Reprocessing of Atmospheric Motion Vector for JRA-3Q at JMA/MSC

Miki ABE

Meteorological Satellite Center (MSC)
Japan Meteorological Agency (JMA)

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Importance of long-term reanalysis

The climate research and seasonal forecasts demand for the re-analysis for quantitative assessment of past and current climate conditions to analyse extreme weather and climate monitoring.

Long-term high-quality dataset with homogeneity in time and space is essential.

The operational Data Assimilation (DA) system improve

AMV derivation algorithm improve

Past analysis dataset

Current analysis dataset

The difference in the quality of analysis creates a lack of long-term data homogeneity

Reprocess with the latest and consistent DA system and algorithm

Get for long-term high-quality dataset with homogeneity

Importance of long-term reanalysis

The climate research and seasonal forecasts demand for the re-analysis for quantitative assessment of past and current climate conditions to analyse extreme weather and climate monitoring.

Long-term high-quality dataset with homogeneity in time and space is essential

The latest DA system is used consistently
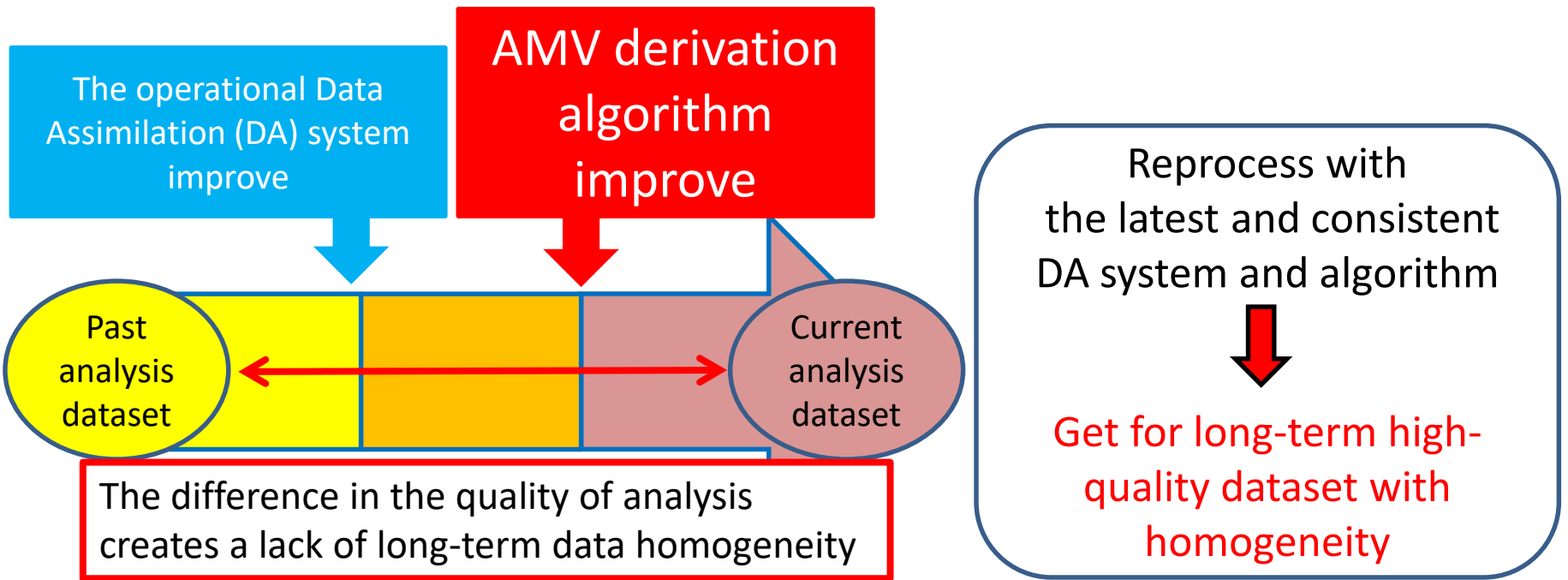
High-quality reprocessed satellite data (AMV) are assimilated

Higher-quality and more homogeneous climate dataset covering the last several decades.

As many observations as possible

Reprocess with the latest and consistent DA system and algorithm

Get for long-term high-quality dataset with homogeneity

Overview of JRA-3Q (The Japanese 75-years Reanalysis)

JMA have the long-term re-analysis projects:

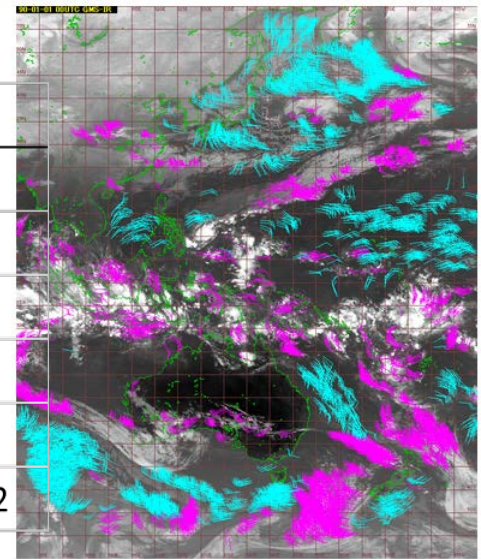JRA-XX : The Japanese XX-years Reanalysis

➢ JRA-25 (1979 – 2004)

➢ JRA-55 (1958 – 2016)

➢ JRA-3Q (1948 (planned)) <= Next Project

Three Quarters of a century (75 years) -> 3Q

* In Japanese, "3" is pronounced as "San" -> San-Q -> Thank you!

