February 10, 2009

Announcement on the upgrade of MTSAT-1R AMV derivation algorithm in May 2009

JMA/MSC plans to introduce new AMV derivation algorithms on 19 May 2009. The changes are listed below:

1. Revision of height assignment scheme for high and middle level IR AMVs

To improve the quality of high and middle level IR AMVs, a new height assignment scheme suggested by Oyama et al. (2008) is introduced. In the new scheme, the each pixel contribution rate to feature tracking within template image, which is derived from the feature tracking process under cross-correlation matching, is used to derive the AMV heights.

2. Resizing template image for IR AMVs and WV AMVs

The template image for tracking targets is resized from 32 pixels to 16 pixels for IR AMVs and WV AMVs at 00, 06, 12 and 18UTC which are computed from images with the interval of 15 minutes. Figure 1 shows the quality change of MTSAT-1R AMVs by resizing template image in terms of monthly statistics to sonde observation. The quality of the wind data is generally improved by the resizing, particularly, the mitigation of slow wind speed bias of high level IR AMVs and cloudy-region WV AMVs over the high and middle latitudes.

3. Expansion of AMV derivation region

The region for deriving AMVs is expanded from 90E-170W and 50S-50N to 90E-170W and 60S-60N, at the same time, the screening condition on satellite zenith angle is changed from 60 degrees to 65 degrees.

As an example, the quality of new AMVs for November 2008 against JMA's NWP first guess is shown in Figure 2. Figure 2 shows the height dependency of number and speed bias (BIAS) of the current and new IR AMVs (QI>0.85). As seen in Figure 2 left, fast BIAS is observed in the current AMVs which are derived between 500 and 700 hPa. On the other hand, the fast BIAS problem is resolved in the new AMVs. This is due to the improvement of AMV height by the usage of each pixel contribution rate to feature tracking within template image in computing AMV height. The slow BIAS of new IR AMVs is also mitigated compared to that of current IR AMVs for the Northern Hemisphere.

Figure 3, 4 and 5 show the spatial distributions of number, BIAS and vector difference (VD) of the current and new AMVs (QI>0.85), respectively. For high and middle IR AMVs and WV AMVs, the BIAS and VD of the new AMVs are overall smaller than those of the current AMVs. With respect to the spatial distribution, the density of the new AMVs is slightly sparser than that of current AMVs. However, the coverage of new AMVs is slightly wider than that of current AMVs, for example, over sub-tropical region in the Northern Hemisphere. For low level IR AMVs, the VDs of new AMVs are slightly improved and the number is slightly increased over the northern middle latitude, while the number is smaller over the tropics.

References

Oyama, R., R. Borde, J. Schmetz and T. Kurino, 2008: Development of height assignment directly linked to feature tracking at JMA, Proceedings of 9th IWW, U.S.A.

Sohn, E. and R. Borde, 2008: The impact of window size on AMV, Proceedings of 9th IWW, U.S.A.

http://www.eumetsat.int/Home/Main/Publications/Conference_and_Workshop_Proceedings/SP_1217939522789?l=en

Ryo Oyama, JMA/MSC

(a)

(b)

