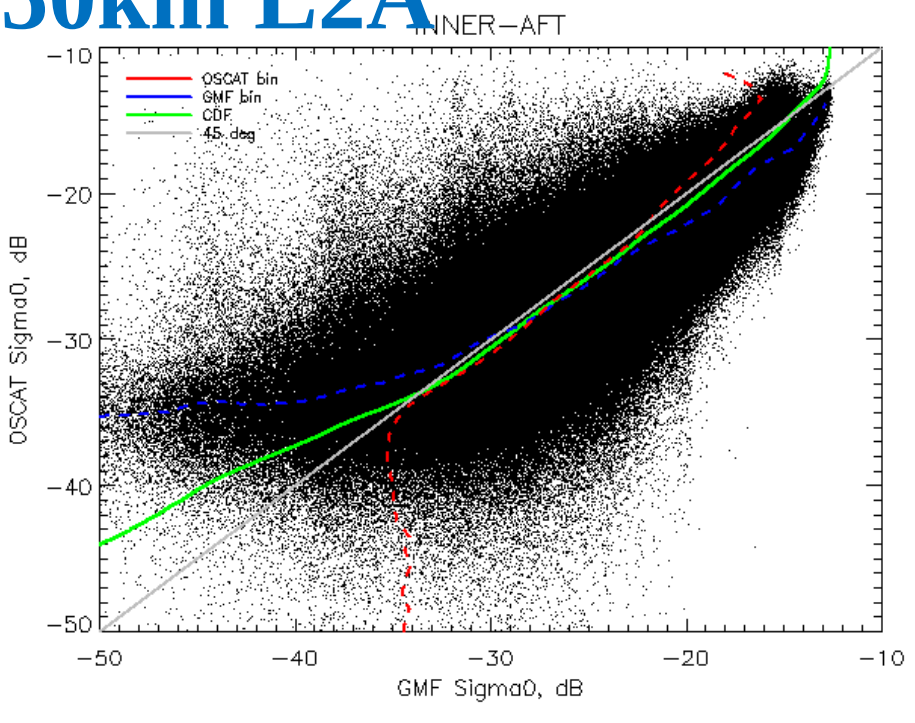
L2A



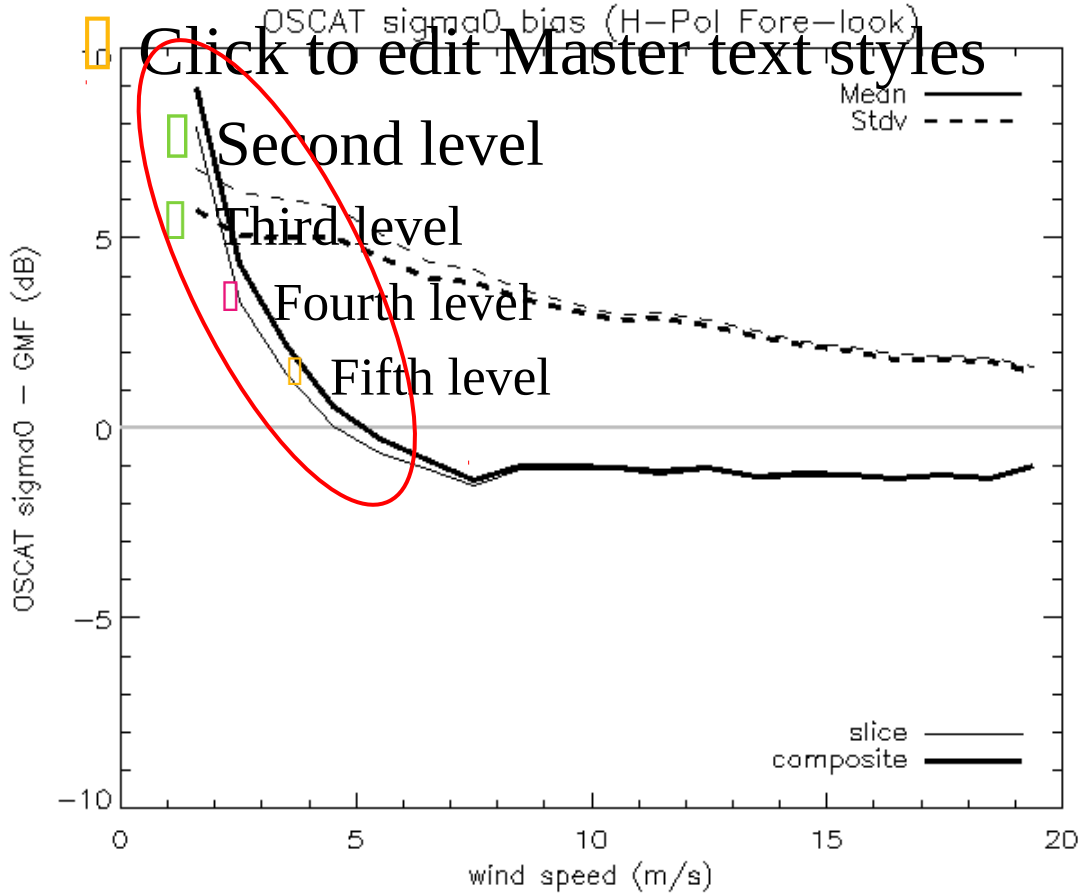


NEW ISRO 50km L2A





Slice & Composite bias



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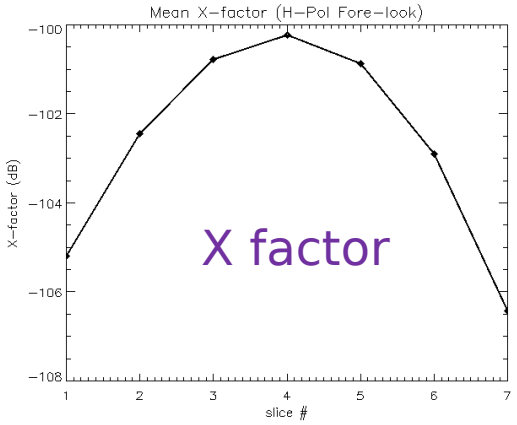
$$\sigma^0_{comp} = \frac{\sum_s X_s \sigma^0_s}{\sum_s X_s}$$



L1B → L2A (NOAA)