JMA has "JRA team" is composed by climate related JMA staff.

Outline of AMV reprocess for JRA-55

|	Kind	Period	Template Image Size (pixel)
GMS-1	IR	1 Jan 1979 – 30 Nov 1979	IR:24 and 32
GMS-3	IR, VIS	1 Mar 1988 – 4 Dec 1989	IR:24 and 32, VIS:32
GMS-4	IR, VIS	4 Dec 1989 – 6 Jun 1995	IR:24 and 32, VIS:32
GMS-5	IR, VIS, WV	6 Jun 1995 – 22 May 2003	IR and WV:24 and 32, VIS:32
GOES-9	IR, VIS, WV	22 May 2003 – 15 Jun 2005	IR and WV:24 and 32, VIS:32
MTSAT-1R	IR, VIS, WV	15 Jun 2005 – 30 Sep 2009	IR and WV:16, 24 and 32, VIS:32

Example of AMVs for GMS-4 (at 00UTC 1 January 1990)

IR AMVs with Infrared image
(Pink: AMVs above 700 hPa level, Aqua: AMVs below 700 hPa level)

AMV Reprocessing for JRA-3Q
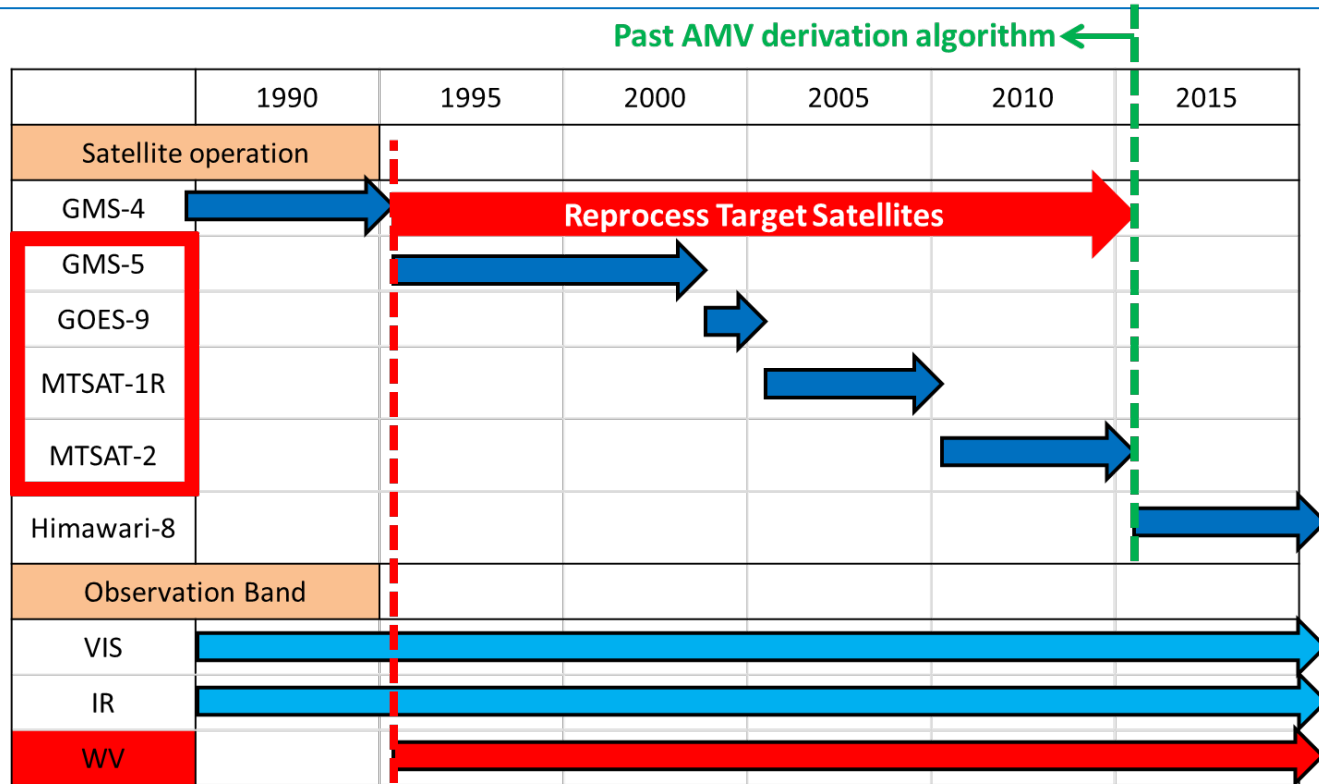
JMA is reprocessing with

   the latest derivation algorithm of Himawari-8 AMV to cooperate on JRA-3Q.

Target Satellites :

MTSAT-2 (2010-2015), MTSAT-1R (2005-2010),
GOES-9 (2003-2005), GMS-5 (1995-2003)

Reason :

Water vapor images are necessary for Himawari-8 AMV algorithm.

