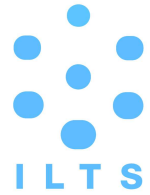




Evaluation of ASCAT Wind



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Motivation

- Evaluation of ASCAT vector wind observations

New calibration has been applied since the end of March 2008

- Assessment of the CMOD5 GMF

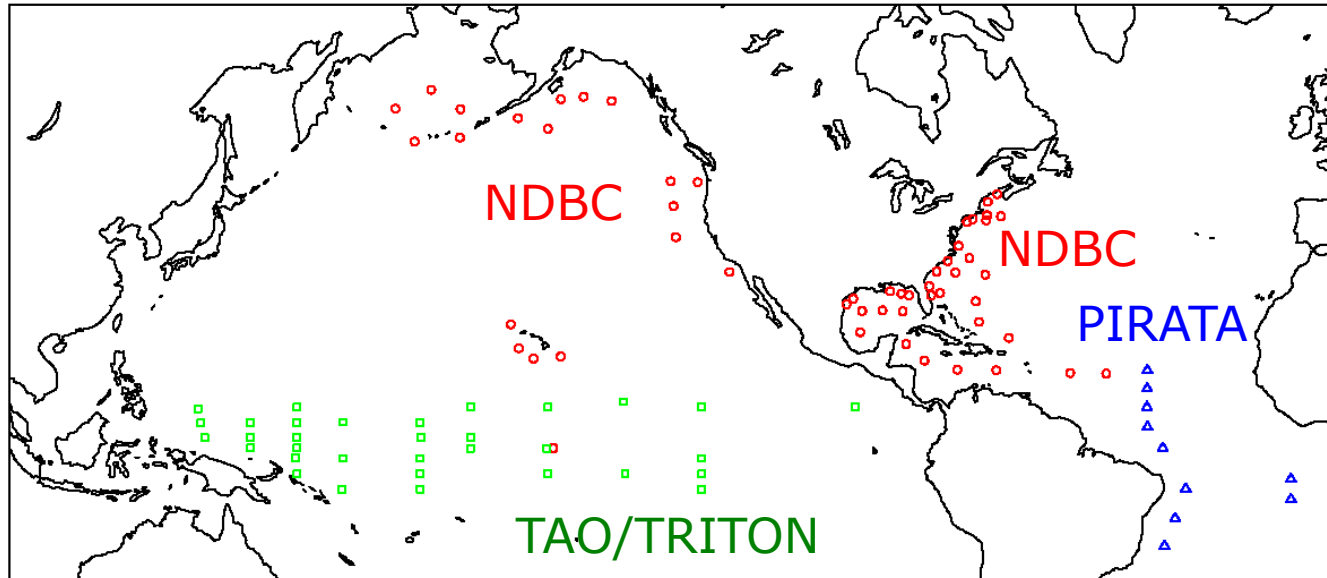
A dual (C & Ku) frequency scatterometer for GCOM-W2

Vector winds under rain and hurricane winds

Outline

- Comparisons with buoy observations
- Assessment of self-consistency using statistical distributions of wind speed and direction
- Focus
 - Performance in high wind speed range
 - Performance in low/mid wind speed range

Buoy Comparisons



- Data Period
 - From April 1, 2008 to September 30, 2008
- Collocation
 - $\Delta r < 12.5$ km, $\Delta t < 30$ min. ($\Delta t < 5$ min. for most of buoys)
- Height and Stability Collections
 - Liu and Tang (1996) Code
 - 10-m height non-equivalent neutral wind

Buoy Comparisons

Comparison of **QSCAT** vector wind with buoys (Apr to Oct 2003)

	#	Bias	RMS	Correlation
Wind Speed (m/s)	7654	-0.04	0.92	0.947
Wind Direction (deg.)				
U > 0 m/s	7652	4.5	27.2	0.968
U > 3 m/s	6813	4.2	20.5	0.982
U > 5 m/s	5193	3.7	15.7	0.989

