

# Construction of New Gridded Product of Surface Wind Vectors over the Global Ocean by Multiple Satellite Observations

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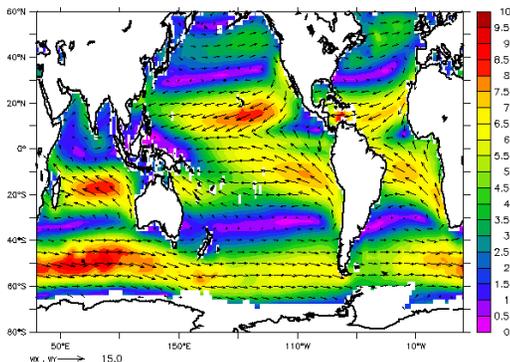
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**Masahisa Kubota (Tokai University)**

**Kunio Kutsuwada (Tokai University)**

**Suguru Kameda (Tokai University → Tome Lab.)**



# Outline

*IOWVST meeting in Sapporo  
May 18, 2016*

New version of our gridded product

**J-OFURO 3**

Overview

Current status

Problem

**Quality Control System (QCS)**

by comparisons with buoy measurements  
for validation of gridded products

Summary

***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 V2**

surface flux data <http://dtsv.scc.u-tokai.ac.jp/j-ofuro/>

Time Resolution : Daily

Period: **Aug. 1999 - Oct. 2009 Qscat/SeaWinds**

**Apr. 2008 - Dec. 2015 MeTOP/Ascet**

***Updating Ascet Data***

# J-OFURO3

Japanese Ocean Flux data sets  
with use of Remote Sensing Observations

J-OFURO1 → J-OFURO2 → **J-OFURO3**  
2000                      2008                      2016

Available fluxes and parameters

Latent and sensible heat fluxes

Net heat flux

**Momentum flux / Surface wind vector**

Freshwater flux

Wind vector, humidity, air-temperature, sea surface temperature

	J-OFURO2	J-OFURO3
Available period	1988-2008	1988-2013 *2008-2010, currently
Temporal grid	daily mean	daily mean
Spatial Grid	1.0 degree grid 0.25degree grid for 2002-2008	0.25 degree grid
Sea Surface Temp.SST	MGDSST (AVHRR+AMSR-E)	EMSST (8 satellite products)
Humidity QA	Schlüssel et al. 1995 with SSIMs	<b>New Algorithm</b> SSIMs, SSMISs, AMSR-E, TMI, and AMSR2
Wind Speed W, Wind Vector U, and V	SSIMs, ERS-1/2, QuikSCAT, AMSR-E, TMI	SSIMs, SSMISs, ERS-1/2, QuikSCAT, AMSR-E, TMI, WindSAT, Ascet, and AMSR2

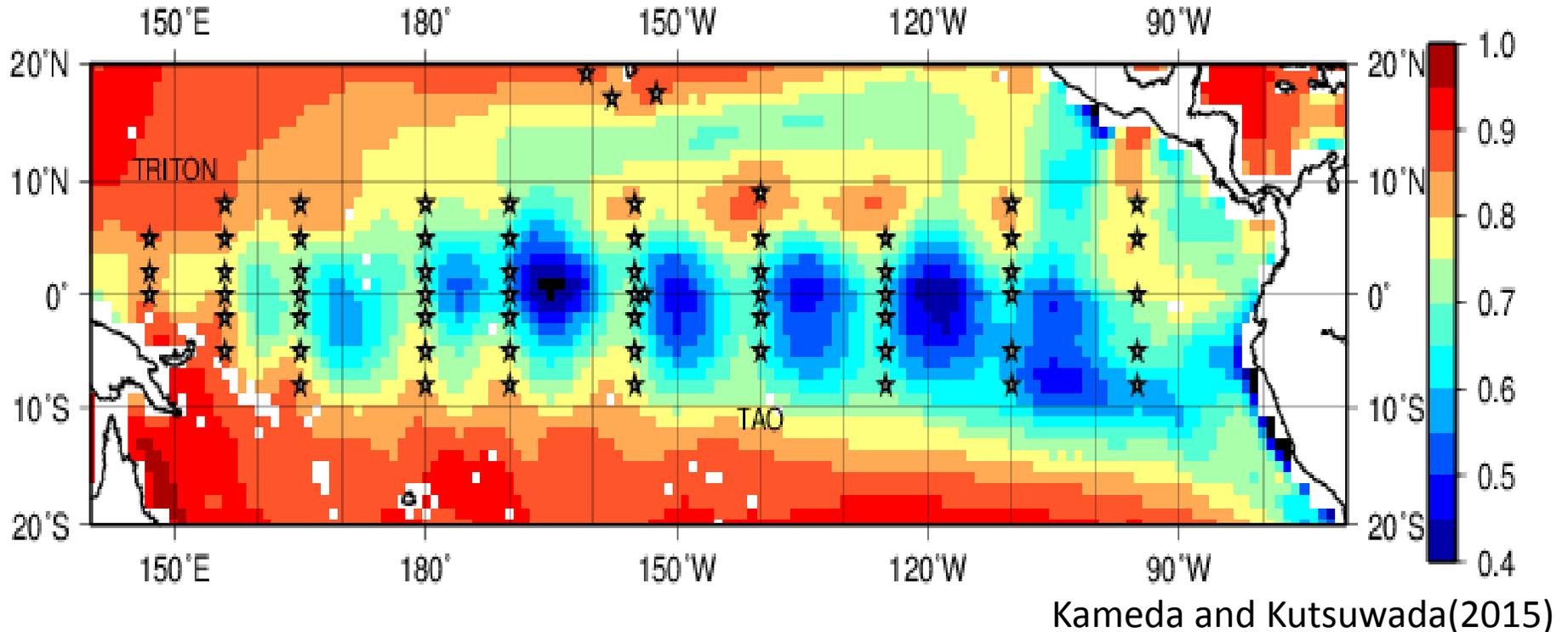
# Final goal

## *in our Air-sea Flux Products*

Products with higher spatial resolution  to examine small-scale phenomena in marginal seas and/or coastal region

Construction using **only data**  
**obtained by satellite measurements**

# Correlation between QSCAT/J-OFURO V2 and NRA1 for meridional wind



Spatial correlations tend to depend on buoy locations.



The NWP model products have reliabilities which are spatially inhomogeneous, possibly due to assimilation by buoy measurement data.

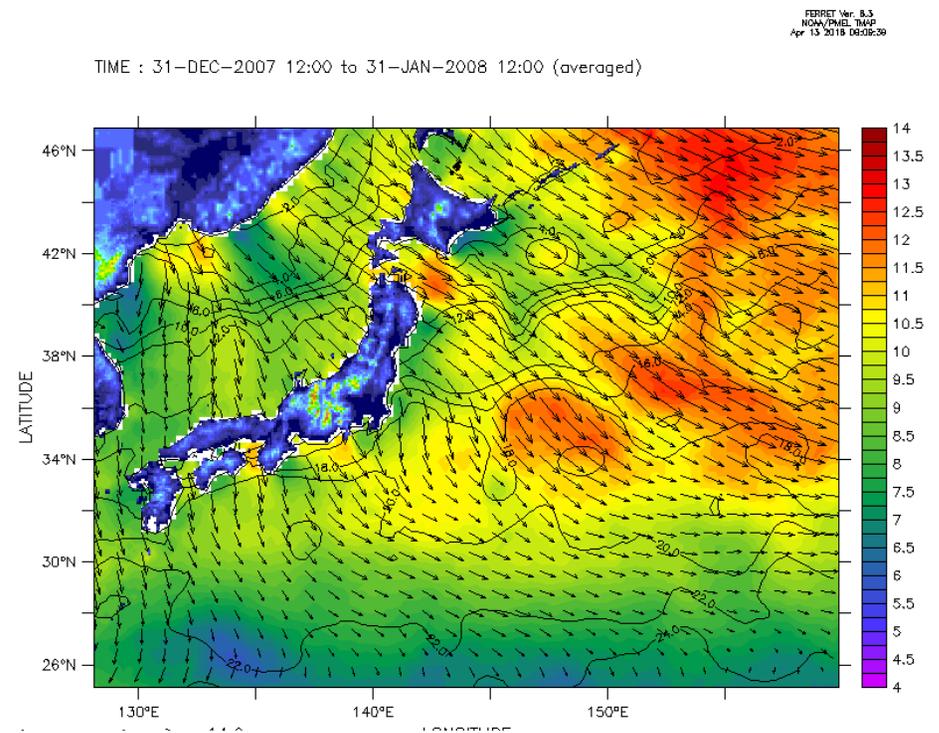
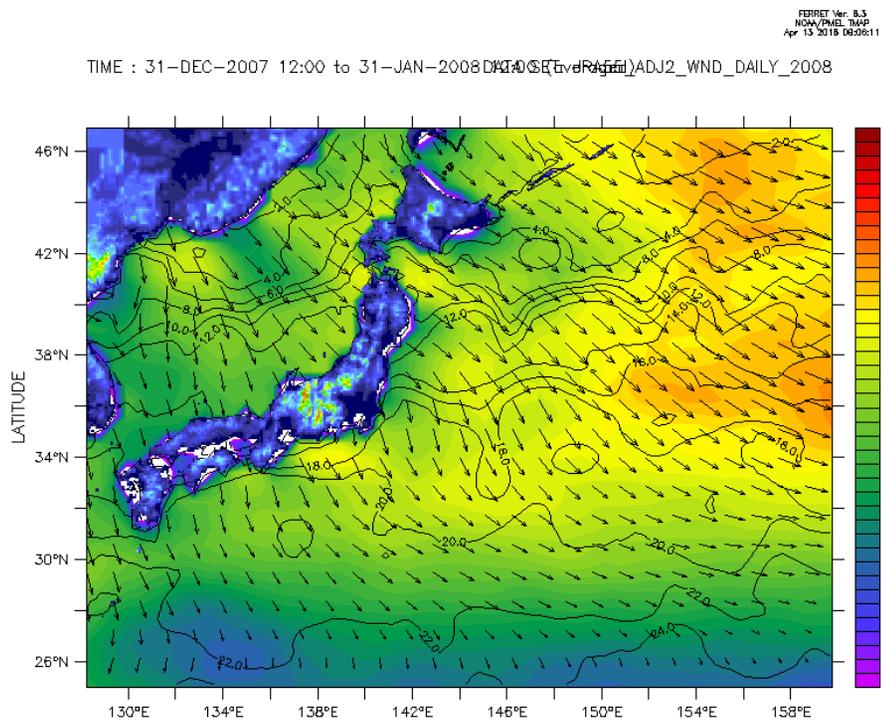
# SST & Wind Vector