Coverage is improved by New Algorithm

DATE :
1st January 2013 00UTC
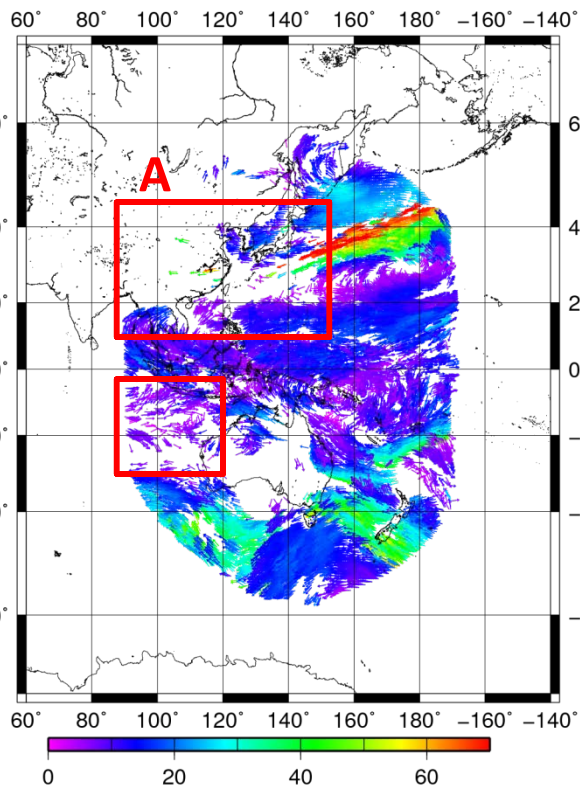Satellite images : MTSAT-2
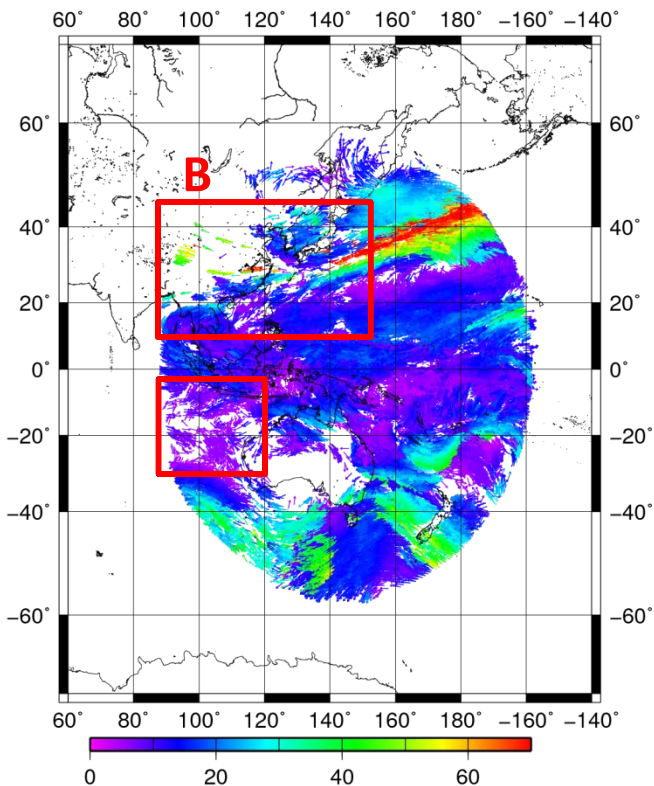BAND : IR(10.3-11.3μm)
QI(fcst) > 85

【The difference point of JRA-55 algorithm】
• Target assignment processing is designed to avoid correlated AMV errors.
• Averaging of similarity surfaces is utilized for noise reduction in the tracking process.
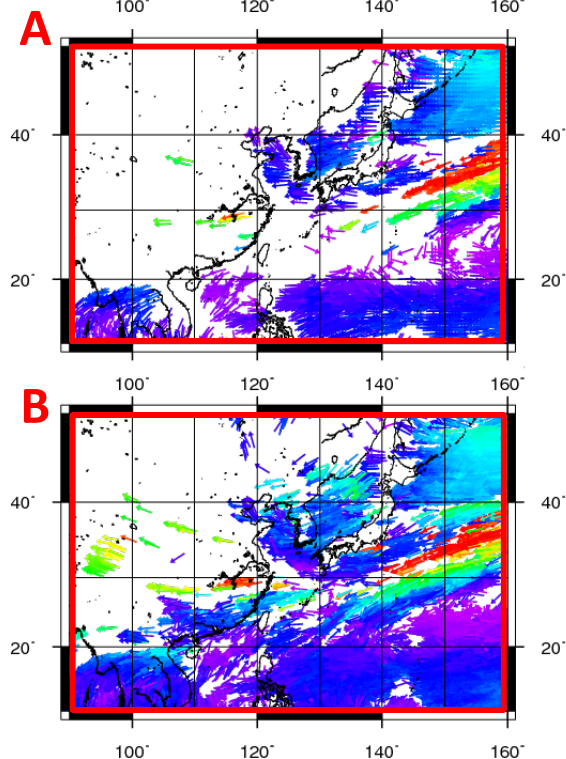• The height assignment method uses maximum likelihood.