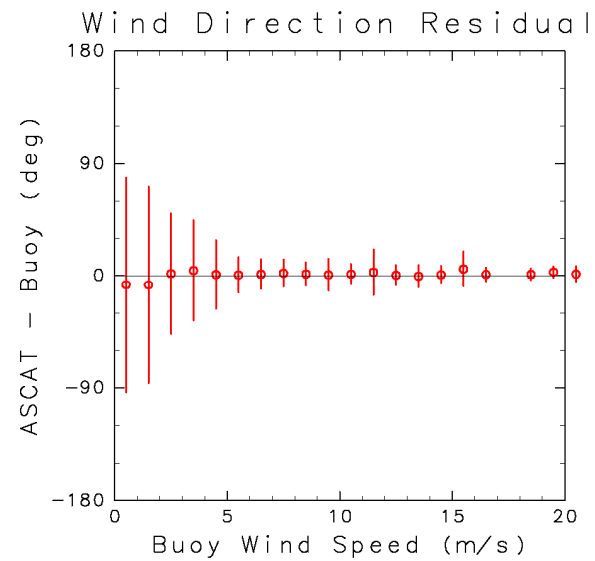
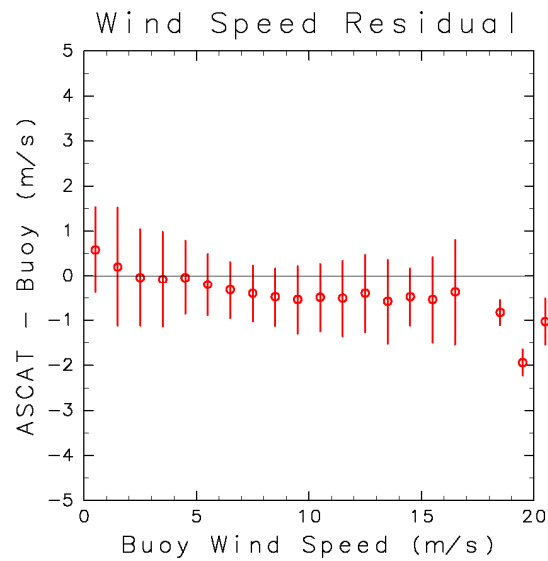
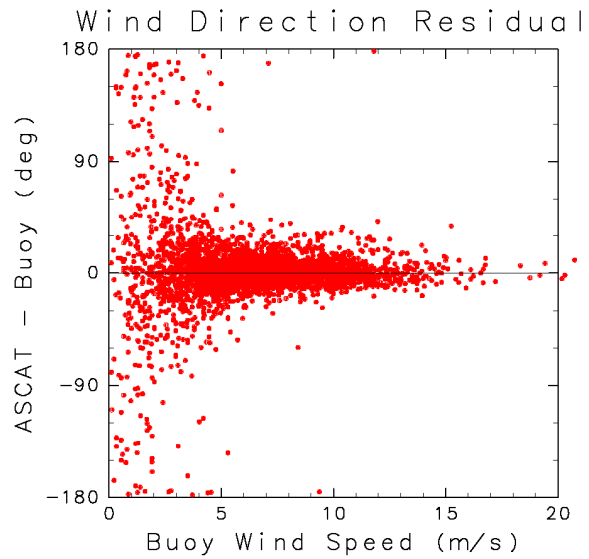
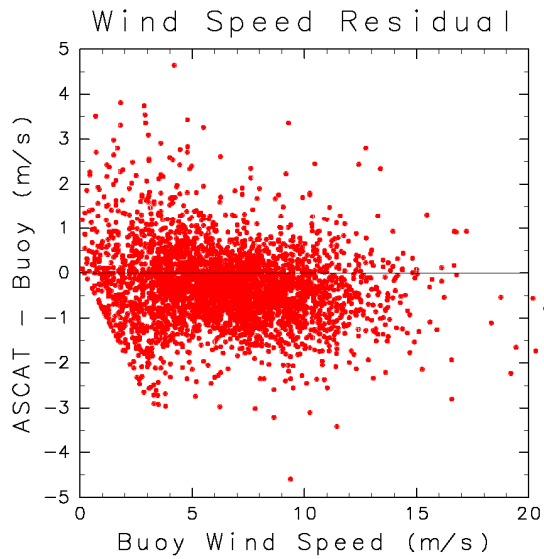
0 5 10 15 20
Buoy Wind Speed (m/s)

0 90 180 270 360
Buoy Wind Direction (deg)

0 90 180 270 360
Buoy Wind Direction (deg)