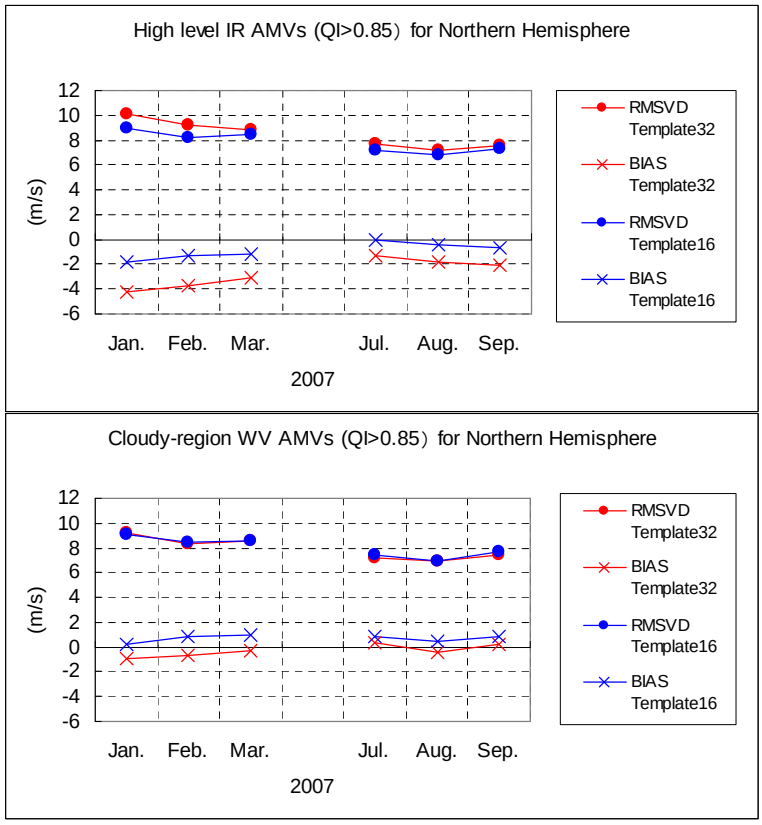

Figure 1: Monthly statistics to sonde observation for Northern Hemisphere (20N-60N). (a) High-level (above 400 hPa) IR AMVs computed by using template size = 16 pixels (Blue) and 32 pixels (Red) and the new height assignment scheme by Oyama et. al (2008), (b) cloudy-region WV AMVs computed by using template size = 16 pixels (Blue) and 32 pixels (Red). The statistical year is 2007, and AMVs with QI above 0.85 are used for the statistics.

(a)

(b)

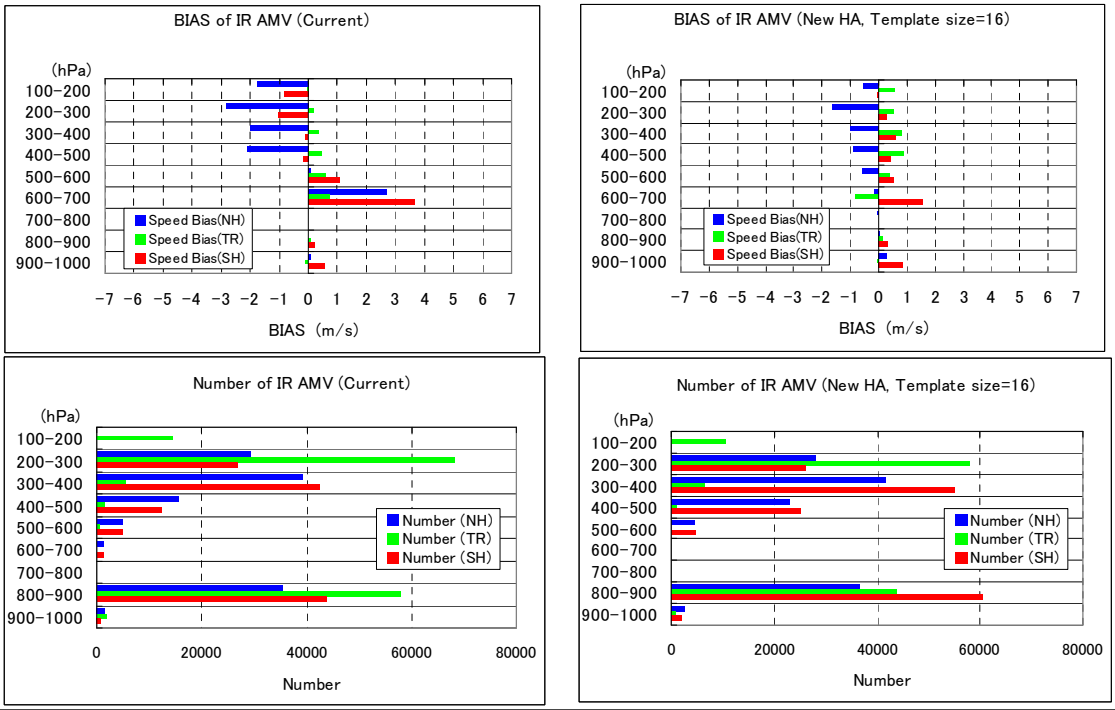

Figure 2: Height dependency of (a) wind speed bias (to JMA's NWP first guess) and (b) number for current (left) and new (right) IR AMV (QI>0.85). The statistics are taken for November 2008.