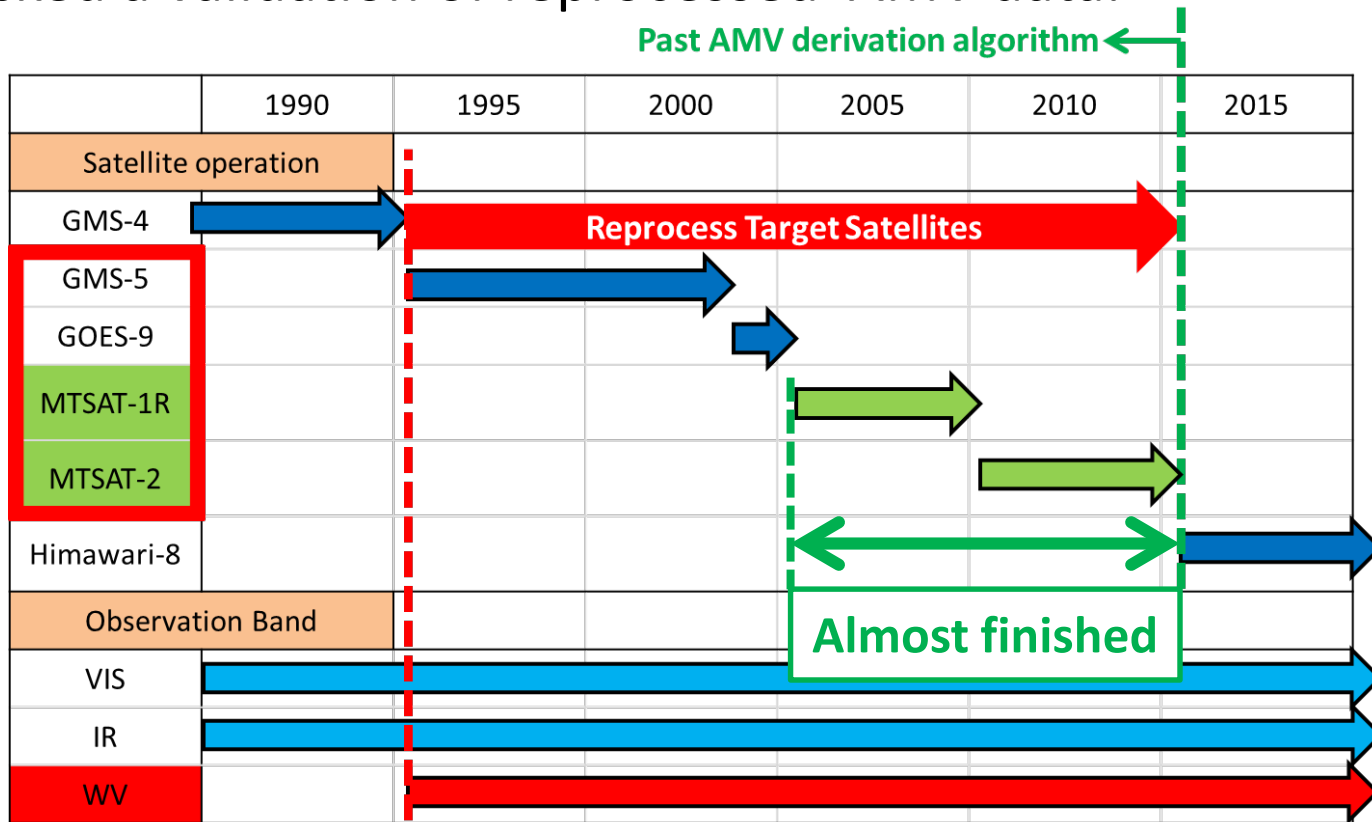Wind Vector of Past algorithm

Wind Vector of New algorithm

New algorithm :
Coverage is improved !!

Current status

JMA has almost finished to reprocess of MTSAT series (2005-2015).

We checked a validation of reprocessed AMV data.