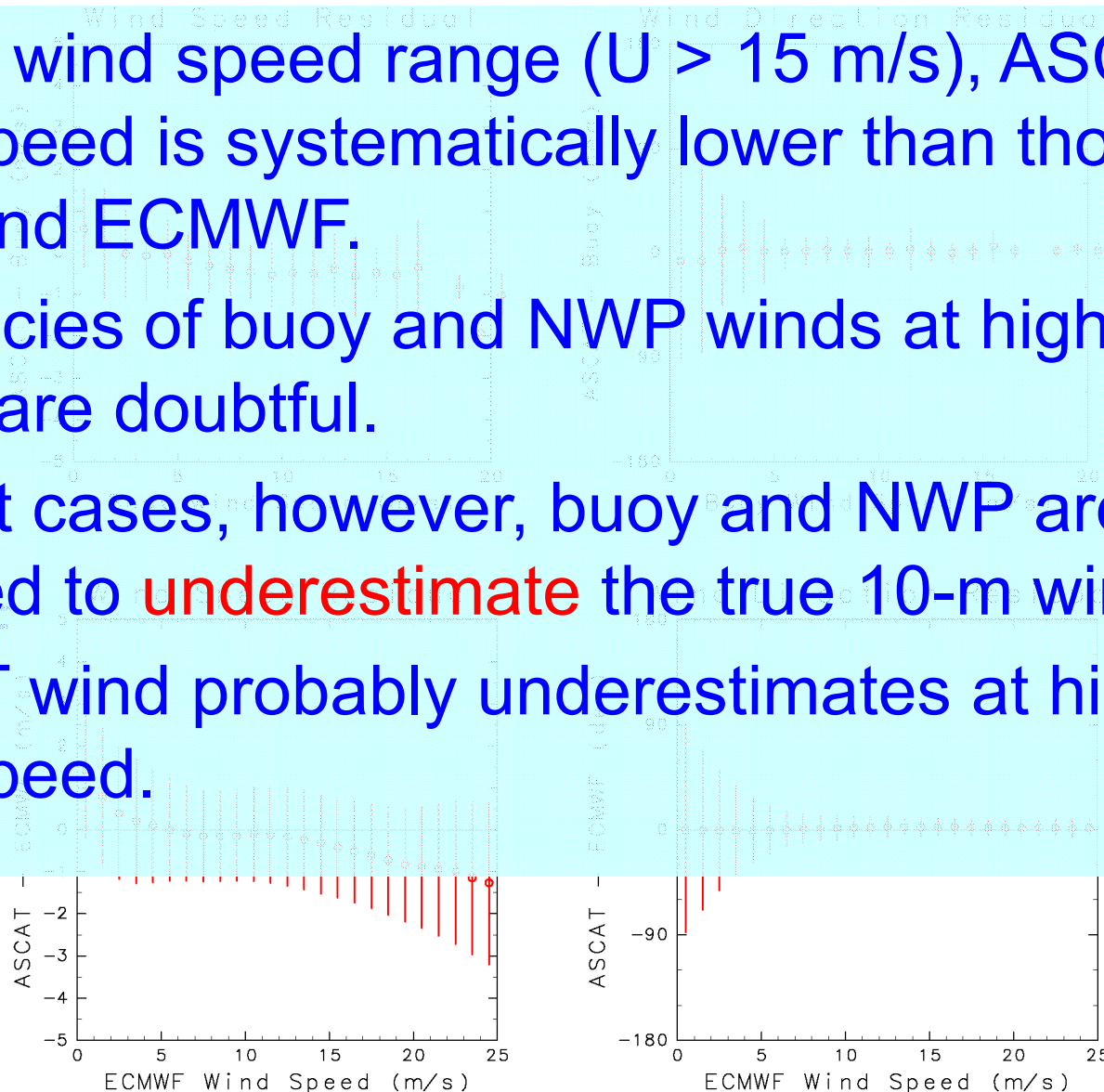
	#	Bias	RMS	Correlation
Wind Speed (m/s)	5136	-0.24	0.86	0.955
Wind Direction (deg.)				
U > 0 m/s	4975	0.9	31.7	0.944