@ around Japan, mean field in January 2008

Units: m/s, color over land: topography

JRA-55

J-OFURO3 (V0.3, CSF)

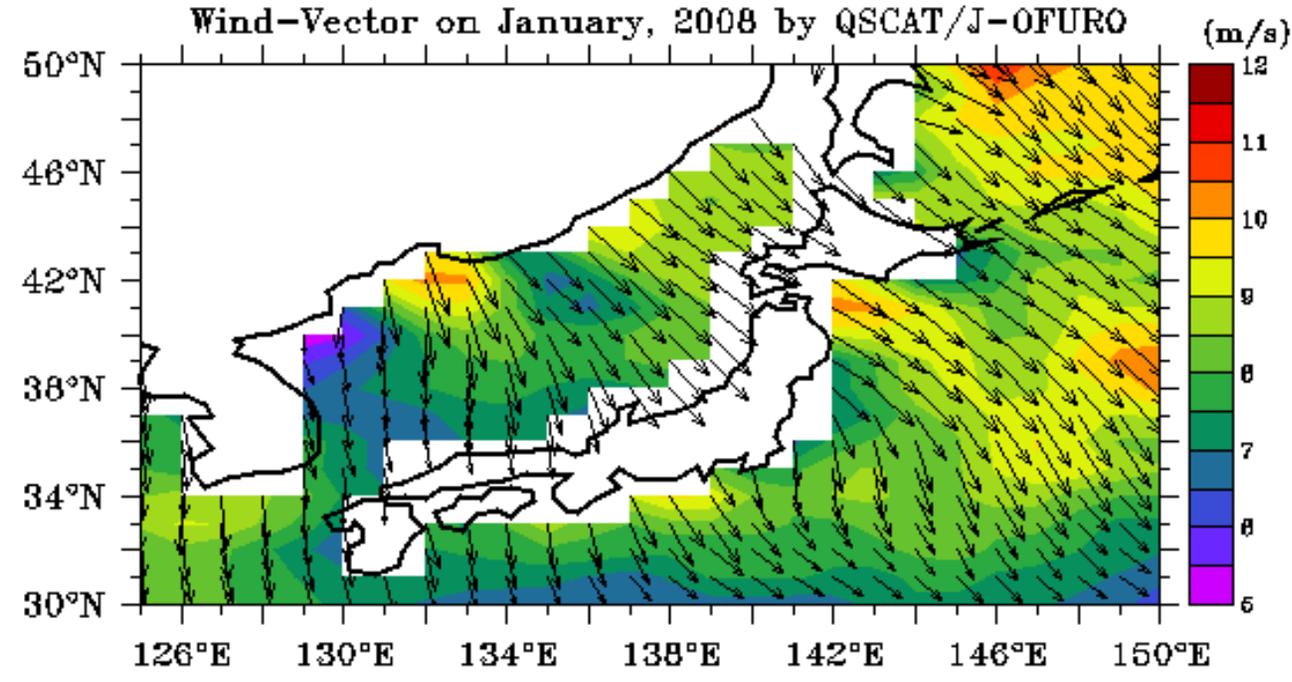
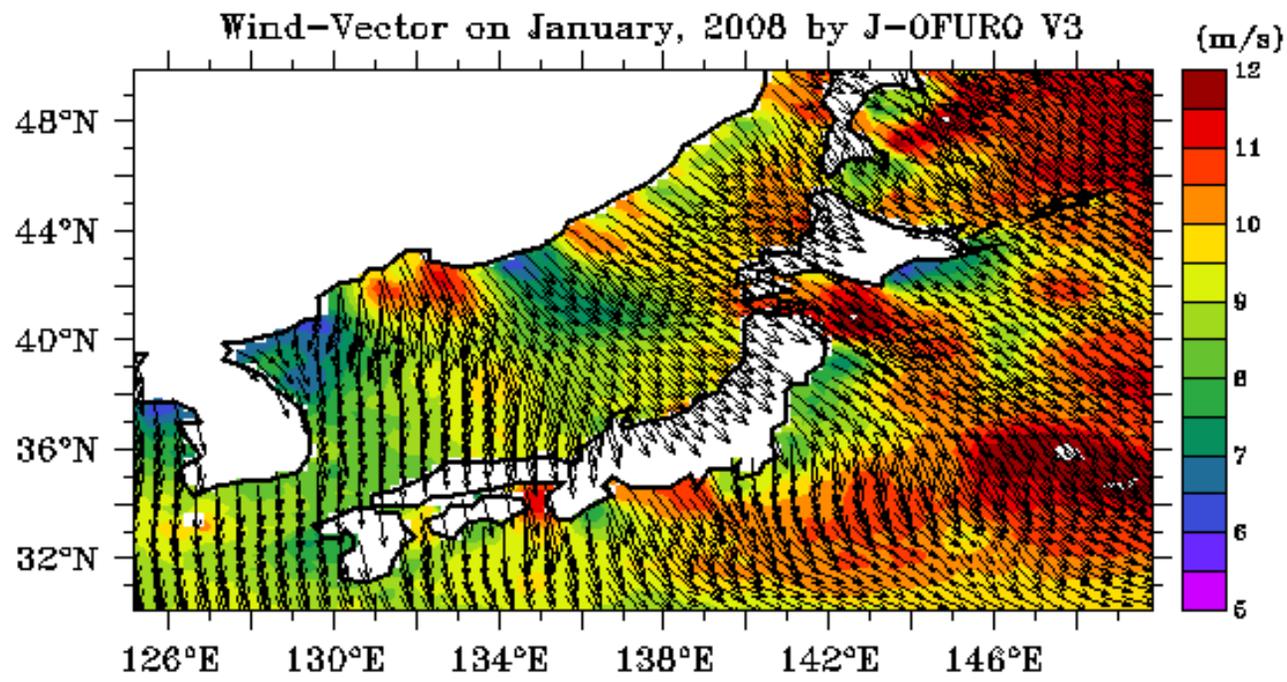


Contour: J-OFURO3 SST [deg.C]

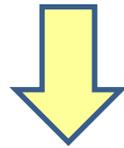
## Comparison between our products

	J-OFURO2	J-OFURO3
Wind Vector U, and V	ERS-1/2 QuikSCAT ASCAT-A & B	SSMIs, SSMISs, ERS-1/2, QuikSCAT, AMSR-E, TMI, WindSAT, Ascet, and <i>AMSR2</i>
Procedure for gridded product	<i>Weighting average method</i> (changing with time and space)	<i>Optimum Interpolation method for each day</i>

*IOWVST meeting in Sapporo  
May 18, 2016*



We need to validate our product  
by comparison with in-situ measurements  
using moored buoys (as many as possible),  
together with other products.



Quality Control System (QCS)  
by comparison  
with buoy measurements

# Quality Control System V2(QCS2)

# J-OFURO V0.3

Main ID "WIND\_VECTOR3" Sub ID "07" Data Name "J-OFURO3\_V0.3"

Intercomparison "on" Validation "FLUX"

Variable "UWND" Year "ALL" Buoy Version "BETA"

