CGMS-XXXI JMA-WP-10
Prepared by JMA
Agenda Item: III/4
Discussed in WG III

Outline of the High-density Atmospheric Motion Vectors (AMVs)

JMA developed high-density atmospheric motion vector (AMV) extraction. This paper reports on outline of the AMV data processing in MSC.
No action is required on this subject.

Outline of the High-density Atmospheric Motion Vectors (AMVs)

1. Background

Former discussions in CGMS and International Wind Workshop proposed some measures to further standardization of Atmospheric Motion Vectors (AMVs) such as the standardized validation method and unified BUFR format that includes standardized quality indices. MSC/JMA developed its AMV extraction computer programs so as to meet the proposals, and the status of the development has been reported in the CGMS meetings. MSC commenced operational High-density AMV dissemination in May 2003 in time with the commencement of operational observation of GOES-9 over the Western Pacific area after a validation period of about half a year.

Brief specification and the operational status of the High-density AMVs in the first few months are reported.

2. Outline of the High-density AMVs

MSC/JMA set up the following tasks to improve the calculation method of AMVs.

- To increase the number of calculation of AMVs
- To improve the accuracy of the height assignment and reduce the wind speed errors
- To perform fully automatic processing using high-speed WS
- To add appropriate quality information to each wind vector
- To distribute the products by binary bulletins coded in BUFR format via GTS

After the ~~C~~considerable work of research and development for improved AMV extraction, ~~has been carried out. Operational~~ the operational production and distribution of high-density AMVs extracted ~~by~~ with the newly developed method was started on May 22 12UTC 2003.

High-density AMVs are calculated and distributed 4 times (00,06,12, and 18UTC) per day.

Differences between the high-density AMVs and the former AMVs are shown below.

	High-density AMV (from 03/05/22, 12UTC)	**Former AMV (until 03/05/21, 18UTC)**
Number of AMVs per Calculation	**High-level : 7000-10000** **Low-level : 1500-2000** **Water Vapor motion wind : 10000-15000**	**High-level : 300-500** **Low-level : 200-300** **Water Vapor motion wind : 2000-3000**

Calculation method	**Fully Automatic Process with High-speed WS**	**Automatic Vector Calculation with Human Quality Check (deletion of vectors, correction of height assignment, addition of vectors, etc.) except for WV Motion Wind Vectors** **WV Motion Winds Vectors were calculated fully automatically**
Calculation time	**Within 1 hour after base time**	**About 2.5 hours after base time**
Quality Information	**Three kinds of quality information:** **Two kinds of QI same as EUMETSAT's (one referring to NWP results and the other not referring to NWP results,)** **and RFF same as** **NOAA/NESDIS and Wisconsin University** **are added to all vectors**	**No information are added (all vectors that passed human QC are treated equally)**
Distribution	**Binary Bulletins coded in BUFR Format** **A/N Bulletins coded in SATOB Format are also distributed for the time being (only vectors with high QI numbers are extracted and distributed)**	**A/N Bulletins coded in SATOB Format**

3. Example of Calculation of High-density AMVs

An example of High-density AMVs is shown in figs. 1 – 3 for infrared, visible and water vapor images respectively. As shown in the table above, the numbers of wind vectors are increased by a factor of an order.

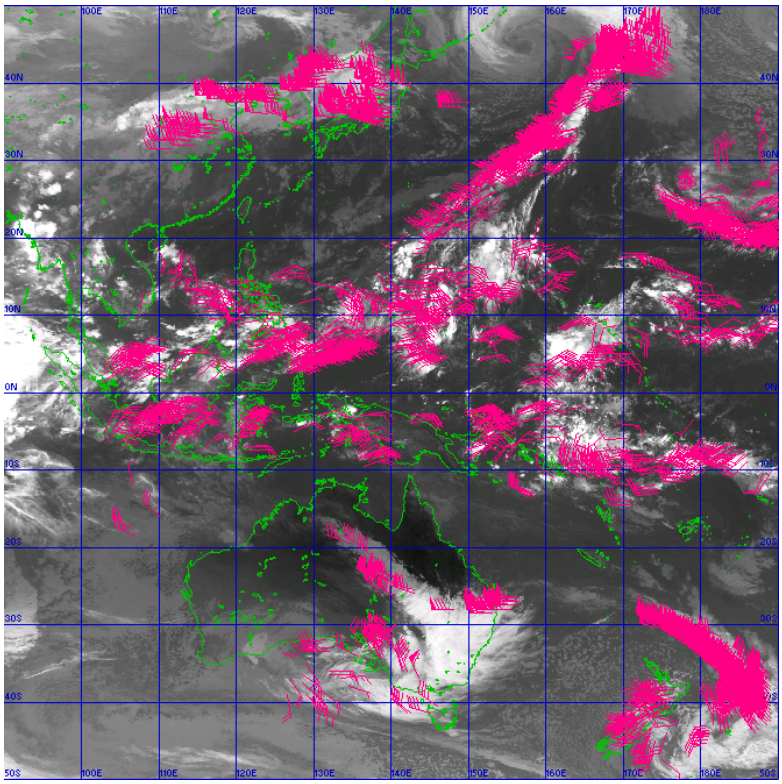

Fig.1: Example of High-density AMVs (October 1 00UTC 2003)
Calculated from IR image