U > 3 m/s	4081	1.2	18.2	0.980
U > 5 m/s	2944	1.5	11.1	0.992

Dependences of Residuals on Buoy Wind Speed

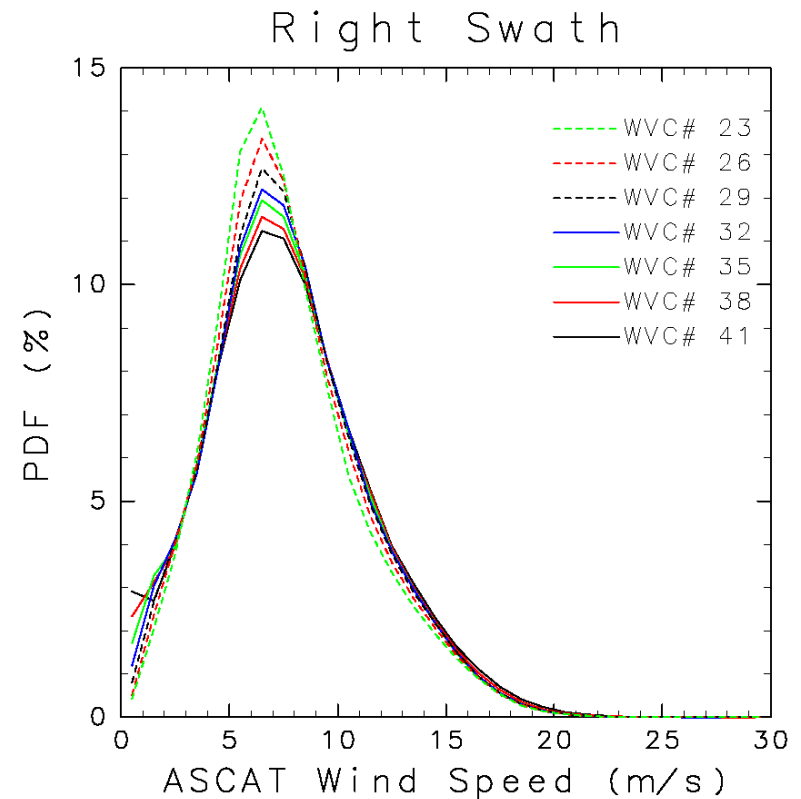
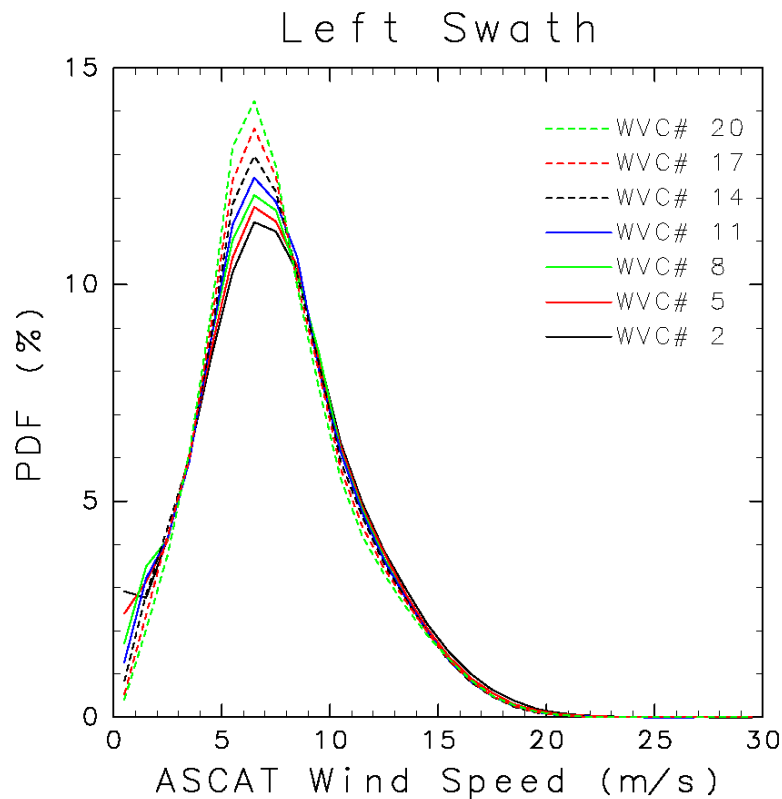