* Tools for sonde statistics are under development.

O-B statistics
(AMV vs first guesses in JMA's Global Spectral Model (GSM))

Speed Bias(2013)　　　　Rmsvd(2013)　　　　Speed(2013)
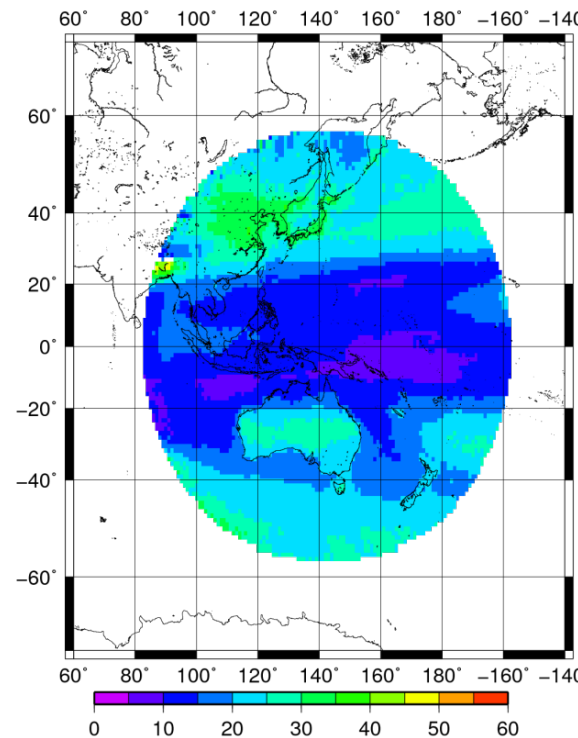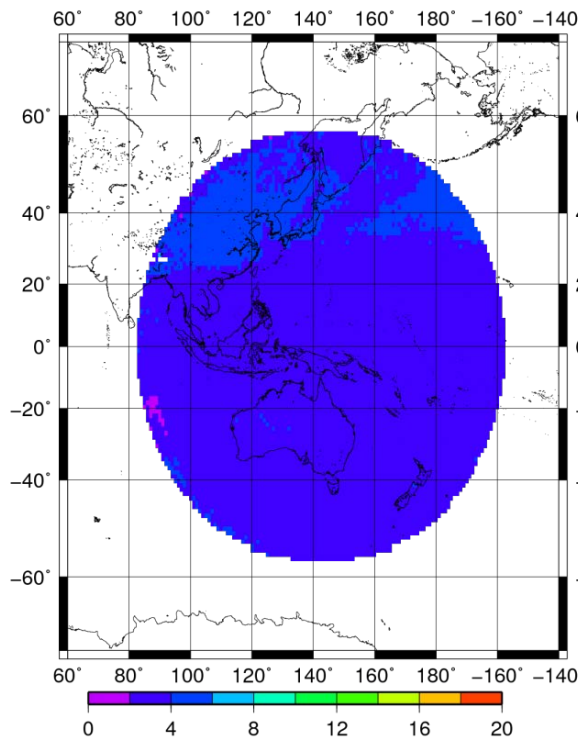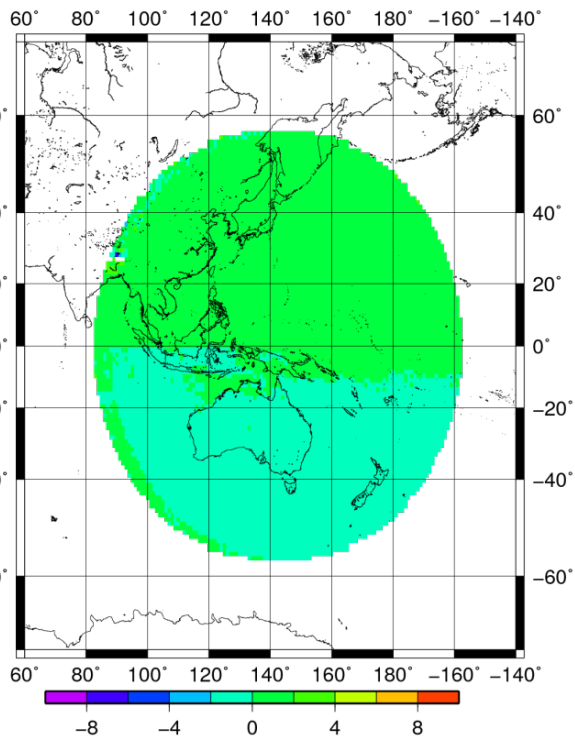
Speed Bias