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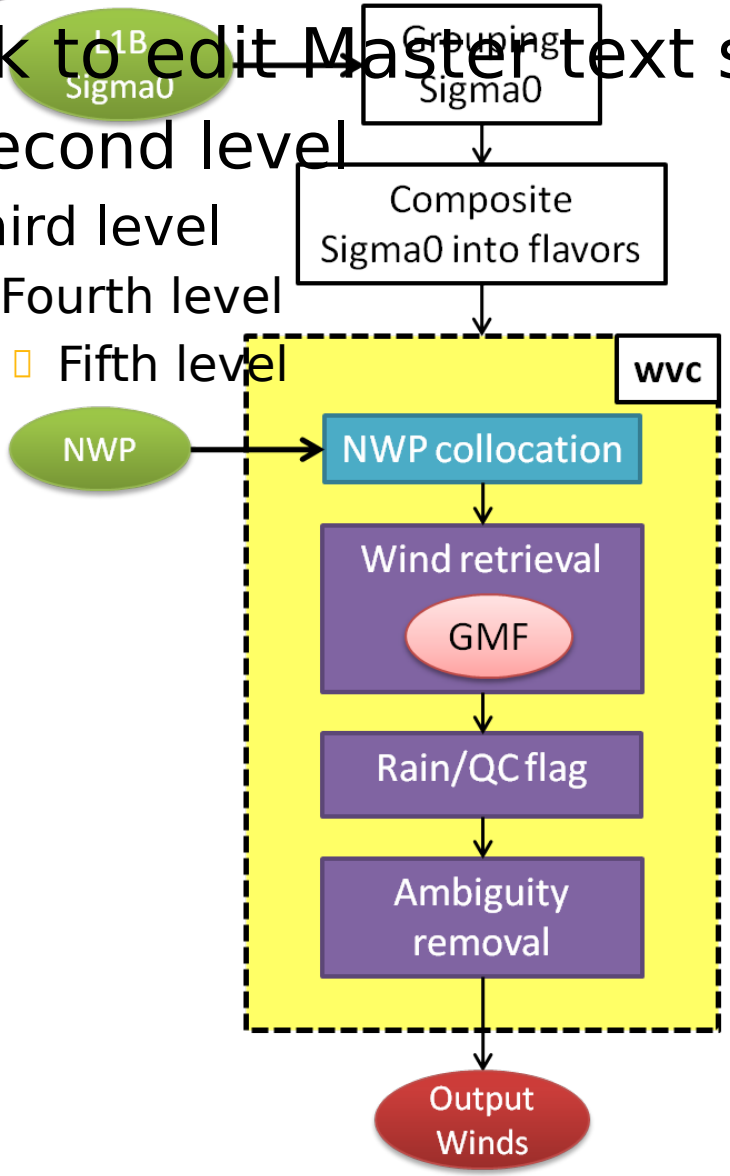
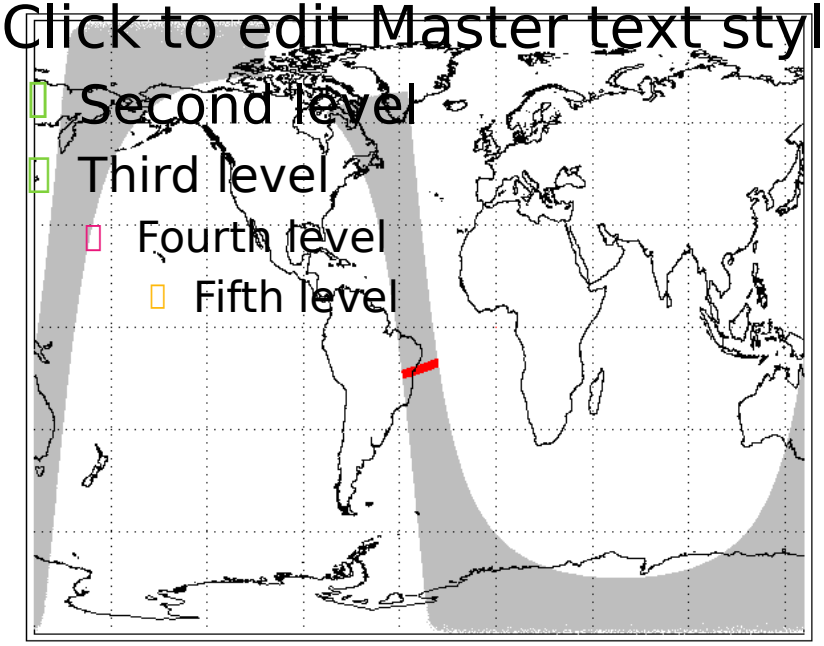
OSCAT wind processor



- Use QuikSCAT wind processor as a starting point
- Process OSCAT data from Level 1B
- Grid Sigma0 @ 25 km WVC (L2A)