Dependences of Residuals on Wind Speed

- In high wind speed range ($U > 15$ m/s), ASCAT wind speed is systematically lower than those of buoy and ECMWF.
- Accuracies of buoy and NWP winds at high wind speed are doubtful.
- In most cases, however, buoy and NWP are believed to **underestimate** the true 10-m wind (?).
- ASCAT wind probably underestimates at high wind speed.



ASCAT Global Wind Speed Histograms

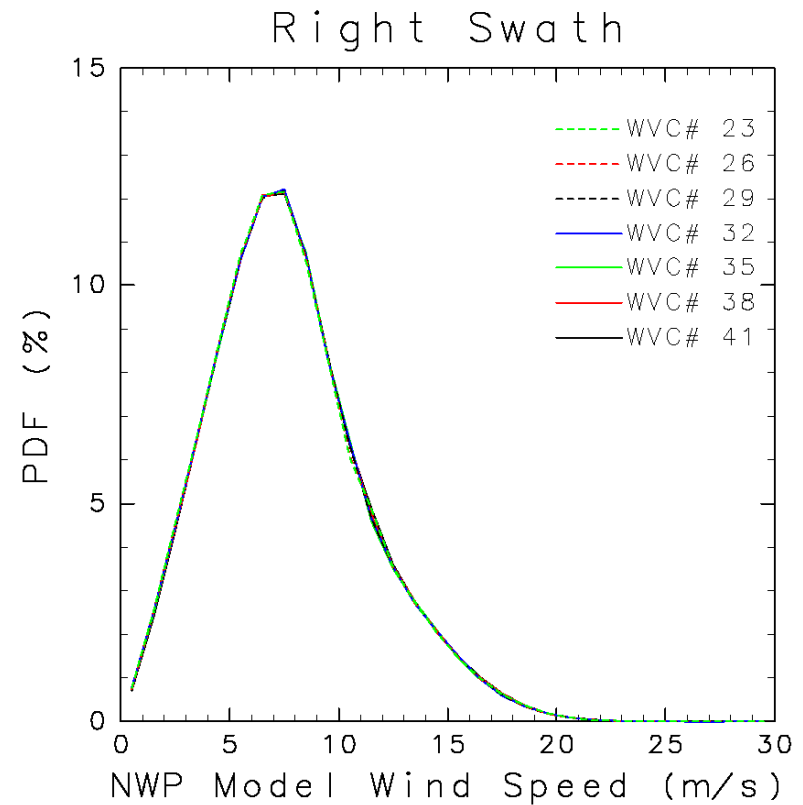
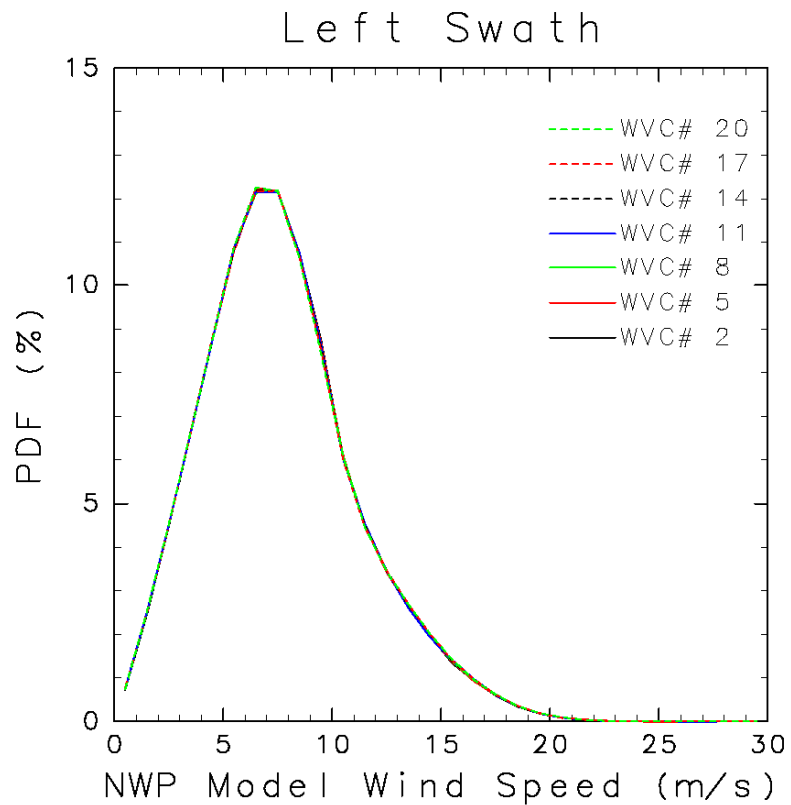


