CGMS-XXXII JMA-WP-07
Prepared by JMA
Agenda Item: II/7
Discussed in WG II

Status of Atmospheric Motion Vectors

This document reports the status of Atmospheric Motion Vectors in JMA.

Status of Atmospheric Motion Vectors

Atmospheric Motion Vectors (AMVs) extraction system in MSC was revised and MSC has been disseminating High Density AMVs since 06UTC 22 May 2003. The revision and the specification of High Density AMVs are shown in CGMS XXXI JMA-WP-10.

(1) JMA has operationally utilized the image data obtained by GOES-9 operated by NOAA/NESDIS as the backup of GMS-5 since 22 May 2003. GVAR data from GOES-9 are transformed into GMS-5 VISSR format so that spatial and radiational resolutions are made equal to those of VISSR data. Although the sub-satellite position of GOES-9 (155E) is different from that of GMS-5 (140E), the AMV extraction domain is the same as that for GMS-5.
(2) The process is automated and high-density winds are produced by using EUMETSAT QI and UW-CIMSS RFF as quality control indices.

Comparisons of both the quality and the number of AMVs between the year 2002 and 2003 were made for the period from June to December. AMVs are calculated at grid points arrayed at 0.5 degree latitude/longitude intervals and all the AMVs with QI > 0.3 are disseminated in BUFR messages, and ones with QI > 0.85, thinned to be at 1 degree intervals, are disseminated in SATOB messages. AMVs disseminated in SATOB messages are compared with nearby rawinsonde observations based on the standard CGMS quality statistics and the trends of bias and RMSE are traced and the number of AMVs in both SATOB and BUFR messages are monthly monitored.

1. Low level infrared vectors

In 2002, the bias ranged from –0.9 m/s to +0.3 m/s, and the RMSE from 4.1 m/s to 5.3 m/s. In 2003, the bias ranged from –0.7 m/s to +0.1 m/s, and the RMSE from 3.1 m/s to 4.4 m/s.

2. High level infrared vectors

In 2002, the bias ranged from –3.4 m/s to –1.4 m/s, and the RMSE from 8.1 m/s to 9.2 m/s. In 2003, the bias ranged from –5.2 m/s to –2.3 m/s, and the RMSE from 8.4 m/s to 10.7 m/s.

3. High level water vapour vectors

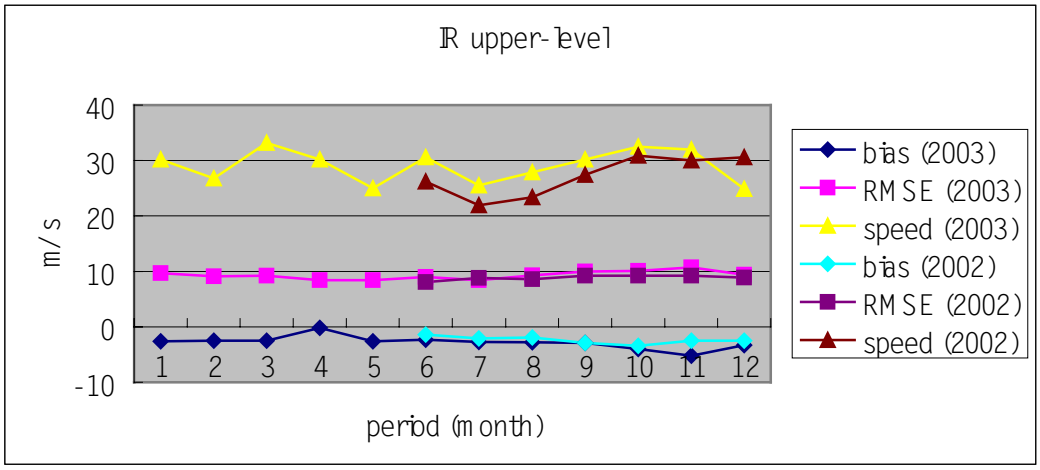
In 2002, the bias ranged from –0.2 m/s to +0.9 m/s, and the RMSE from 8.4 m/s to 9.2 m/s. In 2003, the bias ranged from –1.8 m/s to –0.4 m/s, and the RMSE from 7.7 m/s to 8.9 m/s.