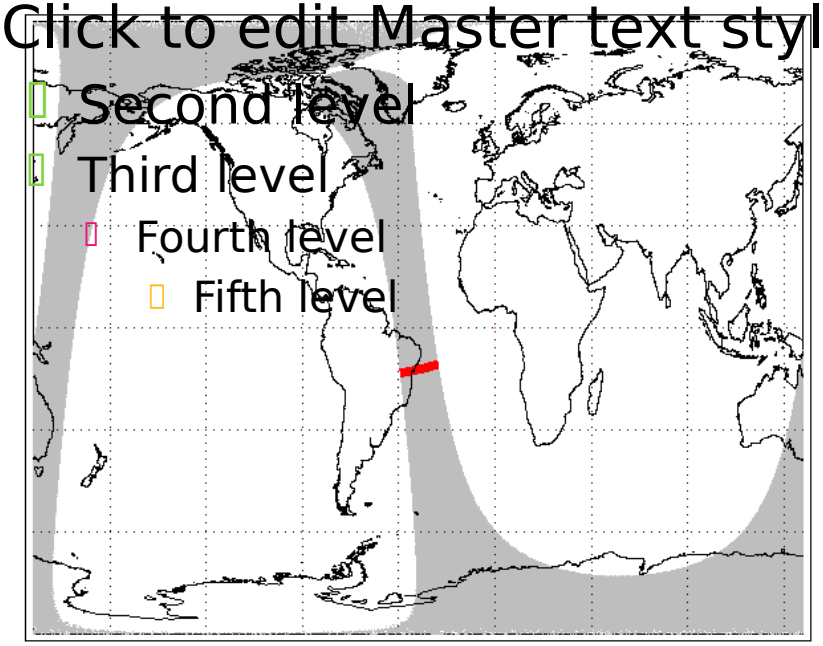
ISRO orbit (50 km)



ISRO derived WVC index (i,j) from satellite position and velocity vectors

(not currently available in routine L1B processing)

NOAA orbit (25 km)



Derived WVC index (i,j) by approximation from orbital elements given in L1B attribute parameters, i.e.

- Inclination = 98.28 deg
- Semi-major axis = 7098.14 km
- Eccentricity = 0.00113
- Equator crossing longitude (descending node) = varied orbit-by-orbit

Composite Sigma0 and STD

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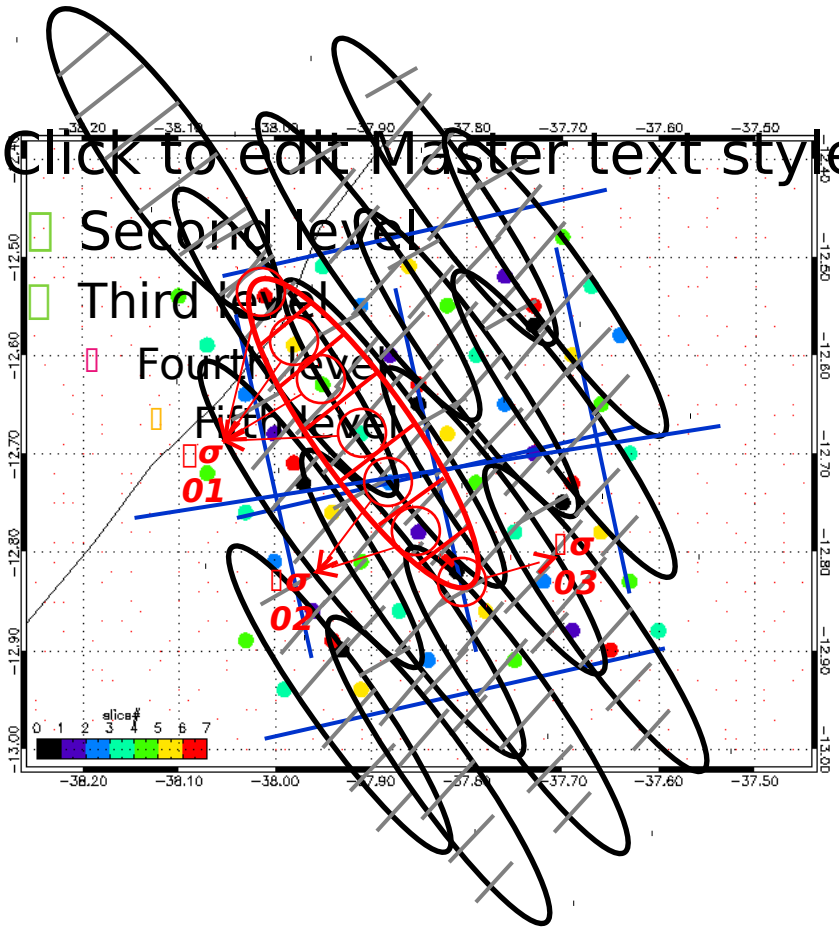