Period: April 1, 2008 – October 31, 2008

Area: global ocean, 60°S – 60°N

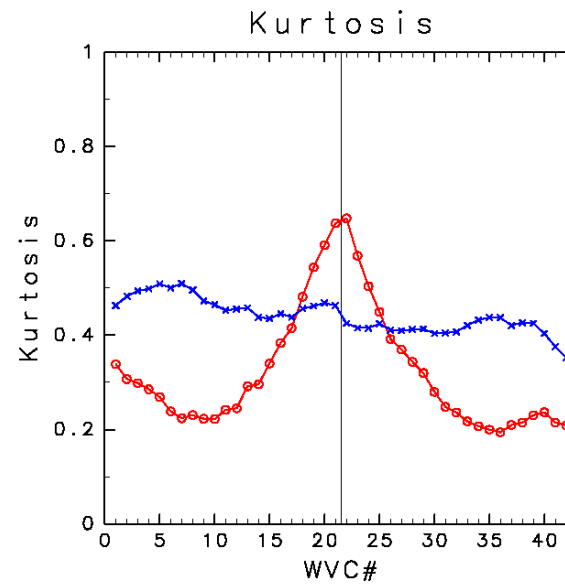
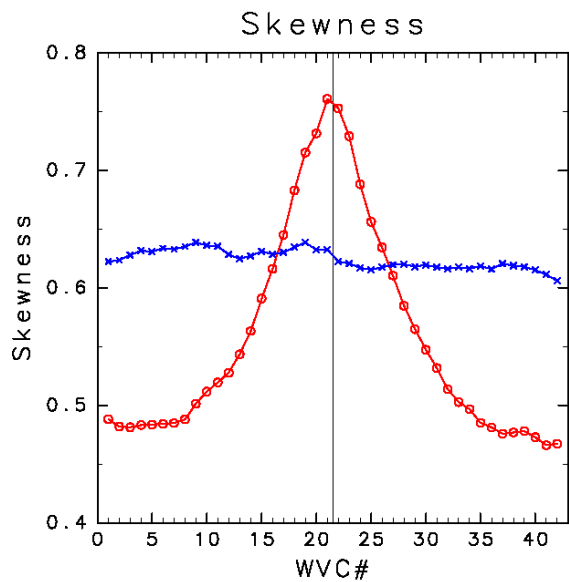
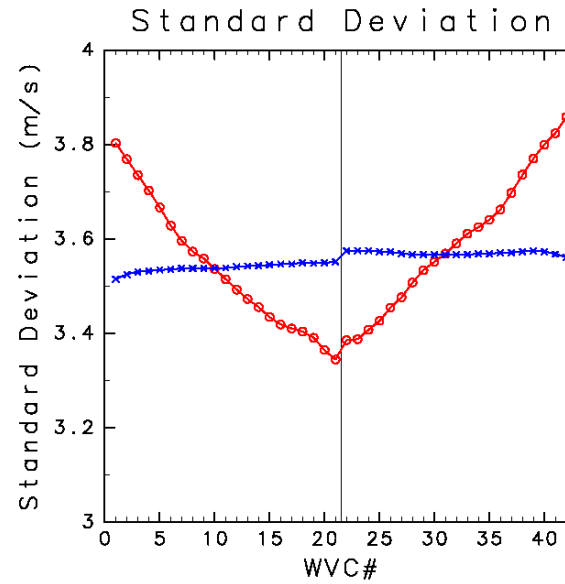
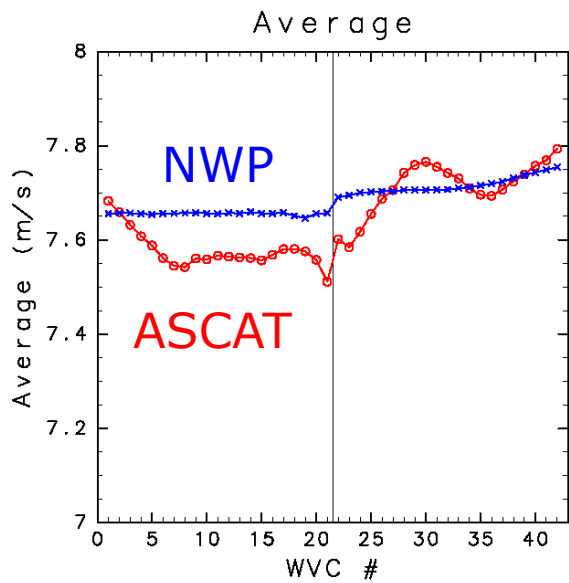
Bin size: 1 m/s