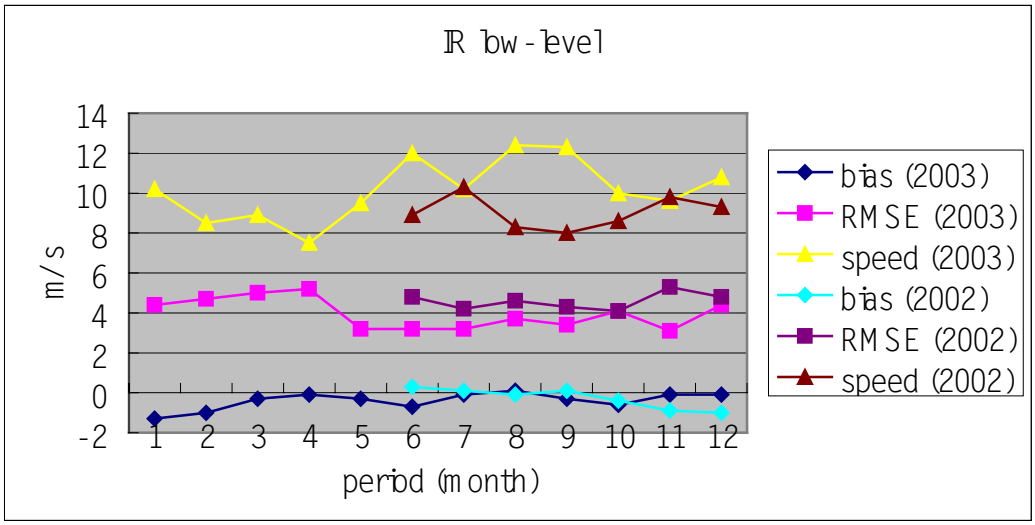
Quality was not very different between 2002 and 2003 for AMVs disseminated in SATOB messages, but it is slightly better in 2003 for low-level infrared vectors and water vapour vectors, while it is slightly worse in 2003 for high-level infrared vectors. The sign of bias of water vapour vectors became negative in 2003 from the positive in the previous year.

High-level water vapour vectors had been produced only for cloudy areas until April 2003. The change of the sign of water vapour vector bias might be related with the practice that high density AMVs were produced for clear skies as well as for cloudy areas after June 2003. The number of AMVs disseminated in SATOB has decreased by about 20 % for water vapour and high level infrared vectors while the decrease in low level vectors are small. The number of AMVs in BUFR messages is 20 times for water vapour vectors and 15 times for visible and infrared vectors as many as those in SATOB messages respectively.

Because the image data operationally utilized in MSC were concurrently changed along with the change in AMV extraction process when the AMV system was revised, it is difficult to identify the exact cause of each difference above. Results show that SATOB vectors retain their quality as before and BUFR message contains more vectors than SATOB message does by more than a factor of ten.

MSC introduced automatic AMV process using QI and RFF when the AMV system was revised. MSC follows the same technique as those of EUMETSAT and NESDIS, and has just started an evaluation to seek a possibility to improve their performances.