	ALL	NH	TROP	SH
Upper	**0.36**	1.20	0.56	-0.75
Middle	**0.54**	1.03	0.51	0.11
Low	**0.29**	0.75	0.37	-0.18

Rmsvd

	ALL	NH	TROP	SH
Upper	**3.82**	4.39	3.30	3.97
Middle	**3.34**	3.81	0.51	3.65
Low	**2.24**	2.48	2.07	2.26

Speed

	ALL	NH	TROP	SH
Upper	**23.89**	29.37	14.97	31.05
Middle	**16.27**	19.93	9.08	22.66
Low	**10.39**	11.52	8.25	12.3

O-B statistics (vs GSM : JMA-Global Model)

WV
(6.5-7.0µm)
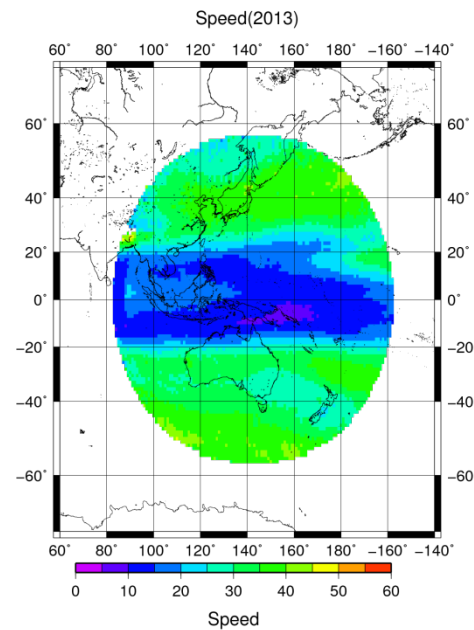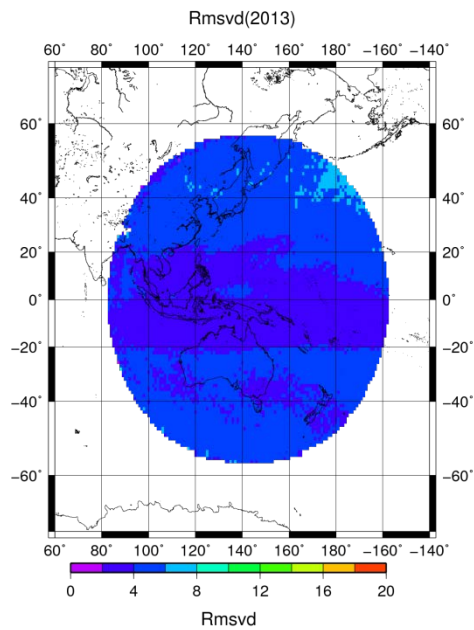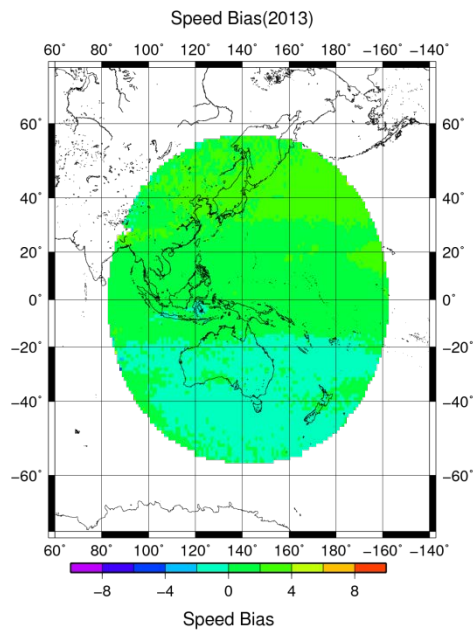
VIS
(0.55-0.90 µm)
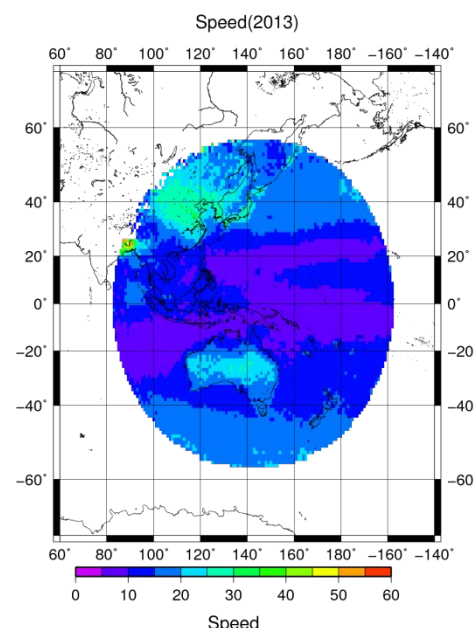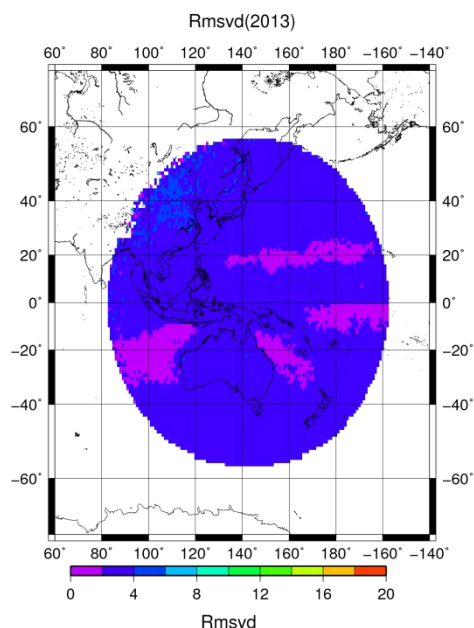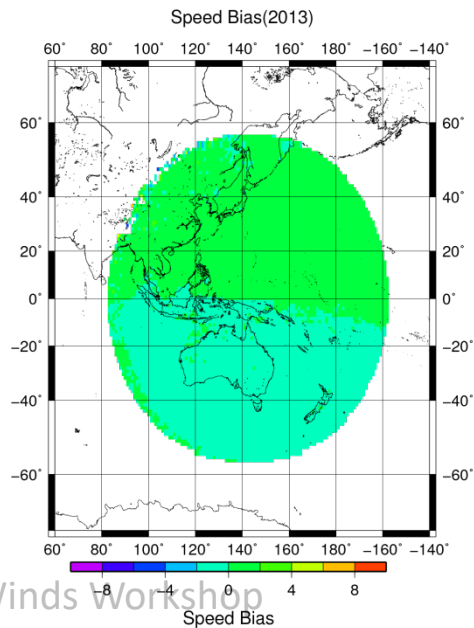
Wind speed correlation (MTSAT-2 AMV vs FG)
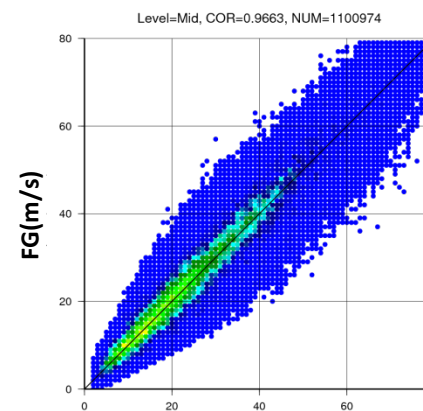
N Hemisphere (poleward of 20N) · Tropics · S Hemisphere (poleward of 20S)

Upper Layer (< 400hPa)

Middle Layer (>= 400hPa < 700hPa)

Low Layer (>= 700hPa)

Reprocessing Plan

		2018		March	2019	2020
GMS-5						
GOES-9		Reprocessing ?			Provide reprocessing data ?	
MTSAT-1R						
MTSAT-2		Reprocessing ?				