ECMWF Wind Speed Histograms



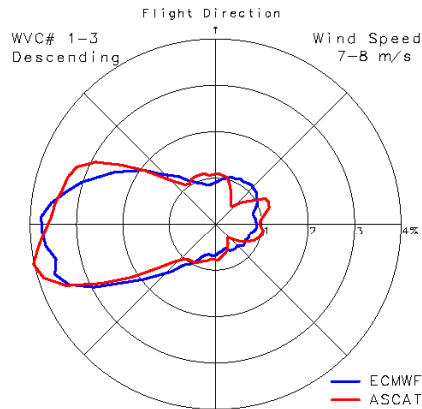
Collocated with ASCAT observations

Statistics of ASCAT Wind Speed Distribution

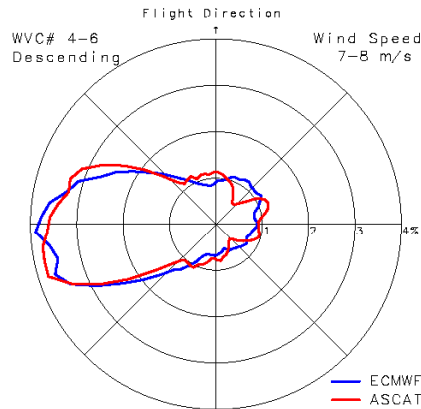


ASCAT Wind Direction Histograms

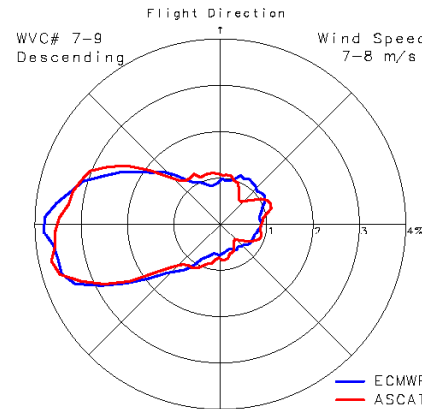
WVC# 1-3



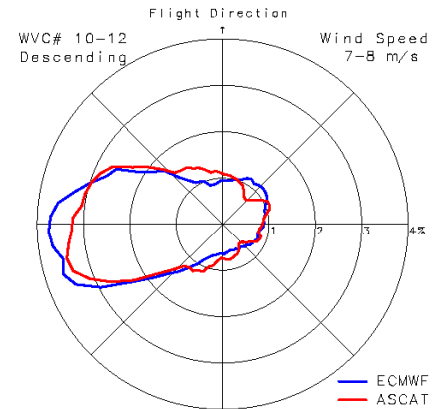
WVC# 4-6



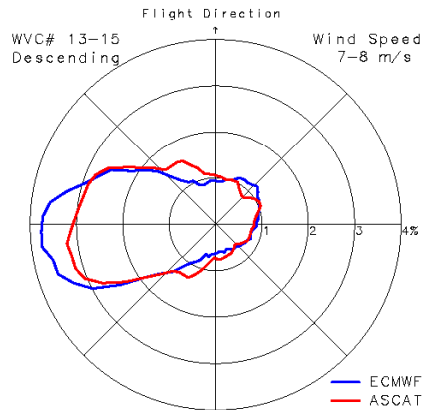
WVC# 7-9



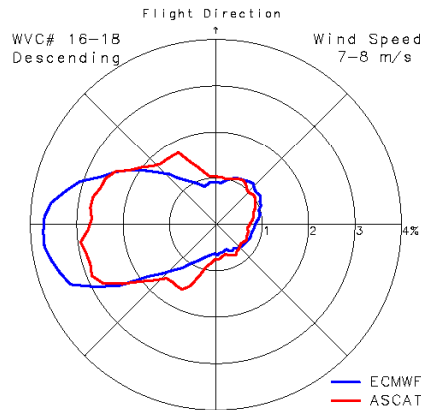
WVC# 10-12



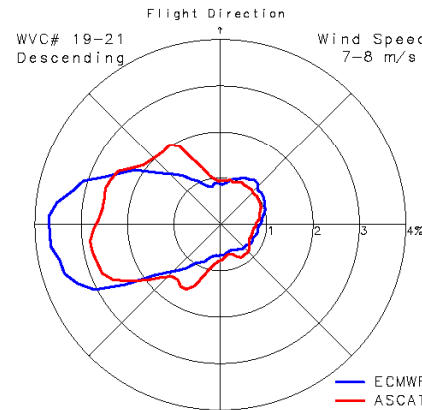
WVC# 13-15



WVC# 16-18



WVC# 19-21

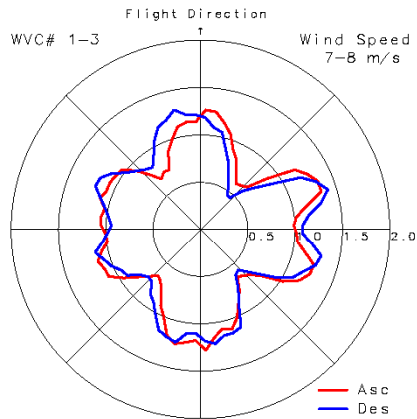


ECMWF
ASCAT

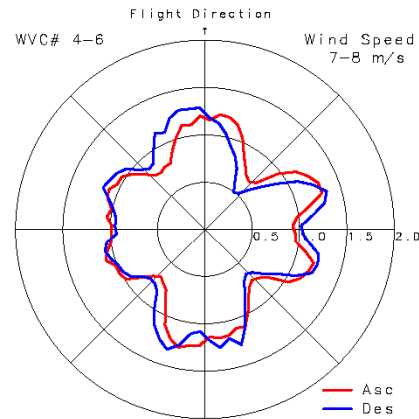
Left Swath, Wind Speed Range: 7-8 m/s, Descending Paths

Normalized Wind Direction Histograms

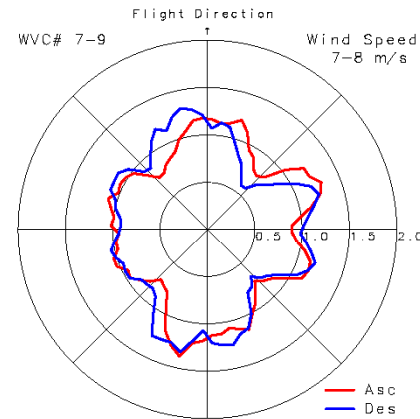
WVC# 1-3



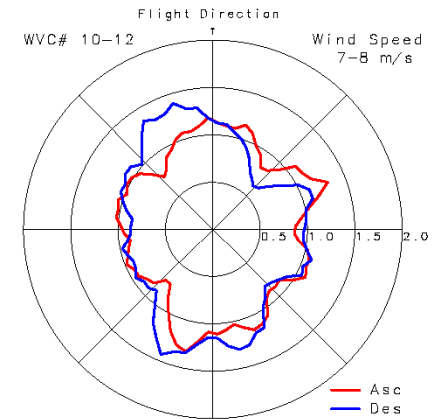
WVC# 4-6



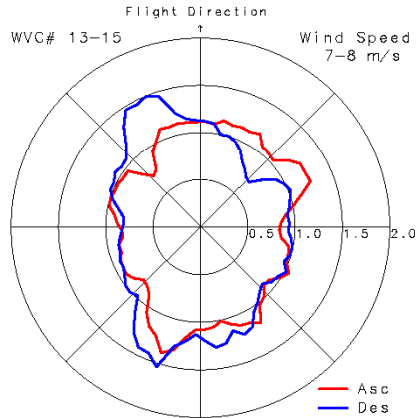
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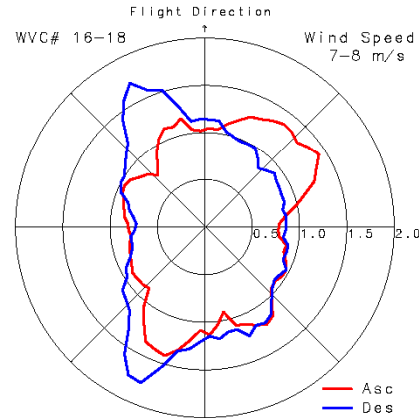
WVC# 10-12