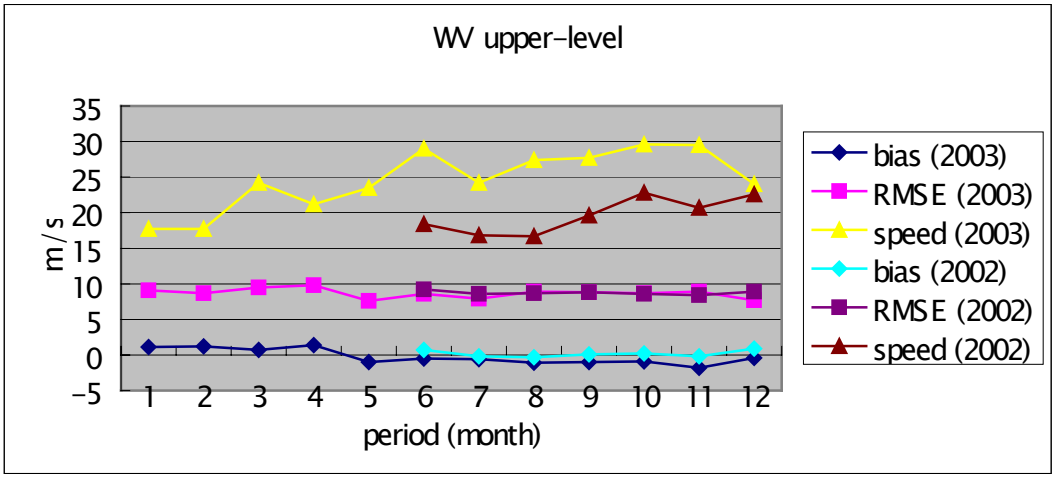


Fig. 1 Monthly mean of differences between AMVs and radiosonde winds

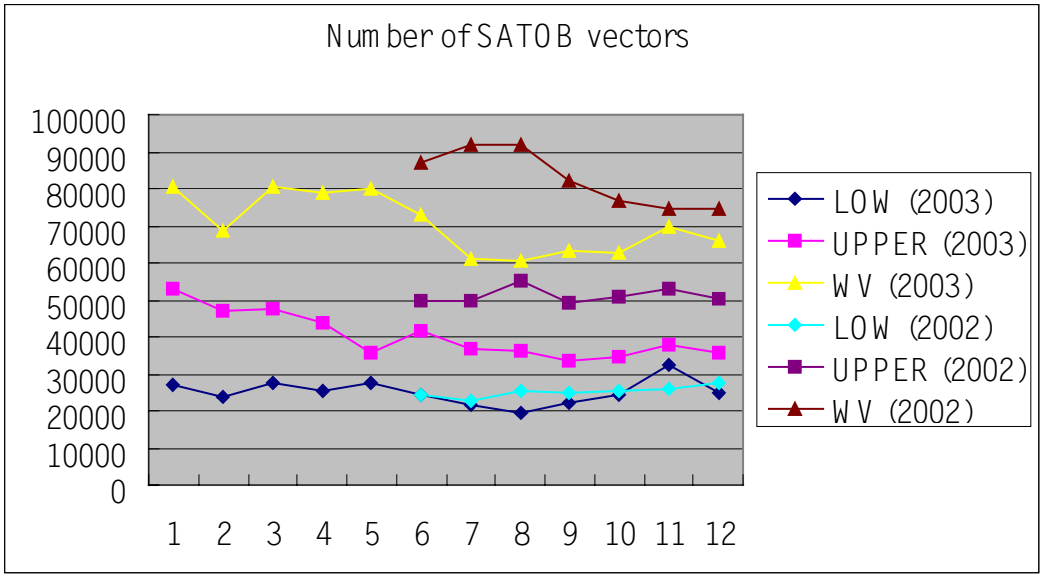


Fig. 2 Monthly number of SATOB vectors

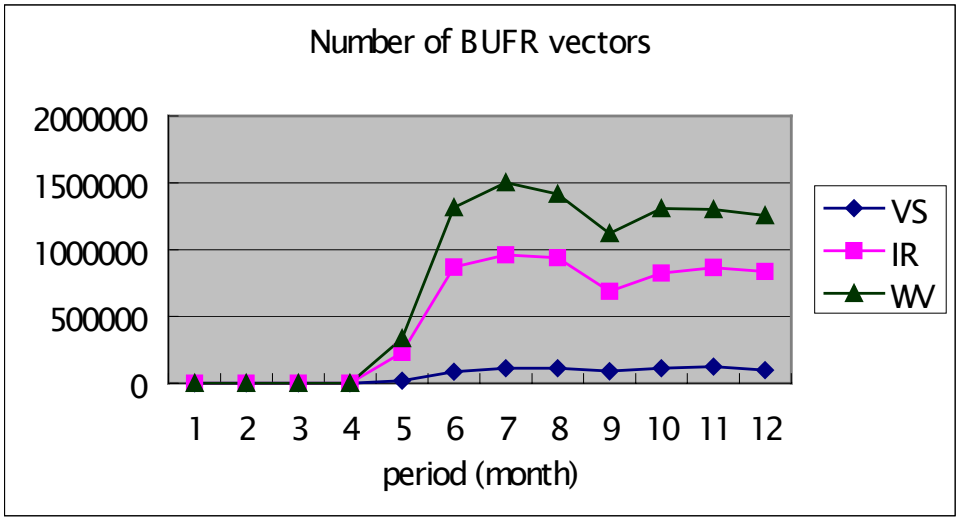


Fig. 3 Monthly number of BUFR vectors