Recent Status and Development of Atmospheric Motion Vector at JMA

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Today’s talk

- Operation Updates on JMA AMVs since 10th IWW
  - MTSAT-2 AMVs Dissemination started (Jul. 2010)
  - Hourly AMV Dissemination started (Mar. 2011)

- Developments achieved
  - MTSAT-1R Rapid-Scan Operation and Rapid-Scan AMVs
  - AMV Climate Dataset

- On going activities and plans
  - Development of Height Assignment Method for Low-Level Wind
  - Development of High Res. Land/Sea Table for Wider Generation of Low Level Winds
  - Future Development and NWC SAF Software

- Summary
**JMA AMVs Outline after 10th IWW**

**Past operation**
- **2010**: MTSAT-1R Operational, MTSAT-2 Standby
- **2011**: Switchover MTSAT-1R to MTSAT-2 (1 Jul.), Hourly AMV dissemination Start (3 Mar.), Rapid-Scan (RS) operation from Jun. to Sep.
- **2012**: MTSAT-2 Operational, Himawari-8 launched

**Future operation plan**
- **2012**: Switchover MTSAT-2 to Himawari-8
- **2013**: Himawari-8 Operational
- **2014**: Rapid-Scan (RS) operation
- **2015**: MTSAT-2 Standby
MTSAT-2 AMV Provision Started July 2010

In place of MTSAT-1R AMVs, MTSAT-2 AMVs are disseminated from 00 UTC 11 July 2010

Bias and RMSVD of IR1 high-level (over 400hPa) AMV against Sonde

QI > 0.85

Bias and RMSVD of IR1 high-level (over 400hPa) AMV against Sonde

QI > 0.85

SRFs of MTSAT-2 and MTSAT-1R are comparable

Response functions

MTSAT-1R

MTSAT-2

Accuracy of AMVs are also comparable between the two satellites

Collocated IR1 high-level winds (Jun. 2010)

QI (without FG) > 0.85
# MTSAT Hourly AMVs Dissemination

JMA started to disseminate hourly-derived AMVs via GTS since 02 UTC 3 Mar. 2011

<table>
<thead>
<tr>
<th>AMV type</th>
<th>Level of height *</th>
<th>Time (UTC)</th>
<th>Image sector</th>
<th>Image interval (minutes)</th>
<th>Distribution</th>
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<tbody>
<tr>
<td>IR1</td>
<td>High, middle, low</td>
<td>00, 06, 12, 18</td>
<td>Full disk</td>
<td>15</td>
<td>BUFR via GTS</td>
</tr>
<tr>
<td></td>
<td>High, middle, low</td>
<td>03, 09, 15, 21</td>
<td></td>
<td></td>
<td>BUFR via GTS</td>
</tr>
<tr>
<td></td>
<td>High, middle, low</td>
<td>02, 04, 05, 08, 10, 11, 14, 16, 17, 20, 22, 23</td>
<td>Northern Hemisphere</td>
<td>30</td>
<td>BUFR via GTS</td>
</tr>
<tr>
<td></td>
<td>High, middle, low</td>
<td>01, 07, 13, 19</td>
<td>Northern Hemisphere</td>
<td>60</td>
<td>BUFR via GTS</td>
</tr>
<tr>
<td></td>
<td>High, middle, low</td>
<td>01, 02, 03, 04, 05, 07, 08, 09, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23</td>
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<td>60</td>
<td>BUFR via GTS</td>
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<tr>
<td>WV</td>
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<tr>
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<td>High, middle</td>
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<td>60</td>
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<tr>
<td>VIS</td>
<td>Low</td>
<td>00, 06</td>
<td>Full disk</td>
<td>15</td>
<td>BUFR via GTS</td>
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<tr>
<td></td>
<td>Low</td>
<td>03, 09, 21</td>
<td>Northern Hemisphere</td>
<td>30</td>
<td>BUFR via GTS</td>
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<tr>
<td></td>
<td>Low</td>
<td>02, 04, 05, 08, 22, 23</td>
<td>Northern Hemisphere</td>
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<td>BUFR via GTS</td>
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<td>60</td>
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<tr>
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<td>Low</td>
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<td>60</td>
<td>BUFR via GTS</td>
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<tr>
<td>IR4</td>
<td>Low</td>
<td>12, 18</td>
<td>Full disk</td>
<td>15</td>
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<td></td>
<td>Low</td>
<td>08-11, 14-17, 20-23</td>
<td>Northern Hemisphere</td>
<td>30</td>
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</tbody>
</table>