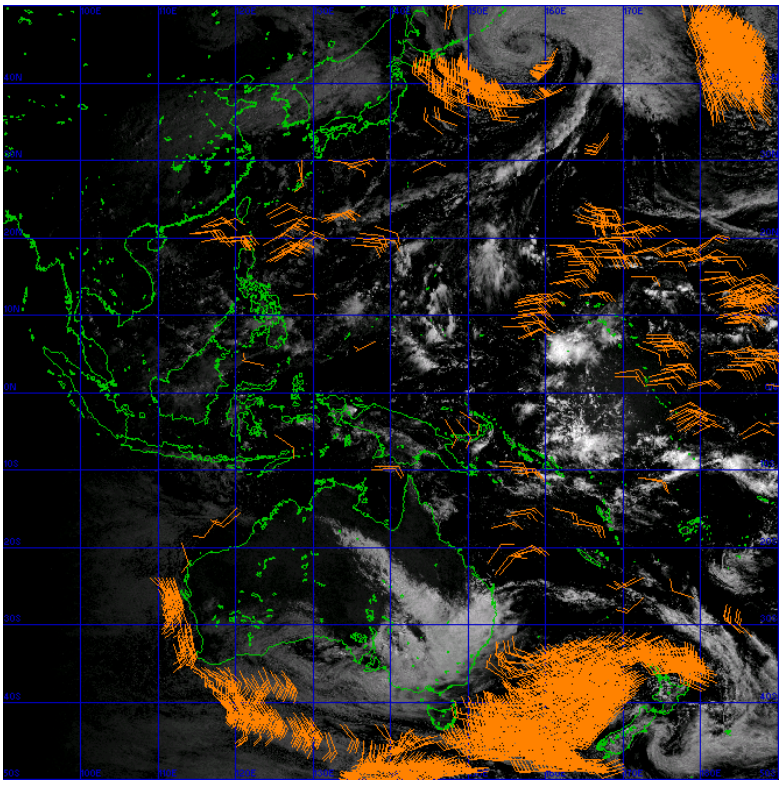

Fig.2: Example of High-density AMVs (October 1 00UTC 2003)
Calculated from Visible image

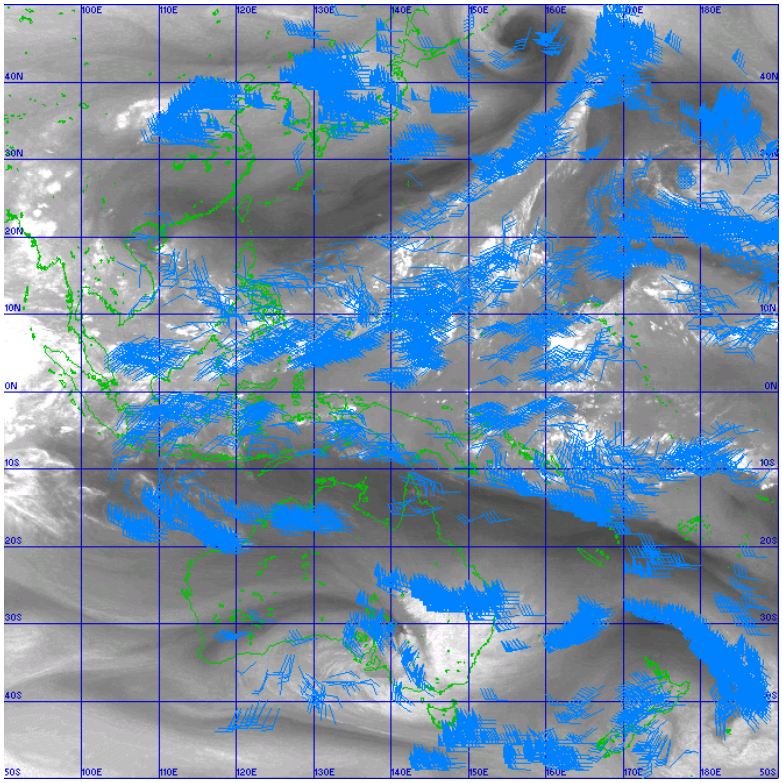

Fig.3: Example of High-density AMVs (October 1 00UTC 2003)
Calculated from WV image

4. Operation and Accuracy

Since the commencement of high-density AMV calculation, there occurred 6 times of dissemination failures (5/23 00UTC, 5/27 12UTC, 6/1 12UTC, 6/4 18UTC, 6/11 12UTC, 7/8 18UTC), which were caused mainly by lack of GVAR-VISSR observation data partially or totally.

In addition to the cases described above, there were several cases in which no (or very few) vectors were calculated in the Northern (or Southern) Hemisphere. All in all, although there have been a small number of minor troubles, the system has been operating mostly stably.

The accuracy of the present AMVs in comparison with rawin observations generally maintains almost the same grade as the former product of the AMVs that were quality-checked by human manually. Root mean square errors (RMSE) of present AMVs are 6-7(m/s) in high-level cloud motion winds, 3-4(m/s) in low-level cloud motion winds, and 6-8(m/s) in water vapor motion wind respectively.