OVWST in Boulder (May, 2009)

Reconstructed Gridded Product of Global Wind Field by Qscat/SeaWinds Data and its Application to Ocean -Atmosphere Interaction in the western North Pacific

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Outline of this study

Introduction of our gridded surface flux products
(*J-OFURO*:*Momentum* & *Heat*) derived by satellite data

Validation for *Gridded Wind Products*
by *Qscat/Seawinds* (1999 -) & *AMSR-E* (2002 -)
using KEO and TAO buoys

Investigation of *Ocean - Atmosphere Interaction*
in the Kuroshio Extension region
using Gridded Products

Summary

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Our Data Server for the Satellite-derived Surface Flux Products in J-OFURO
Japanese - Ocean Flux Data Sets with Use of Remote-Sensing Observations

Gridded Product of Surface Wind/Wind-stress Field using Satellite Scatterometer Data

Parameter : Surface Wind / Wind-stress Vectors
Region : World Ocean (60°N-80°S, 0°E - 0°W)
Spatial Resolution : 1° x 1° grid
J-OFURO : surface flux data *http://dtsv.scc.u-tokai.ac.jp/j-ofuro/*
Time Resolution : Daily (10-day)
Period : Aug. 1991 - Dec. 2000 ERS-1& 2
Aug. 1999 - *Jul. 2006* Qscat/SeaWinds (Ver.1)
Aug. 1999 - Dec. 2008 Qscat/SeaWinds (Ver.2)
Apr. 2002 - *Sep. 2004* ADEOS-Ⅱ/SeaWinds

Updating for Qscat Data Ver.2

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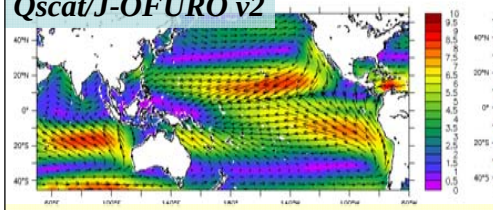
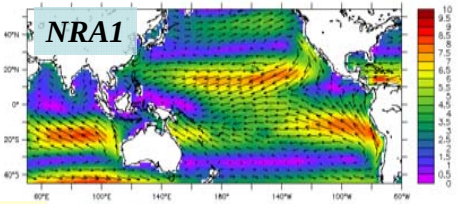
Comparison in 8-year (2000-07) mean fields
Color: Wind-speed, Arrows: Wind vectors

Qscat/J-OFURO v2

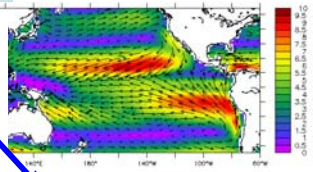


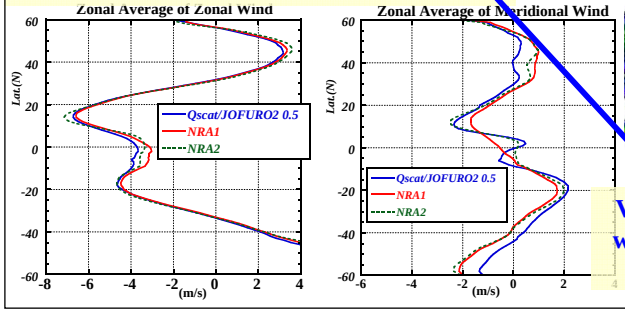
NRA1



There are, more or less, discrepancies among different wind products.

NRA2





Validation by comparison with in-situ measurements (moored buoys)

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Validation of Wind Products

We have validated the reliability for our gridded products of wind/wind-stress by QSCAT/J-OFURO by inter-comparison with the in-situ measurement data, that is, moored buoys (KEO, TAO and NDBC), together with other products with global coverage.