* High: above 400hPa  
  Middle: 400-700hPa  
  Low: 700-1000hPa

Before hourly AMVs dissemination start

+ After hourly AMVs dissemination start
Quality of Hourly AMVs

Monthly stats (Feb. 2011) for MTSAT-2 IR1 high-level winds speed bias against JMA’s global model FG

- Hourly AMVs contribute to increase the number of data significantly
- The accuracy of the hourly AMVs are almost comparable with 6-hourly AMVs. But slight degradation is seen

QI > 0.8
MTSAT-1R Rapid-Scan Operation

Normal Operation
(about 30 min for Full Disk)

Rapid-Scan Observation
(about 5 min)

The Rapid-scan (RS) operation is conducted every summer

<table>
<thead>
<tr>
<th>Rapid-Scan operation</th>
<th></th>
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<tbody>
<tr>
<td>Observation Period</td>
<td>Jun. – Sep.</td>
</tr>
<tr>
<td>Observation Time</td>
<td>00 UTC – 09 UTC</td>
</tr>
<tr>
<td>Observation Area</td>
<td>Around Japan</td>
</tr>
<tr>
<td>Time Interval</td>
<td>5 min.</td>
</tr>
</tbody>
</table>
Rapid-Scan AMV for NWP and TC Analysis

MTSAT-2 IR1 low-level winds
ROKE 2011/09/15/00

MTSAT-1R IR1 low-level winds
ROKE 2011/09/15/00/10

QI > 0.8

Continue to afternoon talk...
AMV Climate Dataset
(Contribution to SCOPE-CM and Reanalysis)

- Reprocess of historical AMVs using the latest algorithms has been completed
  - Since 1979 for GMS series, GOES-9 (West Pacific) and MTSAT
  - Contribution to SCOPE-CM Pilot Project
- The AMVs are provided to re-analysis community
  - Positive impacts are recognized in JRA-55

Observation System Experiment for GMS-3 AMVs (Jun. 1990)
by Climate Prediction Division @JMA

Reprocessed AMV shows strong contribution, particularly on southern hemisphere

GMS-3 (Jan. 1990)
IR1 high-level wind Speed bias against model
Development of HA for Low-Level Wind (on going)

- Current Height Assignment (HA) method is based on cloud-base HA method (LeMarshall 1994, Tokuno 1998)

- More development on
  - Introduction of the CCC method to HA of low-level winds
  - Introduction of multi-Gaussian function fitting to histogram of the cloud top heights

The new method will use only tracked clouds pixels rejecting surface pixels
New Height Assignment method for Low-Level Wind

Zonal mean statistics against JMA’s global model FG field for Sep. 2011

Qi > 0.85

MTSAT-2 IRW low-level winds

- The new HA makes the range of AMV height levels wider
- At this moment, RMSVD is a bit large over mid-latitude
- Negative bias is recognized near the zonal jet.
Development of high res. land/sea table for wider generation of low level winds (on going)

Current land/sea table

New land/sea table

Number of AMV increases several % with almost same quality

Qi Histogram for MTSAT-1R IR1 low-level winds for Jan. 2011

Number of derived MTSAT-1R IRW low-level AMV around Japan (Jan. 2011)
JMA is examining to use NWC SAF software for Himawari-8 AMV generating First for *cloud detection and cloud type analysis* using multiple channels

**AMV derivation procedure**
- Cloud type analysis
- Target selection
- Target tracking
- Cloud height assignment
- Quality control

**Method planed to be implemented to next AMV**

- **Trying**
  - Multi-channel threshold method based on NWC-SAF software algorithm

- **Trying**
  - Nested tracking method
  - Advanced tracking method for the use of rapid scan images

- **Trying**
  - NWP profile correction associated with observation
    - WV channel
    - CO2 channel
  - Examination of the use of NWC-SAF software algorithm

- **Trying**
  - New quality control for Himawari-8 AMV
Summary

• Operation Updates on MTSAT AMVs since 10th IWW
  – MTSAT-2 AMVs Dissemination from 11 Jul. 2010
  – Hourly AMV Dissemination from 3 Mar. 2011

• Development achieved
  – Rapid-scan operation conducted in every summer
  – Reprocess of historical AMVs using the latest algorithms has been completed

• Ongoing activities
  – New Low-level HA adapted the CCC method is under development
  – Planning to introduce high-resolution land/sea table
  – NWC SAF AMV derivation software is being examining for follow-on satellite AMV
Thank you!
Arigatou Gozai Masu!

Harerun the Mascot Character of JMA
Reference


• Tokuno M., 1998: Improvements in the method to extract operational cloud motion winds and water vapor motion winds of the GMS-5 system, Proc. of the Fourth Int. Winds Workshop, Switzerland, 61-68