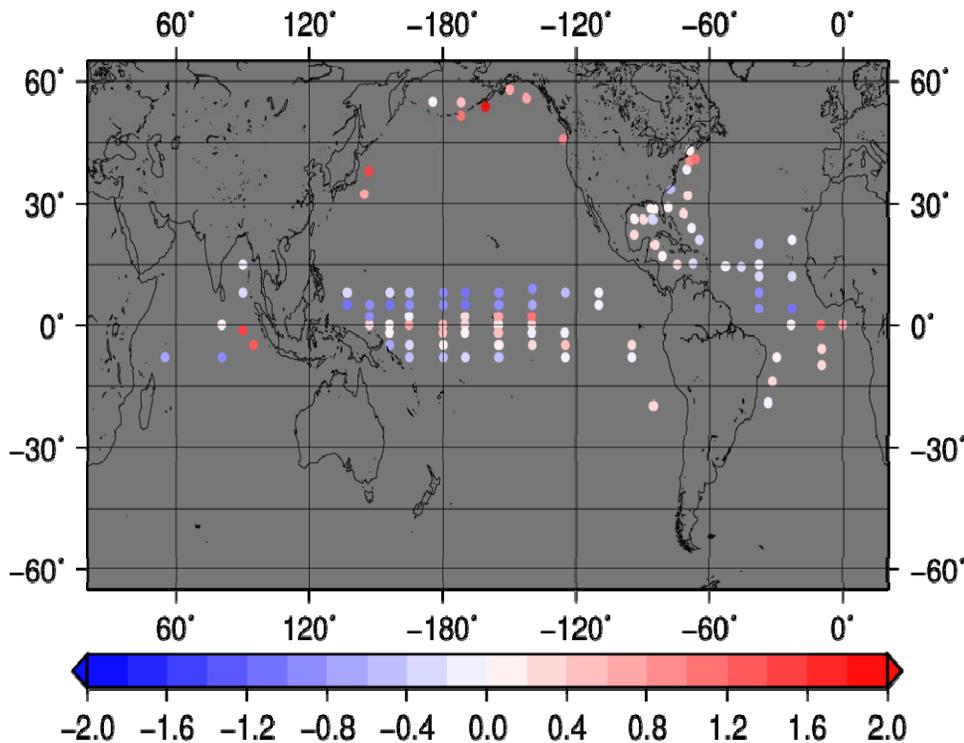
["UWND\\_statistic\\_ALL\\_FLUX.txt"](#)

["01"](#) ["02"](#) ["03"](#) ["04"](#) ["05"](#) ["06"](#) ["07"](#)

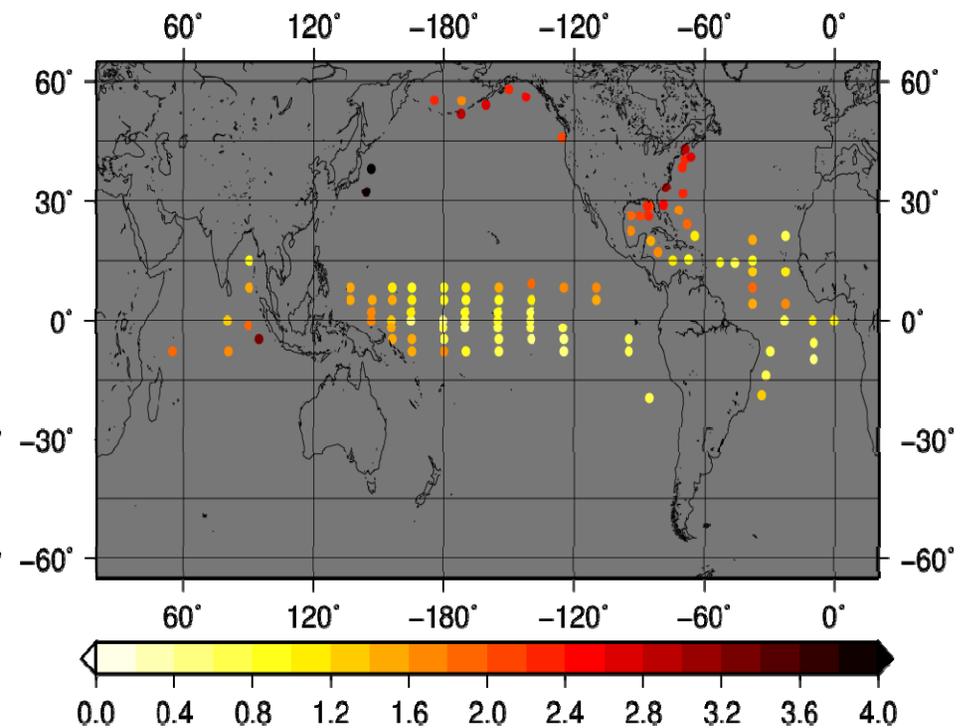
["2008"](#) ["ALL"](#)

["UWND"](#) ["VWND"](#)

UWND ALL BIAS (Num. >= 30)



UWND ALL RMSE (Num. >= 30)



# Quality Control System V2(QCS2)

# J-OFURO V0.3

number of data : **17601**

Buoy average : **-4.841** Grid data average : **-5.009** Bias : **-0.169**

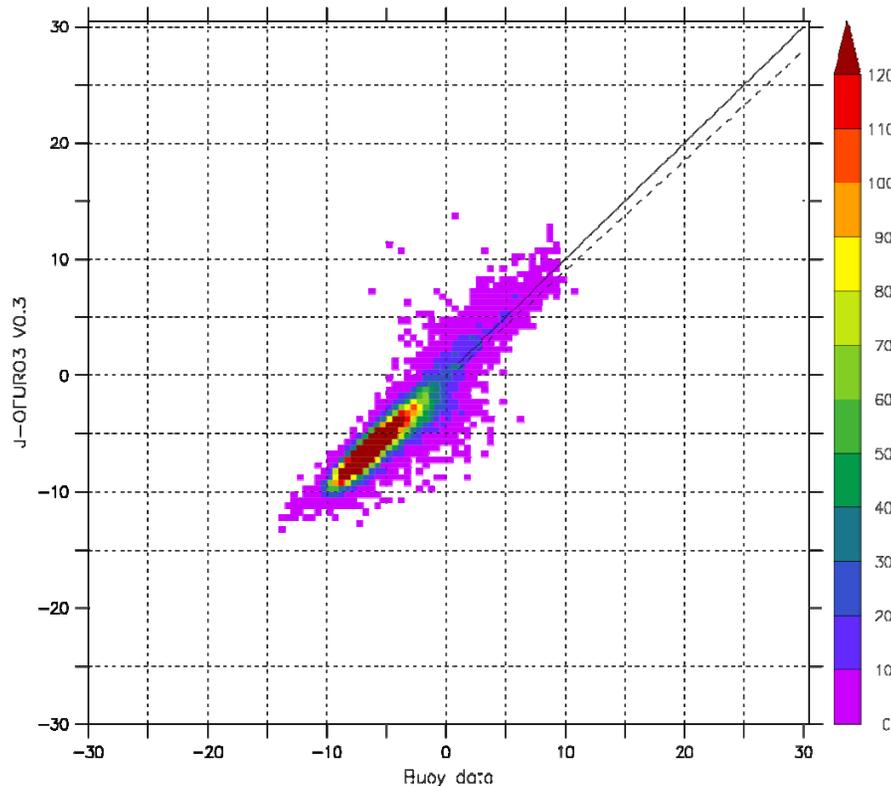
Buoy STD : **3.336** Grid data STD : **3.406**

RMS error : **1.294** Correlation : **0.926** Regression : **-0.430 + 0.946 \* x**

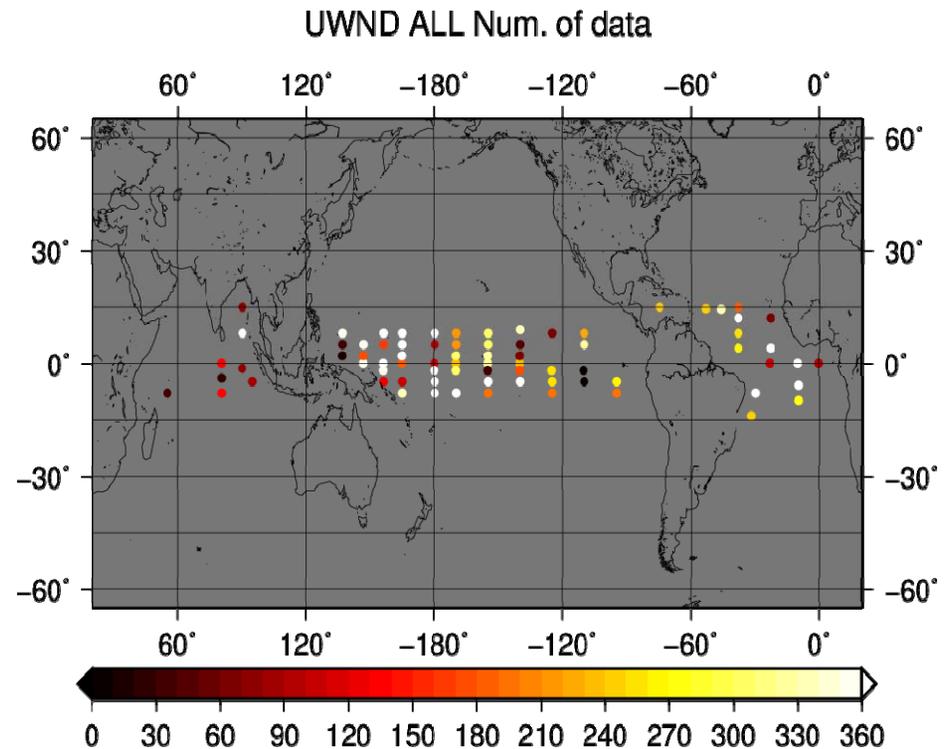
## Low latitudes

FORMAT Ver. 0.3  
NOVA/PMEL TWP  
May 11 2018 09:54:50

DATA SET: UWND\_LOW BUOY A... FLJX



scatter plot with density



# Quality Control System V2(QCS2) J-OFURO V0.3

JAMSTEC "JKEO( 60)"