⇩

NWP product : NCEP/NCAR reanalysis (NRA-1 & 2)

Reliability : depend on the performance of numerical weather prediction model

Name of Data set	Grid size (degree)	Region	
		Zonal	Meridional
QSCAT/J-OFURO V1	1.0	30°E - 390°E	80°S - 60°N
QSCAT/J-OFURO V2	1.0 (0.5)	30°E - 390°E	80°S - 60°N
NRA1	about 1.875	0°E - 1.875°W	88.542°S - 88.542°N
NRA2	about 1.875	0°E - 1.875°W	88.542°S - 88.542°N

Validation using KEO buoy (2004/7/1～2005/11/09)

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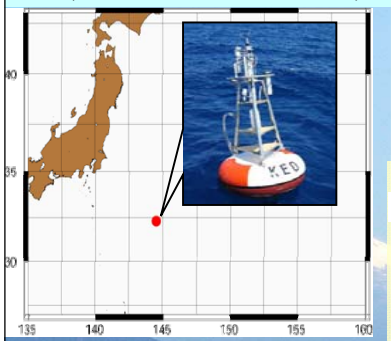
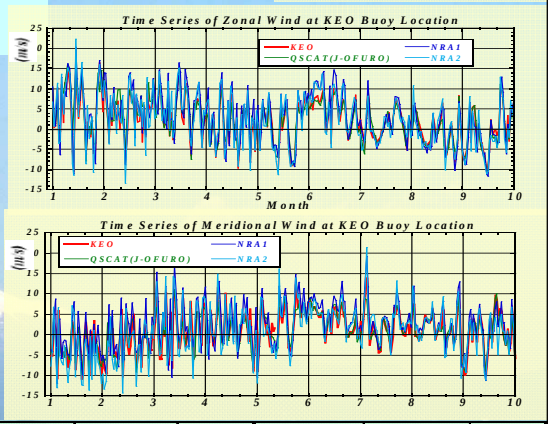




	Name of Data sets	Corr. Coeff	Mean-Diff	RMSD	Corr. Coeff	Mean-Diff	RMSD
Wind	QSCAT/J-OFURO V2	0.93	0.00	2.11	0.92	-0.16	1.96
	NRA1	0.95	0.27	2.04	0.94	0.07	2.06
	NRA2	0.95	-0.04	1.96	0.95	-0.23	1.61
Wind-stress	QSCAT/J-OFURO2	0.91	0.000	0.048	0.86	-0.002	0.049
	NRA1	0.94	0.024	0.056	0.90	0.015	0.052
	NRA2	0.94	0.001	0.050	0.89	-0.001	0.050

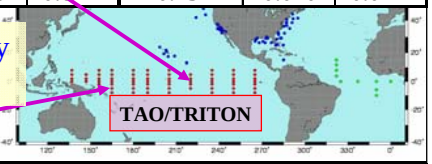
Validation using TAO buoys

OVWST in Boulder (May, 2009)

2N, 140W

		Zonal			Meridional		
	Name of Data sets	Corr. Coeff.	MeanD	RMSD	Corr. Coeff.	MeanD	RMSD
Wind Speed	J-OFURO2	0.91	0.61	0.84	0.97	0.17	0.86
	NRA1	0.76	1.24	1.23	0.81	-1.67	2.07
	NRA2	0.66	0.81	1.54	0.77	-0.51	2.37
Wind Stress	J-OFURO2	0.91	0.016	0.018	0.96	0.001	0.012
	NRA1	0.75	0.028	0.024	0.75	-0.023	0.028
	NRA2	0.66	0.018	0.027	0.75	-0.010	0.027

Our Qscat Product has higher reliablitiy than the NRA-1 & 2.