JRA-3Q team plans to use the reprocessed data.
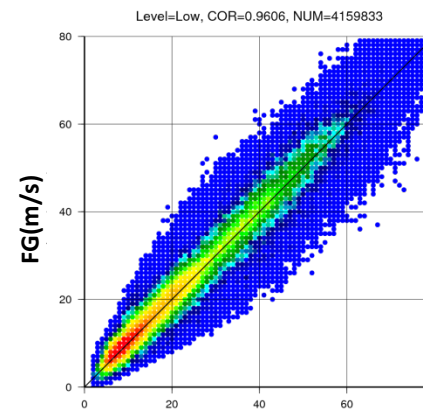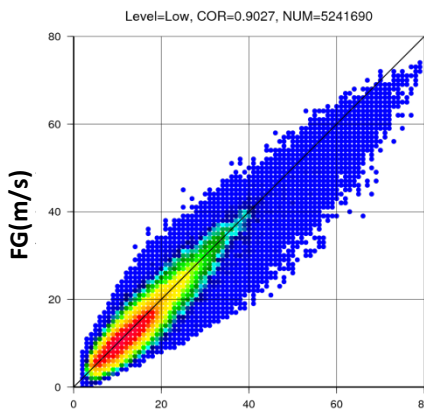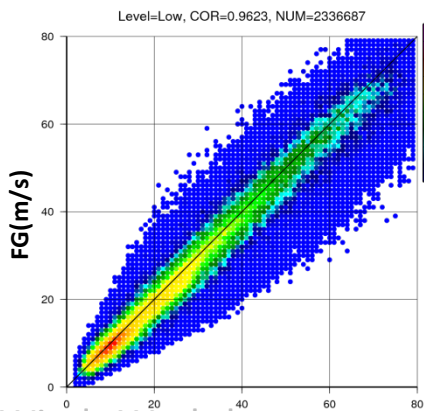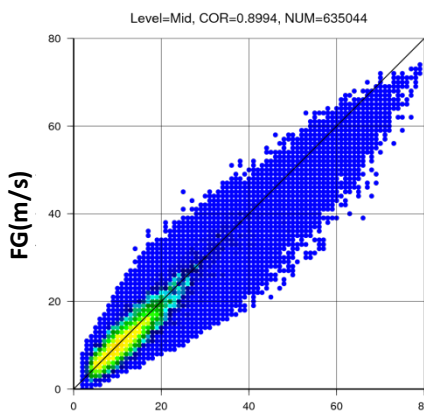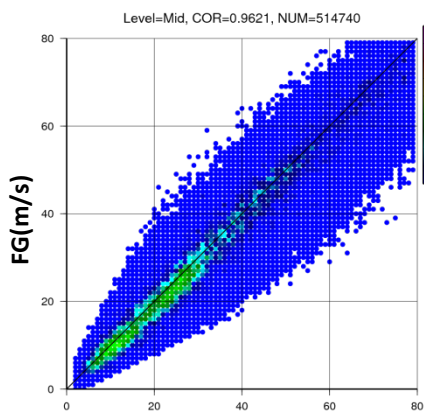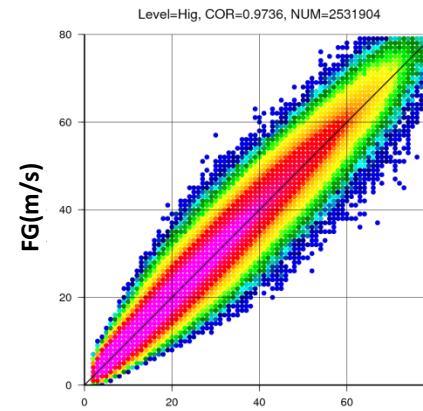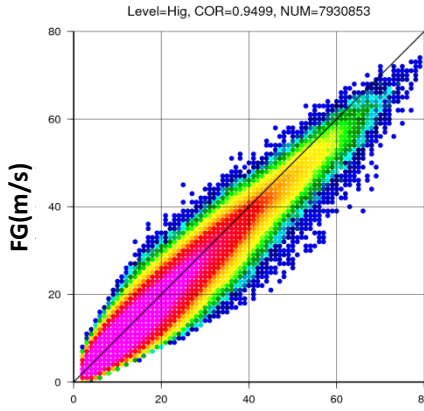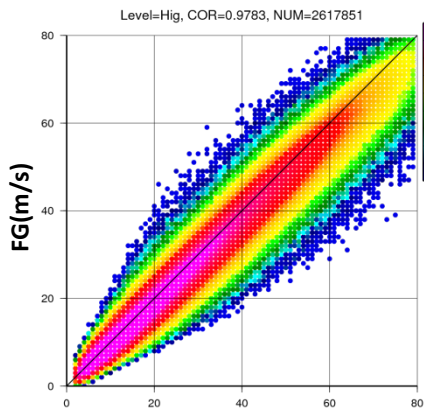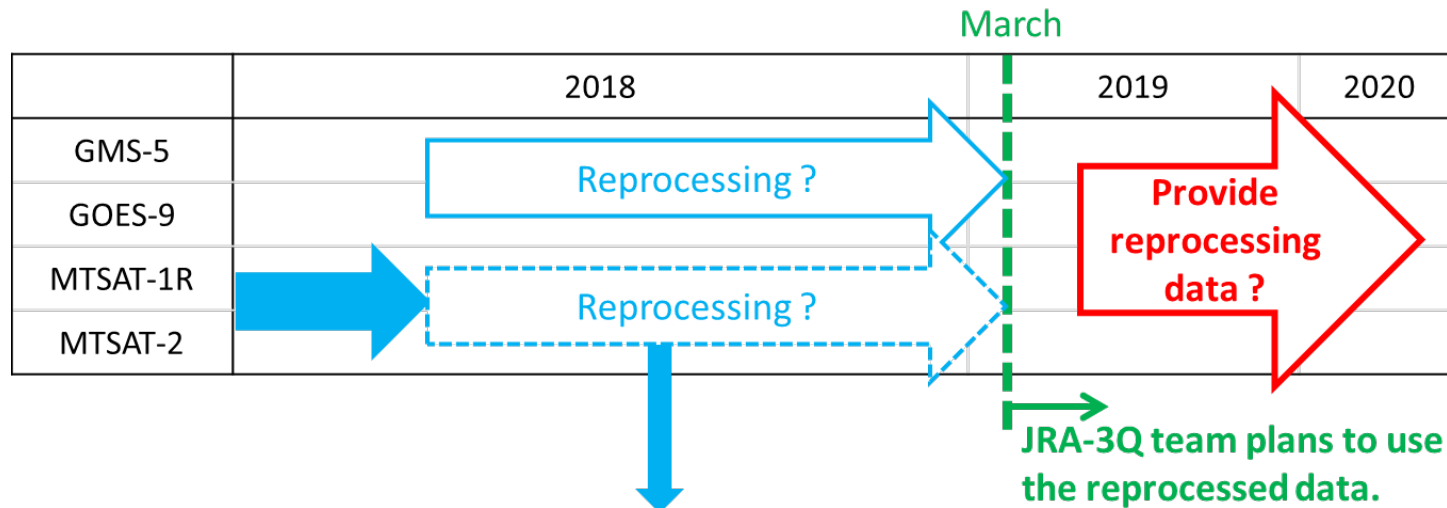
If there is difference in processed data, we need to start over.