$$\sigma^0_{comp} = \frac{\sum_S X_S \sigma^0_S}{\sum_S X_S}$$

We calculate standard deviation of each Sigma0 from the following formulation

$$\sigma^0 STD = \frac{1}{N} \cdot \sqrt{\sum_S \left(\frac{X_S \sigma^0_S}{\sum_S X_S} - \sigma^0_{comp} \right)^2}$$

W POL Sigma0 Residual

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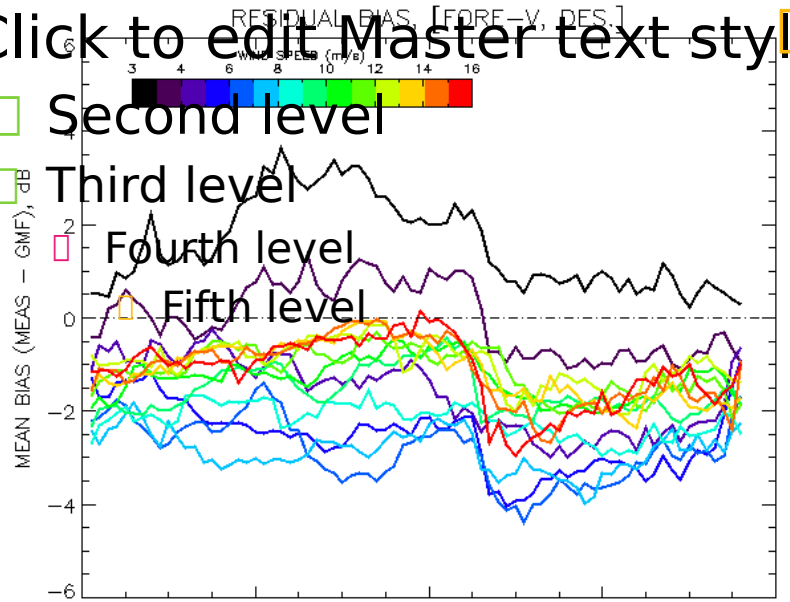
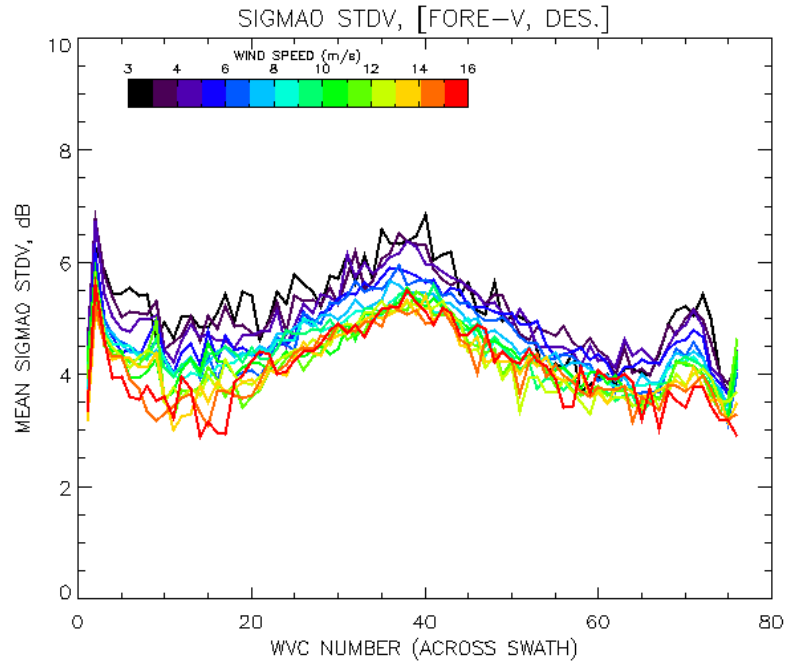
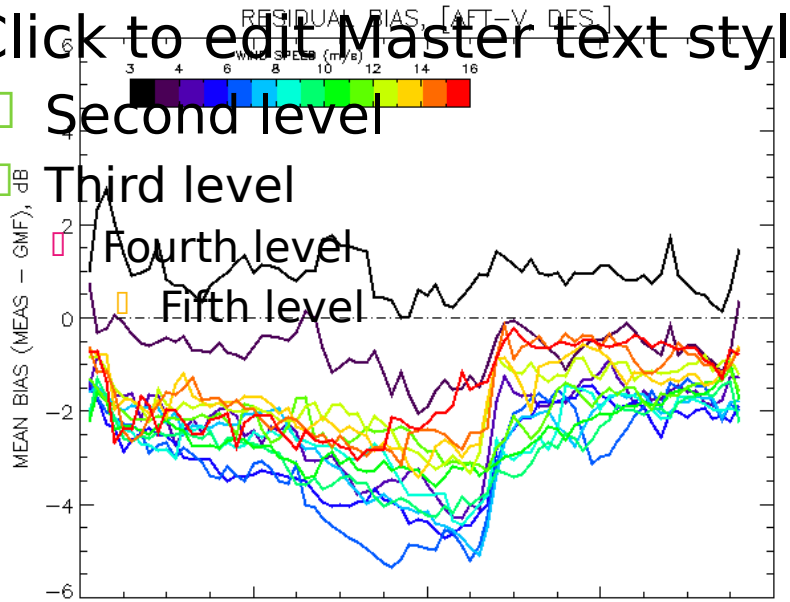
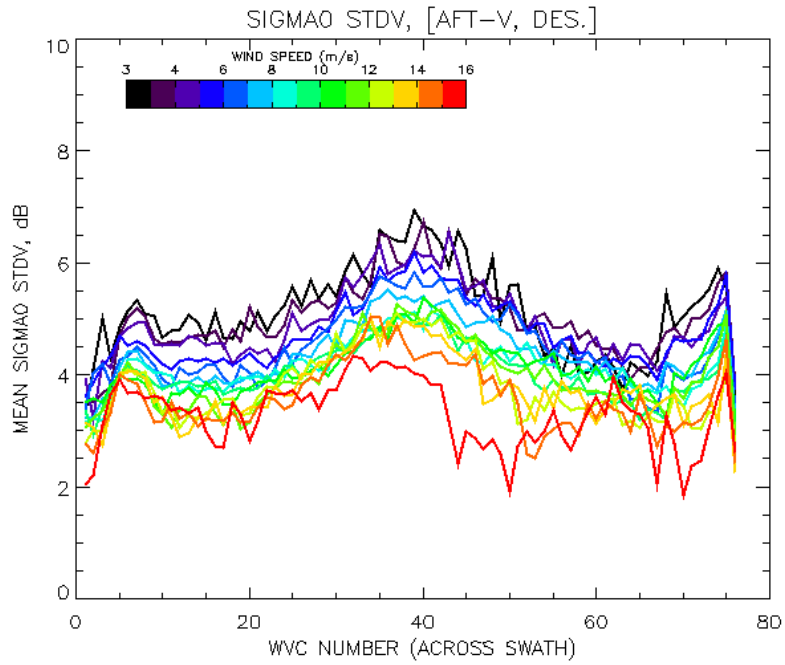
FORE LOOK