2S,156E

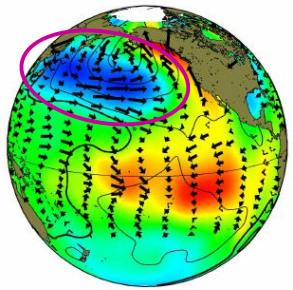
		Zonal			Meridional		
	Name of Data sets	Corr. Coeff.	MeanD	RMSD	Corr. Coeff.	MeanD	RMSD
Wind Speed	J-OFURO2	0.93	-0.42	1.33	0.87	-0.16	1.13
	NRA1	0.89	0.21	1.68	0.82	-0.20	1.31
	NRA2	0.87	0.15	1.79	0.78	-0.07	1.56
Wind Stress	J-OFURO2	0.93	-0.003	0.014	0.85	-0.002	0.012
	NRA1	0.88	0.001	0.021	0.84	-0.001	0.012
	NRA2	0.87	0.000	0.020	0.81	-0.001	0.013

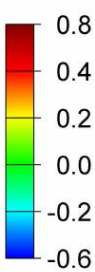
Background of Ocean - Atmosphere Interaction in the Kuroshio Extension region using Gridded Products

OVWST in Boulder (May, 2009)

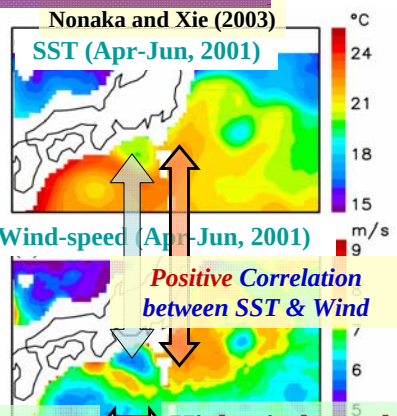
(Mantua et al. 1997)

Pacific Decadal Oscillation
positive phase





Nonaka and Xie (2003)



Positive Correlation between SST & Wind

High wind speed ⇔ Low SST

Strong westerly winds produces decrease of SST via evaporation.

Atmosphere ⇒ Ocean

High SST ⇔ High wind speed

Development of vertical mixing over warm water produces enhancement of wind speed.

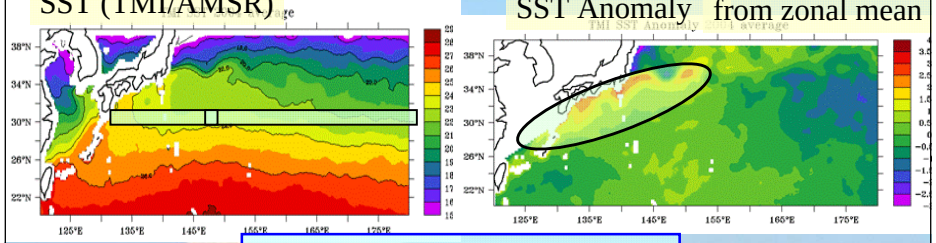
Ocean ⇒ Atmosphere

Mean Field in 2004

OVWST in Boulder (May, 2009)

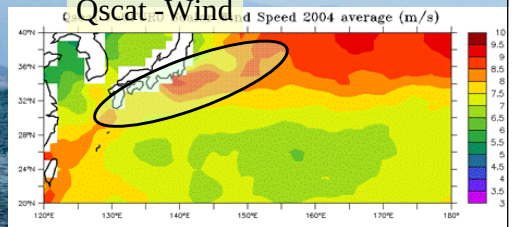
SST (TMI/AMSR)