NDBC

"41001( 10)" "41002( 16)" "41010( 295)" "41013( 37)" "41040( 244)" "41041( 334)" "41043( 229)"  
"41046( 205)" "41047( 290)" "41048( 364)" "42001( 275)" "42002( 328)" "42003( 255)" "42036( 24)"  
"42039( 192)" "42040( 0)" "42055( 244)" "42056( 363)" "42057( 245)" "42058( 243)" "42059( 334)"  
"44004( 36)" "44005( 108)" "44008( 254)" "44011( 332)" "46001( 0)" "46002( 0)" "46005( 0)"  
"46006( 0)" "46035( 0)" "46059( 0)" "46066( 0)" "46070( 188)" "46071( 0)" "46072( 145)"  
"46073( 52)" "46075( 151)" "46078( 21)" "46080( 87)" "46085( 320)" "46089( 130)" "51001( 0)"  
"51002( 0)" "51003( 0)" "51004( 0)" "51028( 0)"

OCS "KEO( 283)" "Papa( 16)"

PIRATA

"0N0E( 99)" "0N10W( 362)" "0N23W( 106)" "10S10W( 277)" "12N23W( 67)" "12N38W( 363)" "14S32W( 241)"  
"15N38W( 187)" "19S34W( 268)" "20N38W( 247)" "21N23W( 57)" "4N23W( 364)" "4N38W( 268)"  
"6S10W( 364)" "8N38W( 254)" "8S30W( 362)"

RAMA "0N80.5E( 138)" "0N90E( 0)" "1.5N90E( 0)" "1.5S90E( 77)" "15N90E( 72)" "4N90E( 0)"  
"4S80.5E( 22)" "5S95E( 86)" "8N90E( 365)" "8S55E( 39)" "8S80.5E( 130)"

# Quality Control System V2(QCS2)

Main ID "WIND\_VECTOR3" Sub ID "07" Data Name "J-OFURO3\_V0.3"

Intercomparison "on" Validation "FLUX"

Variable "UWND" Year "ALL" Buoy Version "BETA"

Buoy "JKEO" Longitude "146.500" Latitude "38.000"

number of data : 60

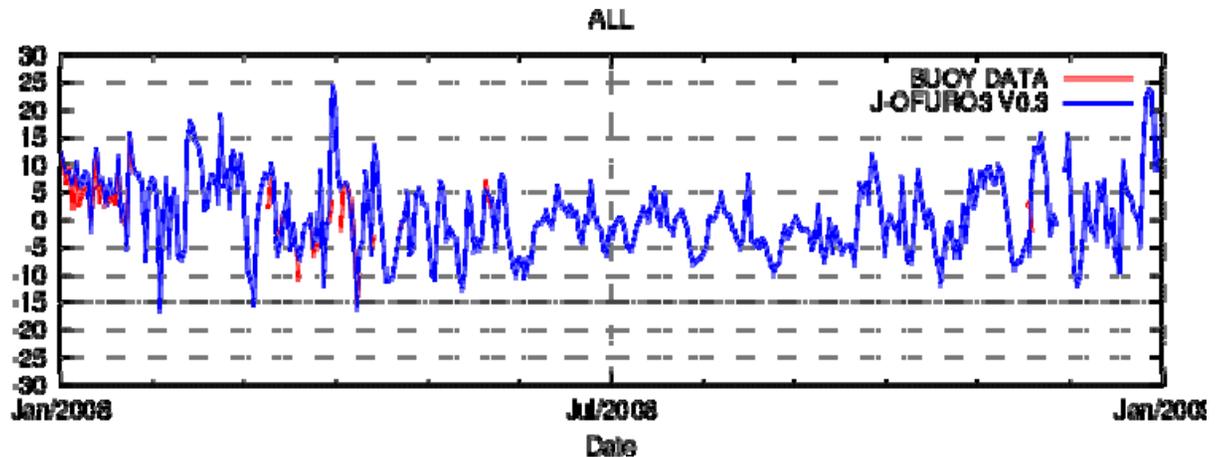
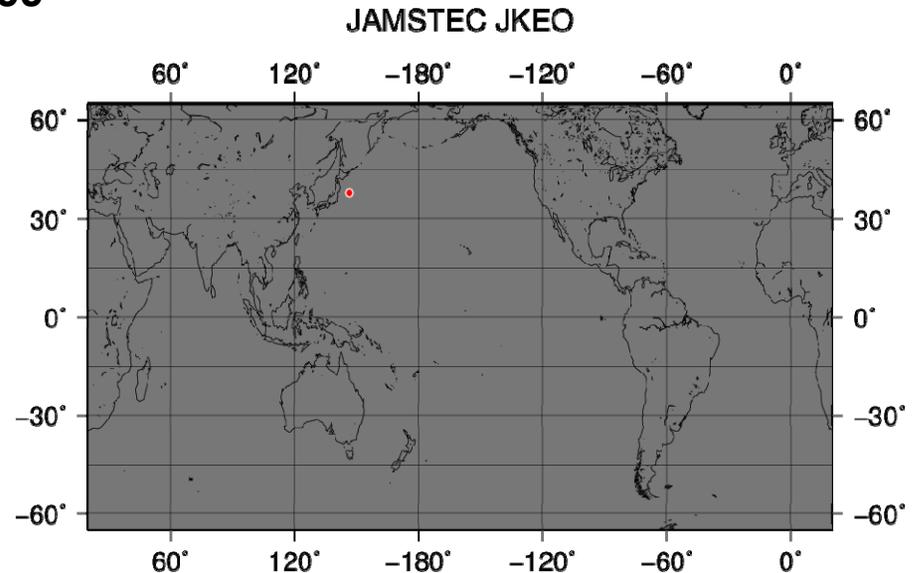
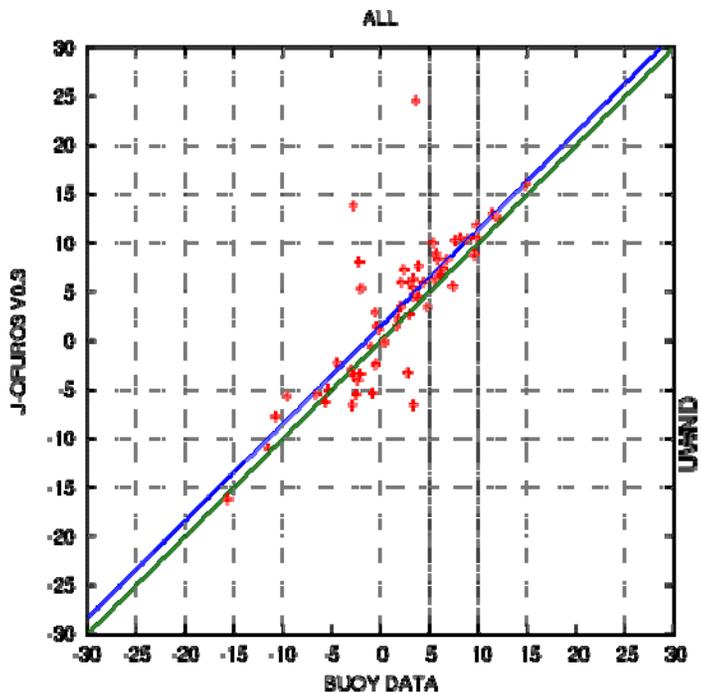
Buoy average : 1.828 Grid data average : 3.297

Bias : 1.469

Buoy STD : 5.941 Grid data STD : 7.358

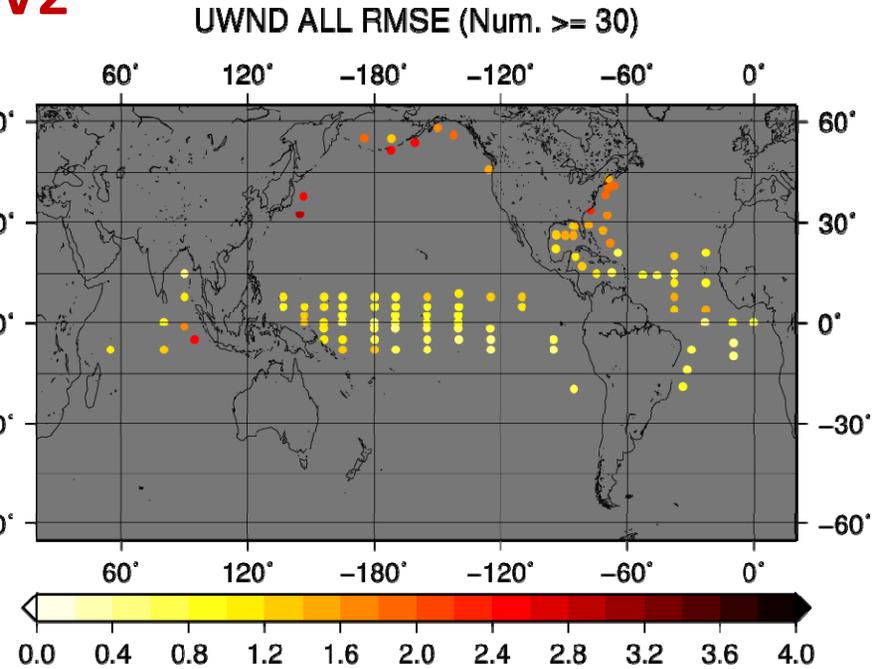
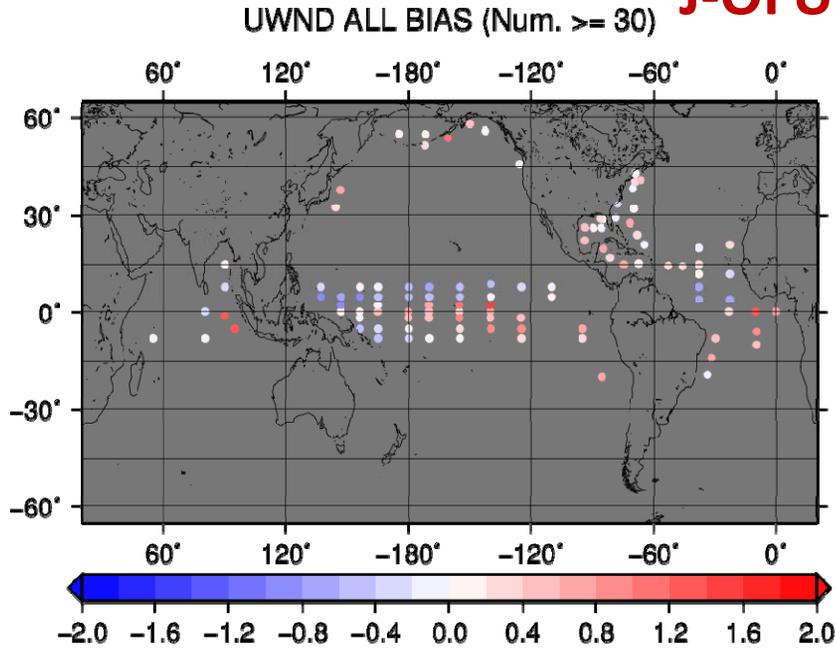
RMS error : 4.352 Correlation : 0.789