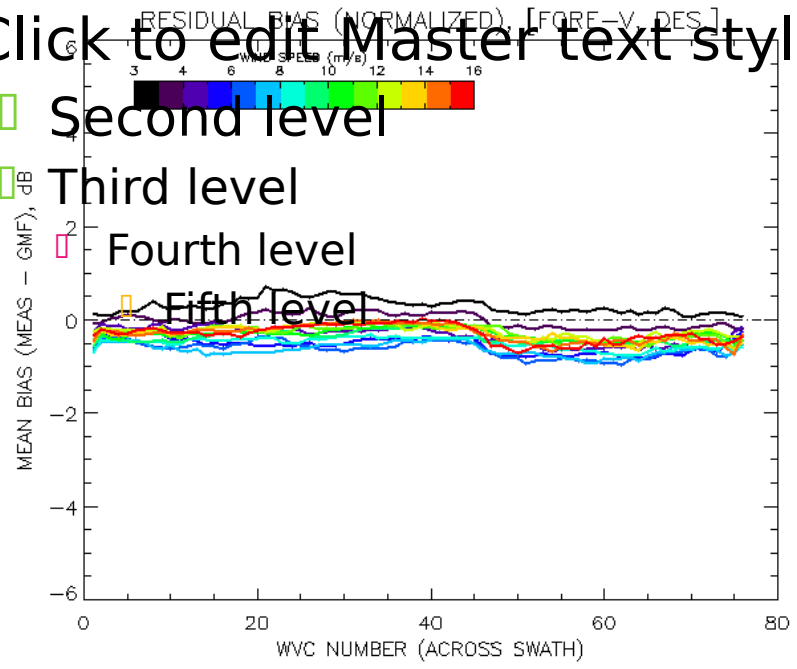


AFT LOOK

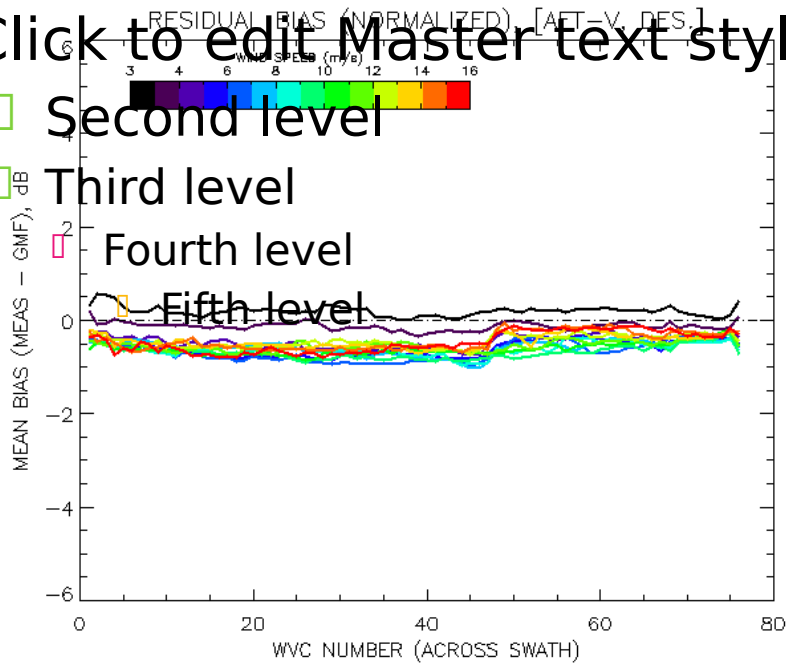
V-POL Sigma0 Residual Bias (Normalized)

We normalize the residual bias by the standard deviation calculated above: $bias_{norm} = \frac{\sigma^0_{comp} - GMF}{\sigma^0 STD}$