SST Anomaly from zonal mean



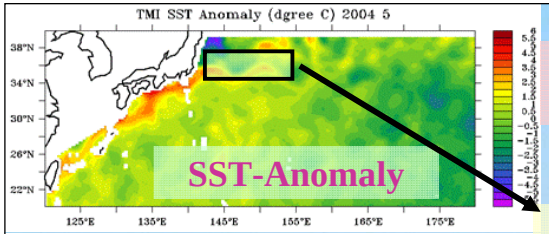
Anomaly = SST − Zonal Mean SST

Qscat -Wind

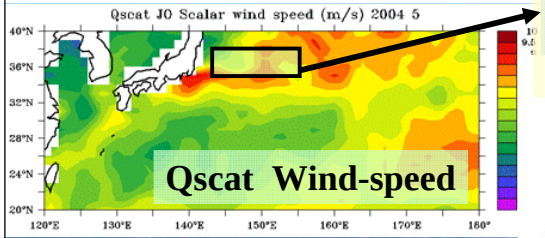


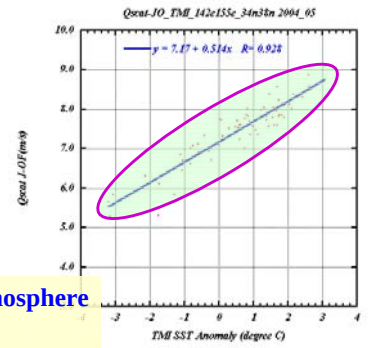
Correlation Analysis in the Kuroshio Extension Region using Qscat-V2 wind-speed and TMI/AMSR SST anomaly

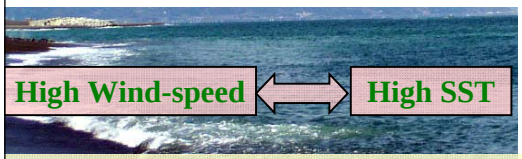
Case of High Correlation (May, 2004)



Correlation between SST-anom. & Wind-speed (34-38° N, 142-155° E)



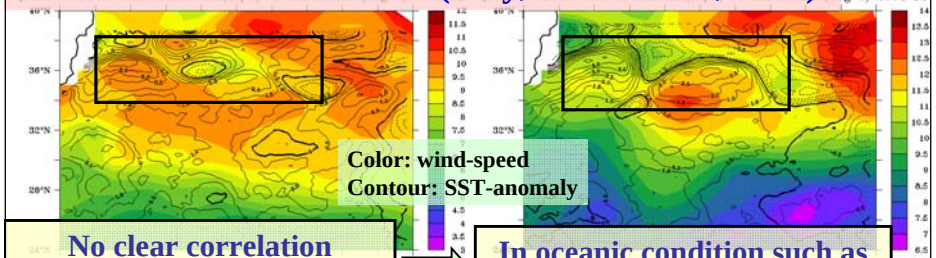




High Wind-speed ⟷ High SST

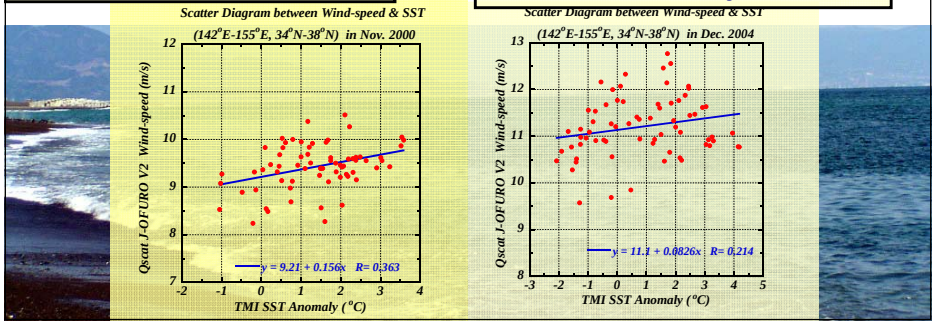
Dominance of the effect from the ocean to atmosphere in the Kuroshio Extension region

Cases of Low Correlation (May, 2000 & Dec, 2004)



Color: wind-speed
Contour: SST-anomaly

No clear correlation between wind-speed & SST ⇨ In oceanic condition such as the dominant eddy structure



Summary

Reconstruction of Gridded Products of Surface Wind Field over the World Ocean using *Qscat/SeaWinds*

Validation of different wind products using buoy winds

Qscat/SeaWinds* & *NWP (NRA-1, 2)

⇨ **Qscat/*SeaWinds* product has higher reliability than NWPs.**

Investigation of *Ocean - Atmosphere Interaction*

High/Low Wind-speed ⟷ High/Low SST

High Positive Correlation between Wind-speed and SST

Correlation features seems to be due to oceanic condition.

⇨ ***Qscat high-resolution product gives much helpful information to such studies on the ocean-atmosphere interaction.***