Regression : 1.480 + 0.994 \*

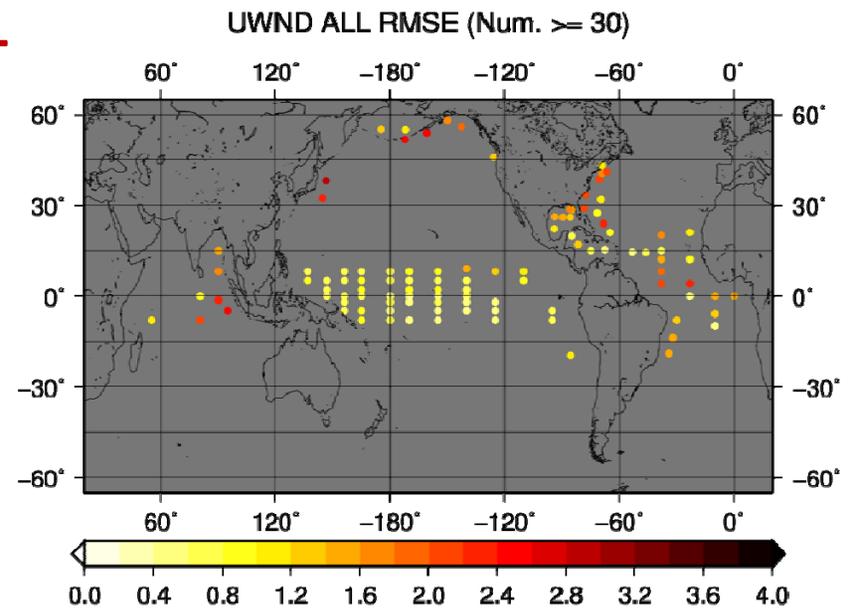
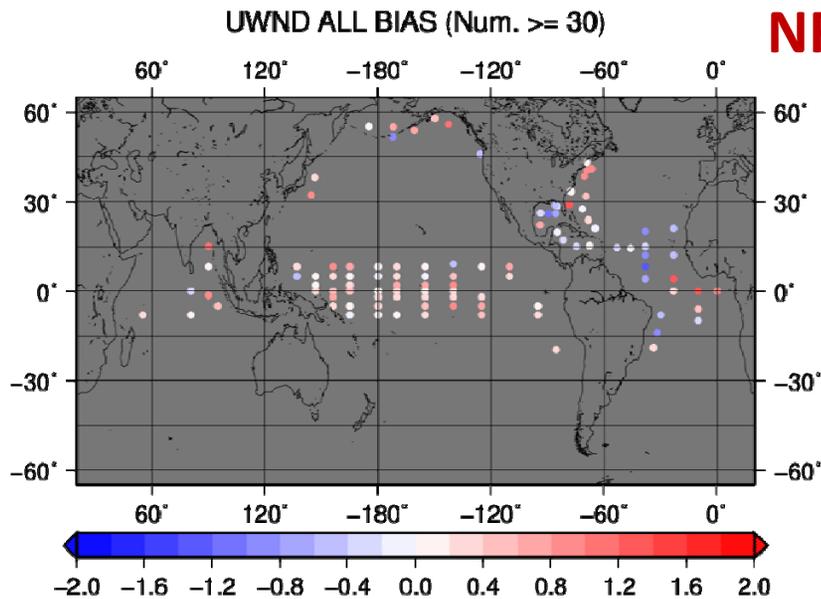


# Quality Control System V2(QCS2)

## J-OFURO V2



## NRA-1



Intercomparisons

among other products

# Quality Control System V2(QCS2)

01 ASCAT

02 QSCAT

03 NCEP

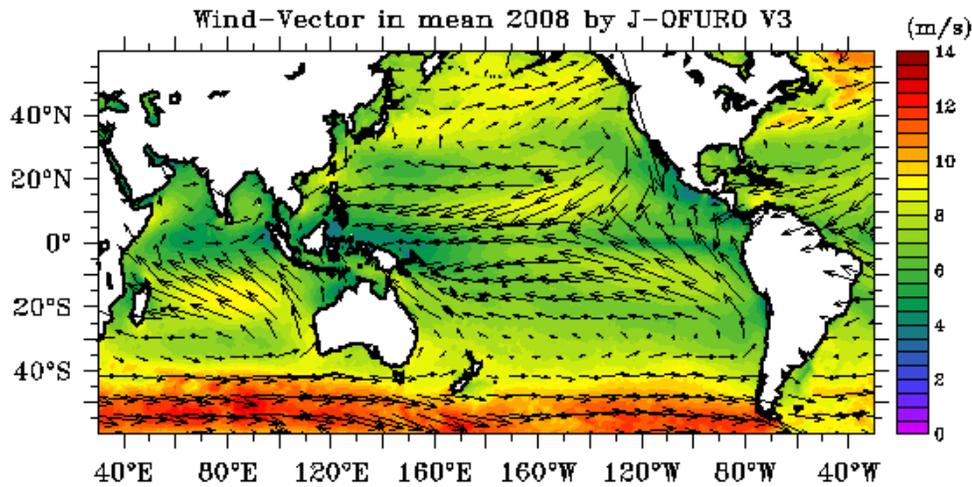
04 JRA25

05 ERA-Interim

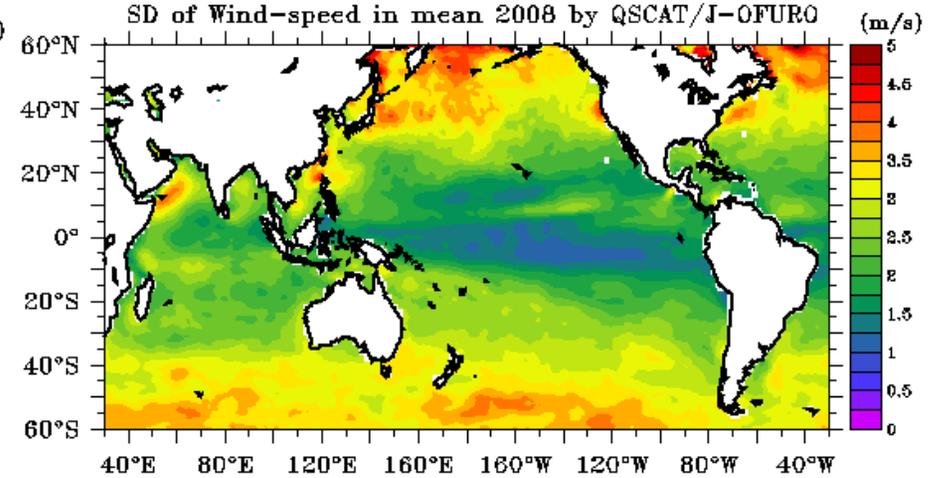
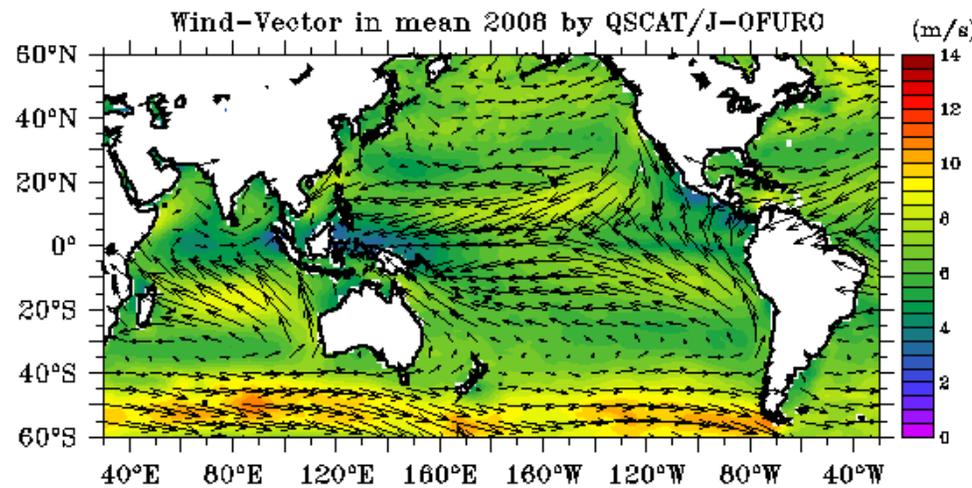
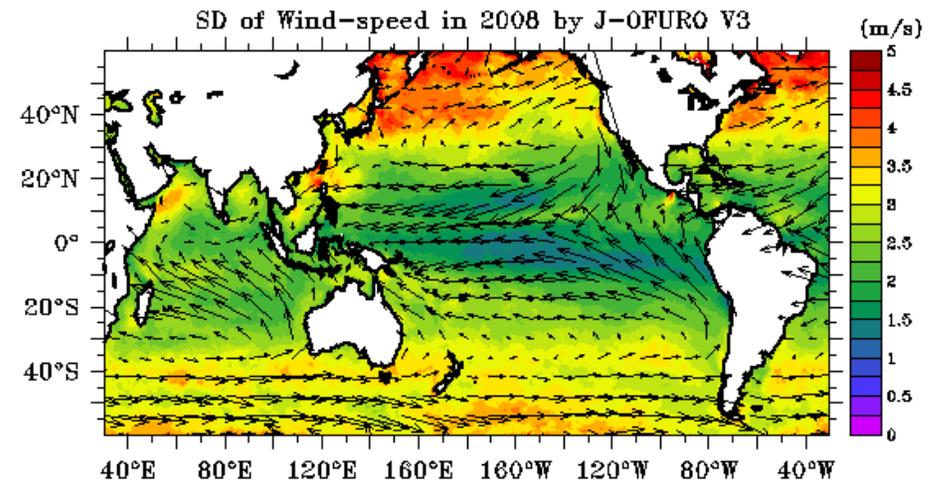
06 CCMP