JRA-3Q team plans to use the reprocessed AMV data from the end of March 2019.

If there are time and resources, we will reprocess AMV of satellite that have not been reprocessed yet.

< About provision reprocessing data >

JMA plans to provide the reprocessed data, but it is now under consideration.

Information of reprocessing AMV for user

< Example to inform of reprocessing AMV for JRA-3Q for user by website>

Information about reprocessing AMV for JRA-3Q will be introduced on web page.

http://www.data.jma.go.jp/mscweb/en/product/reprocess/

* Now, the above web page is for JRA-55.

Meteorological Satellite Center (MSC) of JMA

GENERATION OF ATMOSPHERIC MOTION VECTORS (AMV) FROM PAST SATELLITE IMAGES

Introduction

JMA/MSC has conducted computing Atmospheric Motion Vectors (AMV) from the images of past satellites using the latest AMV derivation algorithms since the end of 2008. The data set of AMV will be provided for the Japanese 55-year Reanalysis Project (JRA-55) scheduled between 2009 and 2012, and the Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) to contribute to climate research fields.
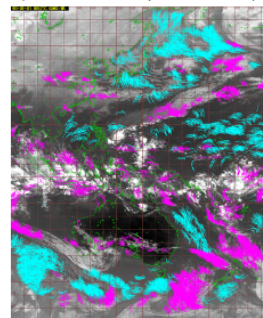
About Data

AMV data are computed from the images of GMS, -3, -4 and -5, GOES-9 and MTSAT-1R using the latest derivation algorithms for six-hourly times (00, 06, 12 and 18UTC). The derivation area is 90E-170W and 60S-60N. As the reference forecast data in computing the AMVs, GPVs from the analysis fields of the Japanese Climate Data Assimilation System (JCDAS) of JMA are used. In the generation, several kinds of AMVs by several sized template images (i.e. image segments to track clouds/water vapor pattern) will be computed. The sizes of template image were determined depending on the time interval of images for the AMV computation (The time interval of images is 15 minutes for MTSAT-1R and 30 minutes for GMS series and GOES-9). The AMV data will be stored in BUFR and provided for users.

Meteorological Satellite Center (MSC) of JMA

GENERATIONS OF SATELLITE METEOROLOGICAL PRODUCTS FOR CLIMATE MONITORING

Introduction

This website reports on the activities of the Meteorological Satellite Center (MSC) of the Japan Meteorological Agency (JMA) for the generations of Meteorological products from the image data of past geostationary satellite contributing to climate monitoring.

JMA participated in the establishment of the Sustained, Coordinated Proce Environmental Satellite Data for Climate Monitoring (SCOPE-CM). Based on recommendations of the SCOPE-CM planning meeting, JMA proceeds with activities related to Essential Climate Variable (ECV) satellite products of Atmospheric Motion Vectors (AMV) and Clear Sky Radiance (CSR) as a pilo project within the framework of SCOPE-CM. JMA plans to provide the data the Japanese 55-year Reanalysis Project (JRA-55) and other reanalysis ce once reprocessing is completed. JMA also proceeds the derivation of long-t surface albedo dataset from the recalibrated visible dataset of GMS-5 using a EUMETSAT algorithm as recommended at CGMS-33 (Recommendation 33.07).

Product List

* Surface Albedo
* Clear Sky Radiance (CSR)
* Atmospheric Motion Vectors (AMV)

Reference

* Overview of SCOPE-CM (at WMO website)

Outline of AMV reprocess at JMA/MSC

Kind of AMV	Period	Template Image Size (pixel)
GMS-1 IR	1 Jan 1979 - 30 Nov 1979	IR:24 and 32
GMS-3 IR, VIS	1 Mar 1988 - 4 Dec 1989	IR:24 and 32, VIS:32
GMS-4 IR, VIS	4 Dec 1989 - 6 Jun 1995	IR:24 and 32, VIS:32
GMS-5 IR, VIS, WV	6 Jun 1995 - 22 May 2003	IR and WV:24 and 32, VIS:32
GOES-9 IR, VIS, WV	22 May 2003 - 15 Jun 2005	IR and WV:24 and 32, VIS:32
MTSAT-1R IR, VIS, WV	15 Jun 2005 - 30 Sep 2009	IR and WV:16, 24 and 32, VIS:32

Example of AMVs for GMS-4 (at 00UTC 1 January 1990)

This is webpage of reprocessed AMV for **JRA-55** project.

To be updated for **JRA-3Q**

IR AMVs with Infrared image
(Pink: AMVs above 700 hPa level, Aqua: AMVs below 700 hPa level)
(Click to enlarge)

Summary

- JMA plans AMV reprocessing using latest algorithm for JMA's past satellite images for JRA-3Q project.

- The Himawari-8 algorithm need a water vapor band for cloud height assignment. Therefore AMVs from MTSAT-1R, 2 and GMS-5 is planned to be reprocessed.

- JMA plans to provide the reprocessed data for overseas users, but it is now under consideration.

Thank you for your time !!