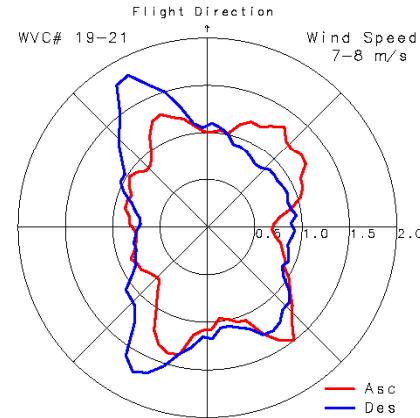
WVC# 13-15



WVC# 16-18



WVC# 19-21

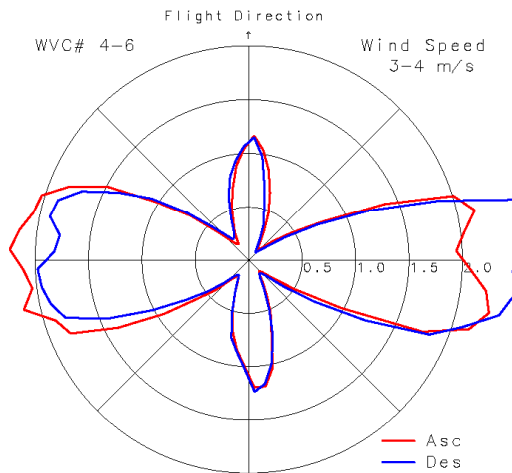


Descending
Ascending

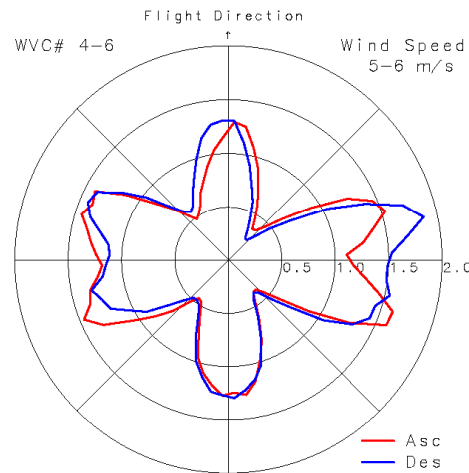
Normalized (ASCAT/ECMWF), Left Swath, Wind Speed: 7-8 m/s

Wind Speed Dependence of ASCAT Wind Direction Histograms

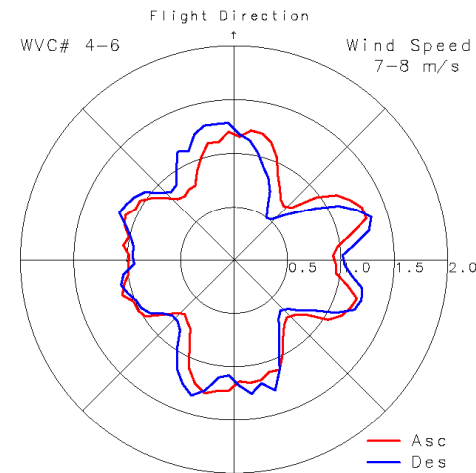
3-4 m/s



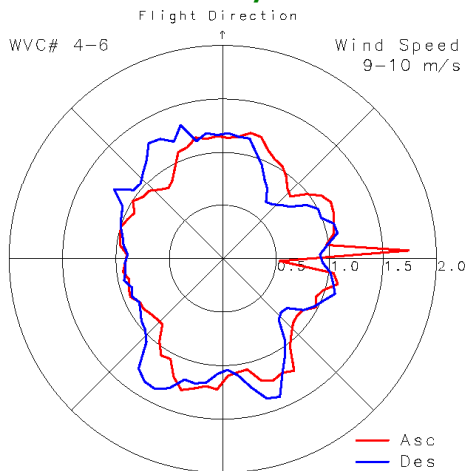
5-6 m/s



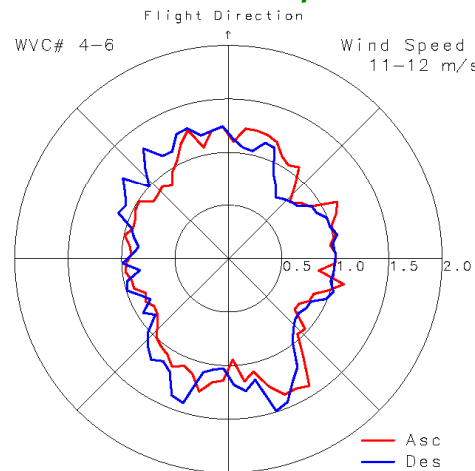
7-8 m/s



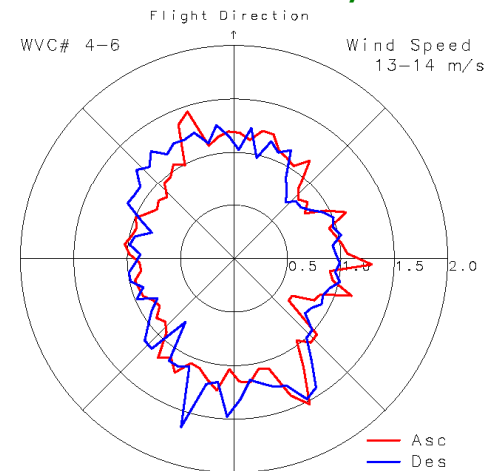
9-10 m/s



11-12 m/s



13-14 m/s



Descending
Ascending

Normalized (ASCAT/ECMWF), WVC#: 4-6 (Left Far Swath)

Summary

- ASCAT wind speed and direction agree well with buoy observations, except for small negative bias in wind speed (0.2 m/s).
- RMS differences of wind speed and direction are comparable to or slightly better than those of QSCAT winds.
- ASCAT wind speed has systematic negative bias with reference to buoy observations and ECMWF outputs in high wind speed range (> 15 m/s).
- ASCAT global wind speed histogram varies with cross-track cell location.
- Directivities relative to the antenna beams are discernible in low to mid wind speed ranges (< 8 m/s).
- These results suggest needs of improvements of the C-band GMF (and/or calibration of the antenna beams).