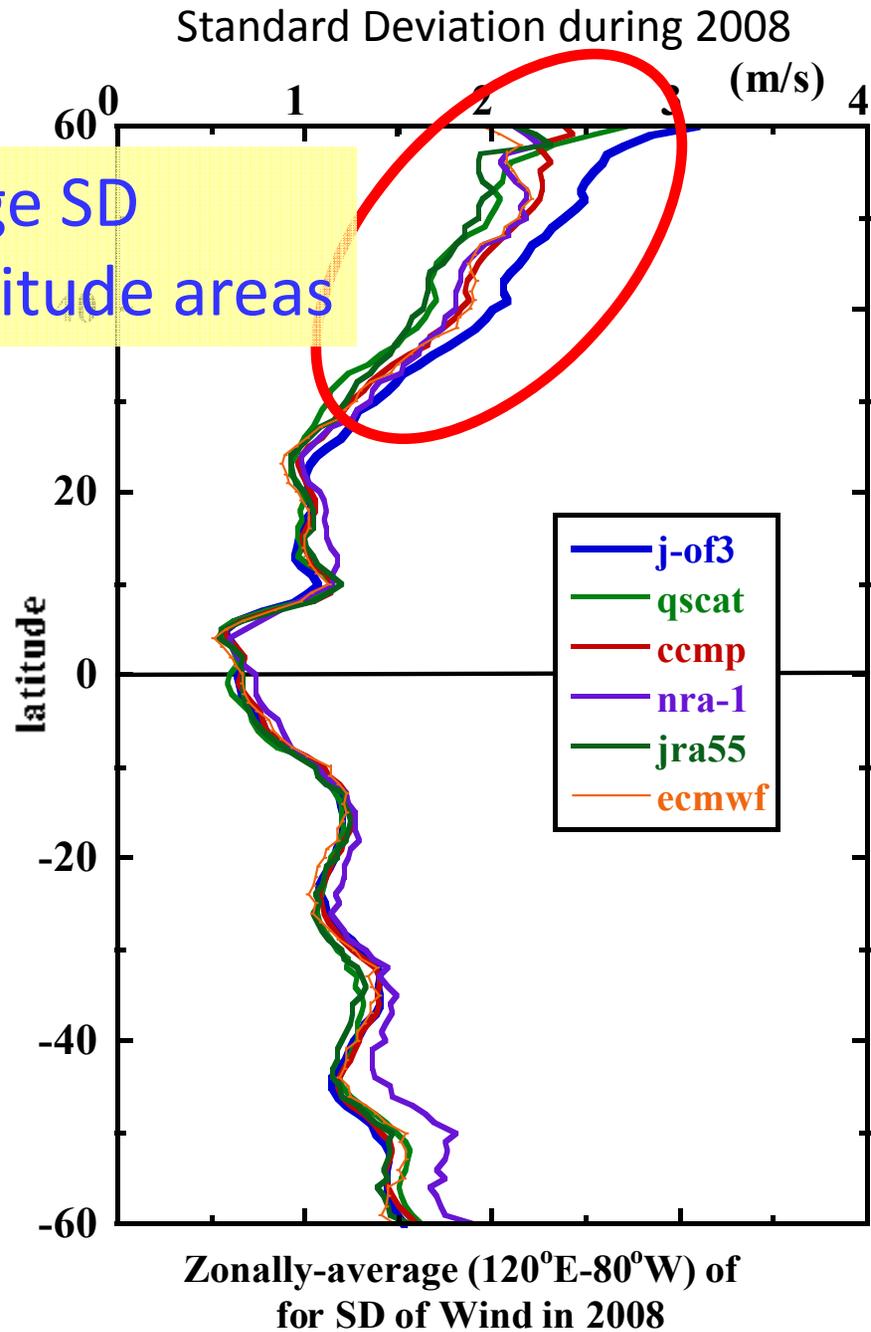
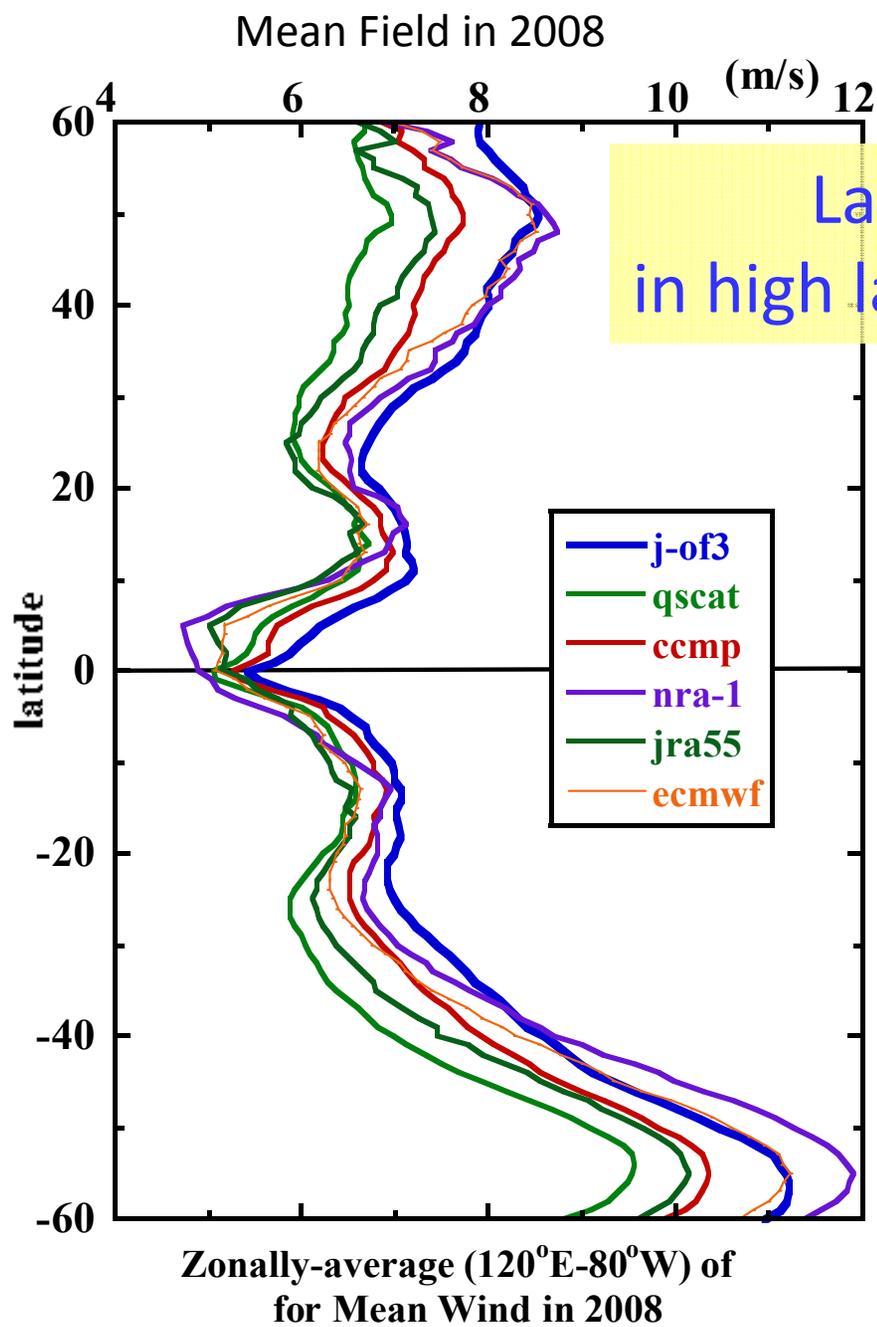
07 J-OFURO3\_V0.3