FORE LOOK



AFT LOOK



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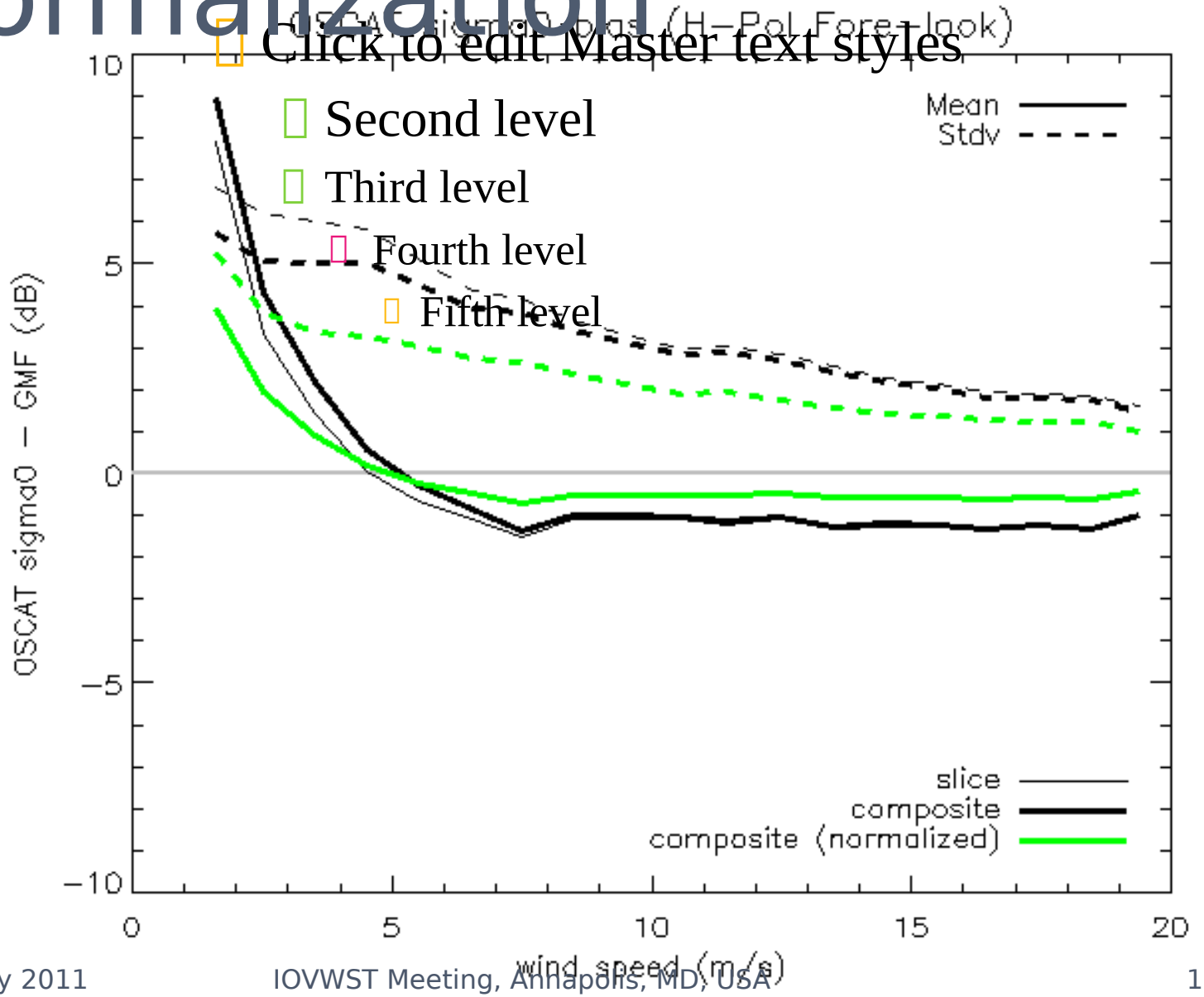
Residual Bias after Normalization



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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