## Mean Field in 2008



## Standard Deviation during 2008

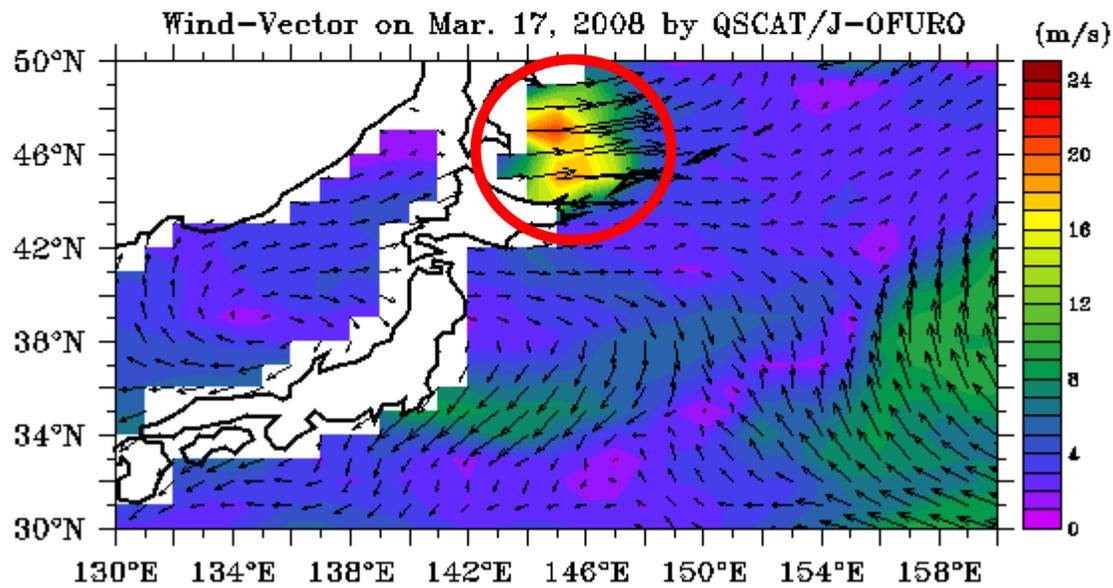
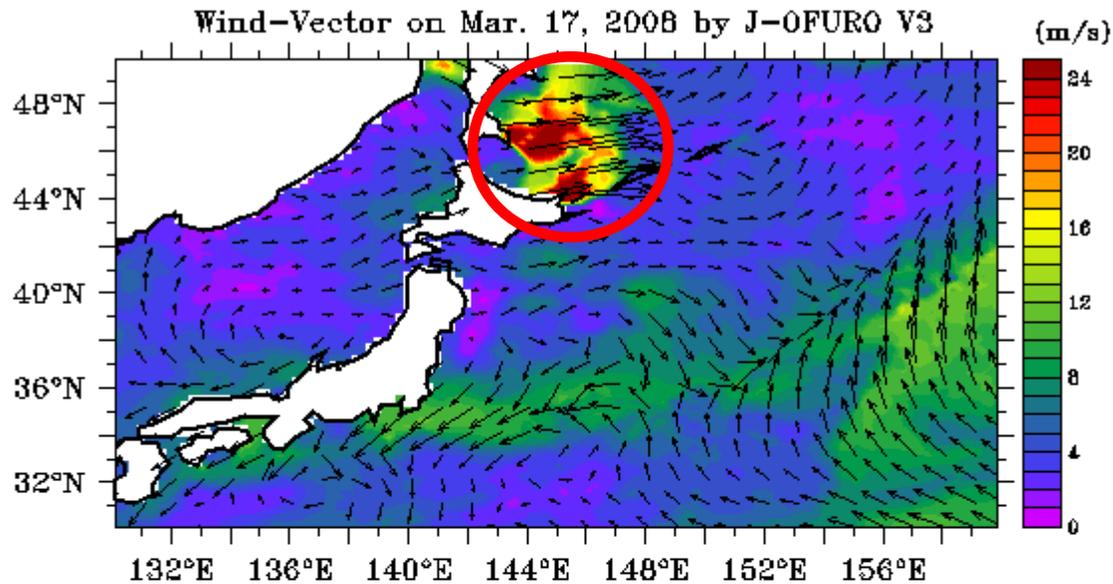


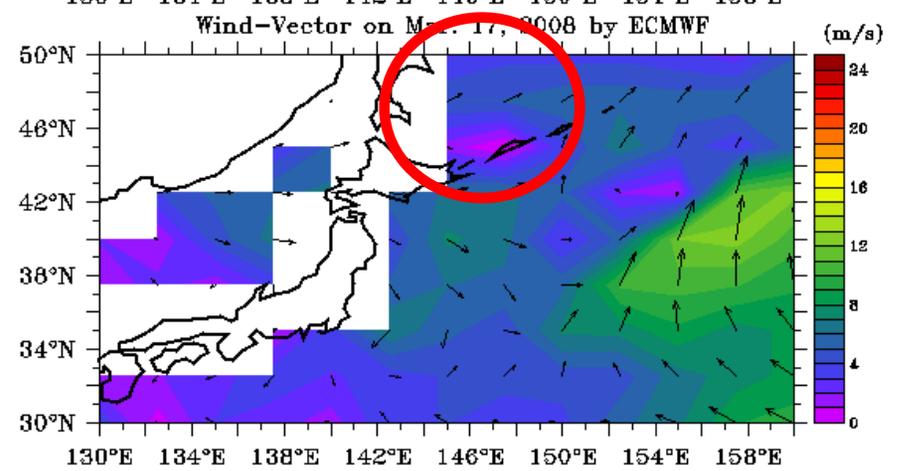
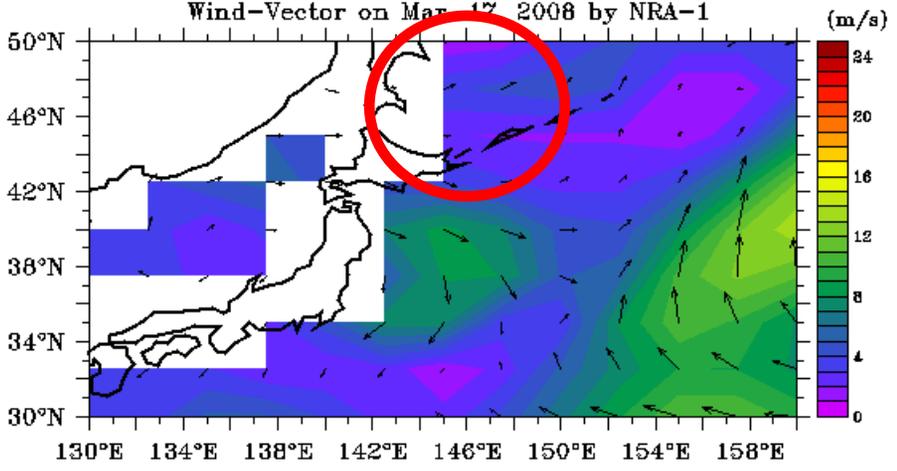
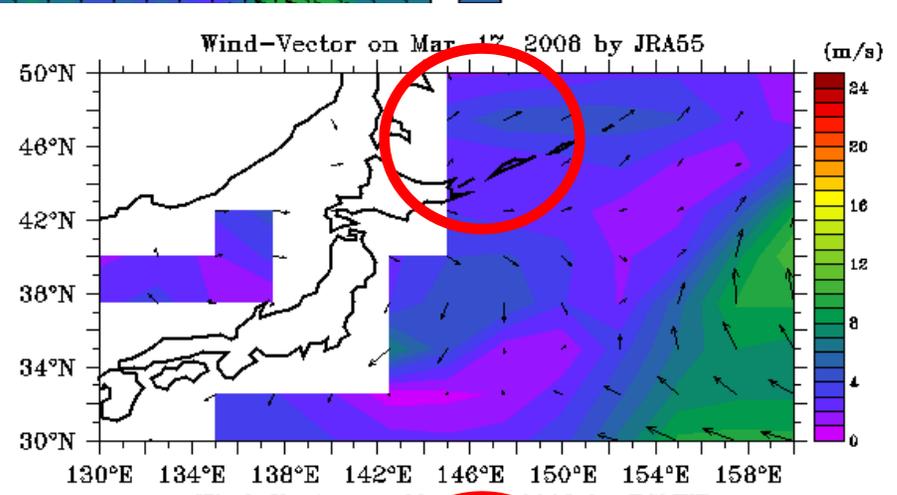
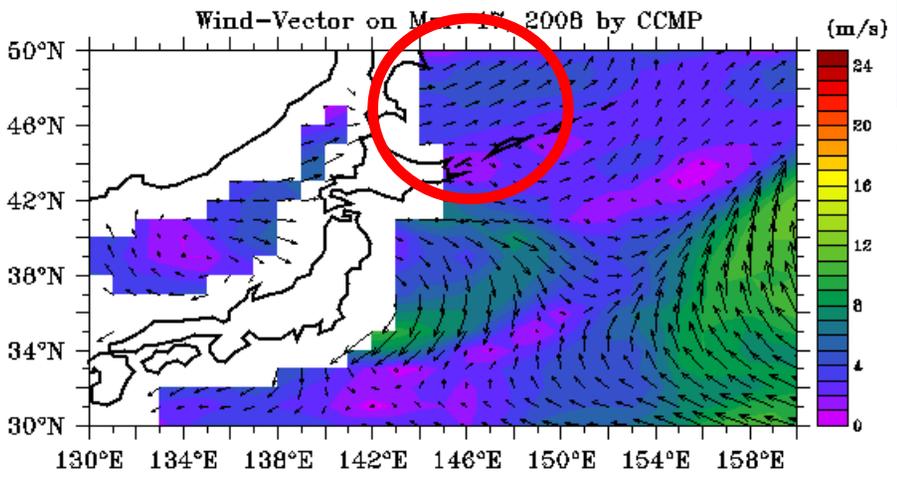
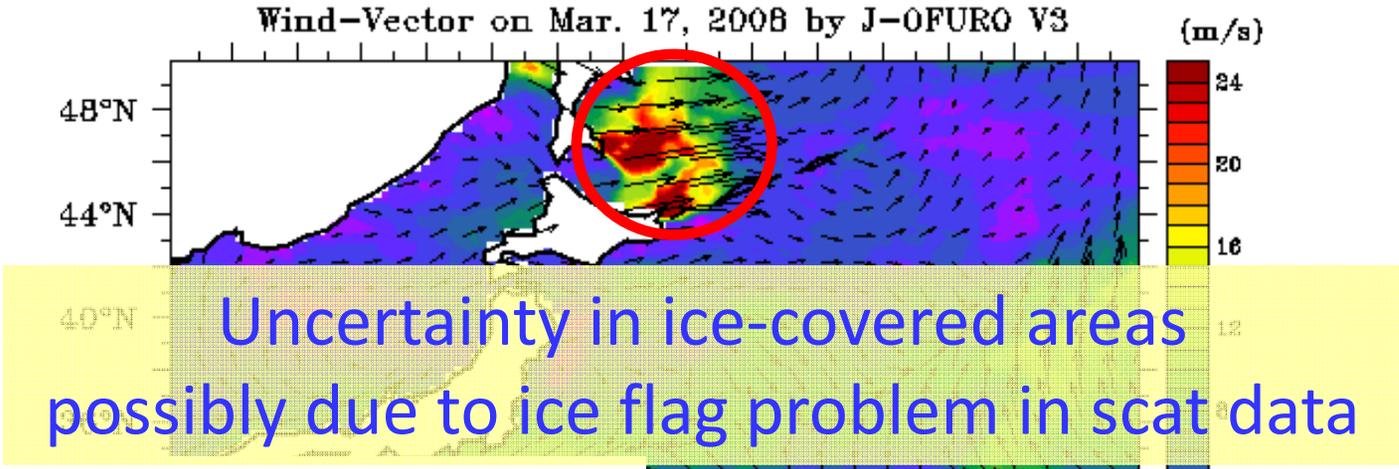


Some Problems  
in construction of our products

in ice-cover areas  
and/or  
rainy areas

# Uncertainty in ice-cover areas





# Summary 1

We are preparing to construct a new version (**J-OFURO V3**) of gridded products of surface flux parameters including wind vectors using only satellite measurements.

These products have higher spatial resolution (0.25 x 0.25 deg) and time coverage from 1988 to the current.

We are planning that our products will be available for users in our website in near future.

# Summary 2

We have designed our **Quality Control System** (QCS) by comparison with moored buoy measurements which are useful for validation our products.

Products of surface wind vectors are constructed by multi-satellite observation data (microwave scatterometers and radiometers).

Our wind products have large SDs in high latitude areas, compared with other wind products, and seem to be abnormally high wind speeds in ice-covered areas, which should be improved.

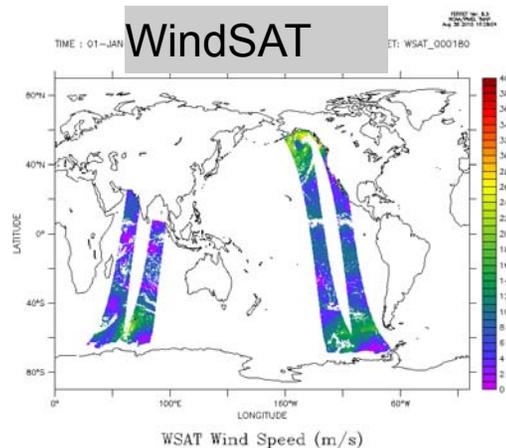
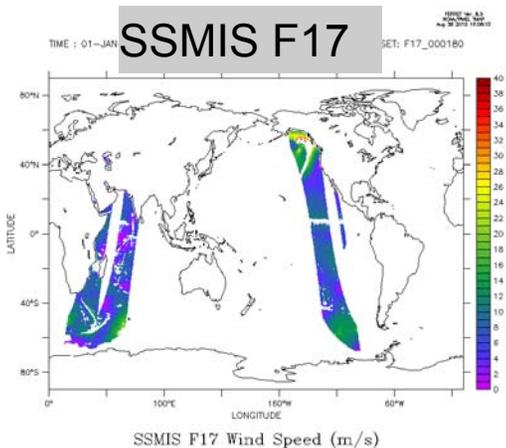
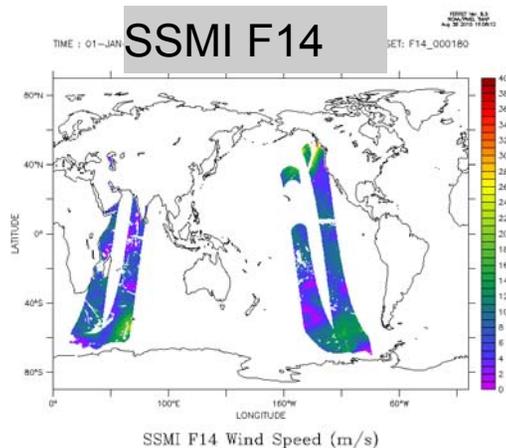
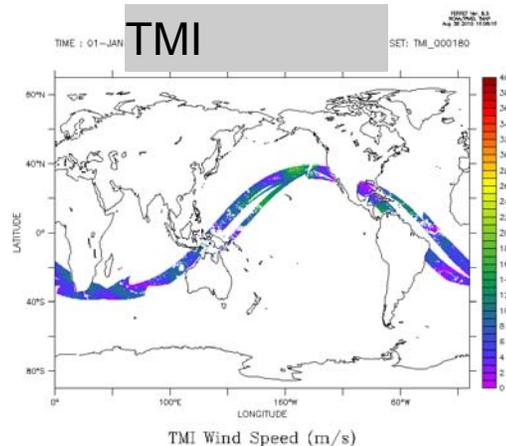
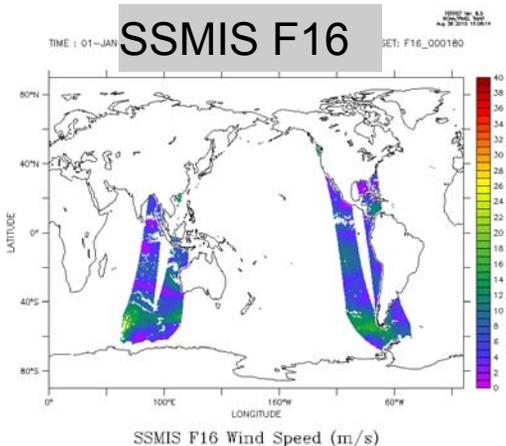
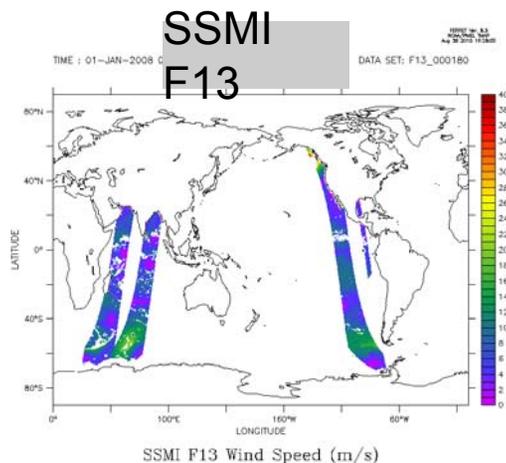
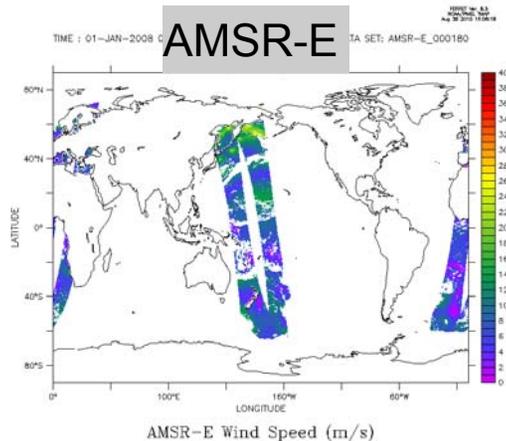
*IOWVST meeting in Cona  
May 6, 2013*

*Continuously Construction of  
Gridded Products of Surface Wind Vectors  
by Satellite Measurement Data*

*Thank you for your attention!*

# Multi-satellite observation for J-OFURO3 wind speed

1st January 2008: 00:00-03:00 UTC



Correlation Coefficient between CCMP and J-OFURO03