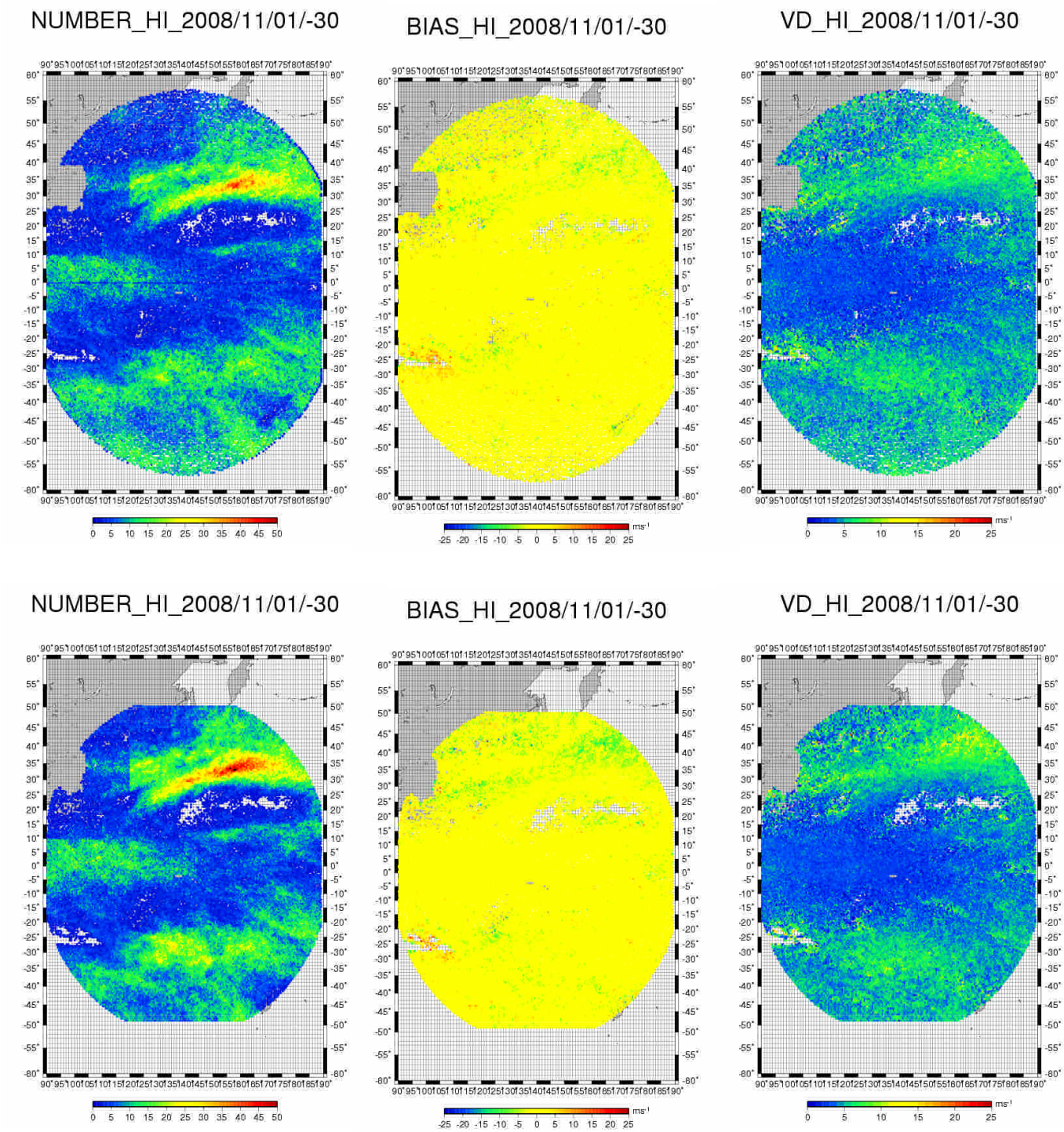

Figure 3: Spatial distributions of number, wind speed bias (BIAS) and Vector difference (VD) (to JMA's NWP first guess) for high and middle level IR AMV (QI>0.85). The statistics are taken for November 2008. Upper: new AMVs, bottom: current AMVs

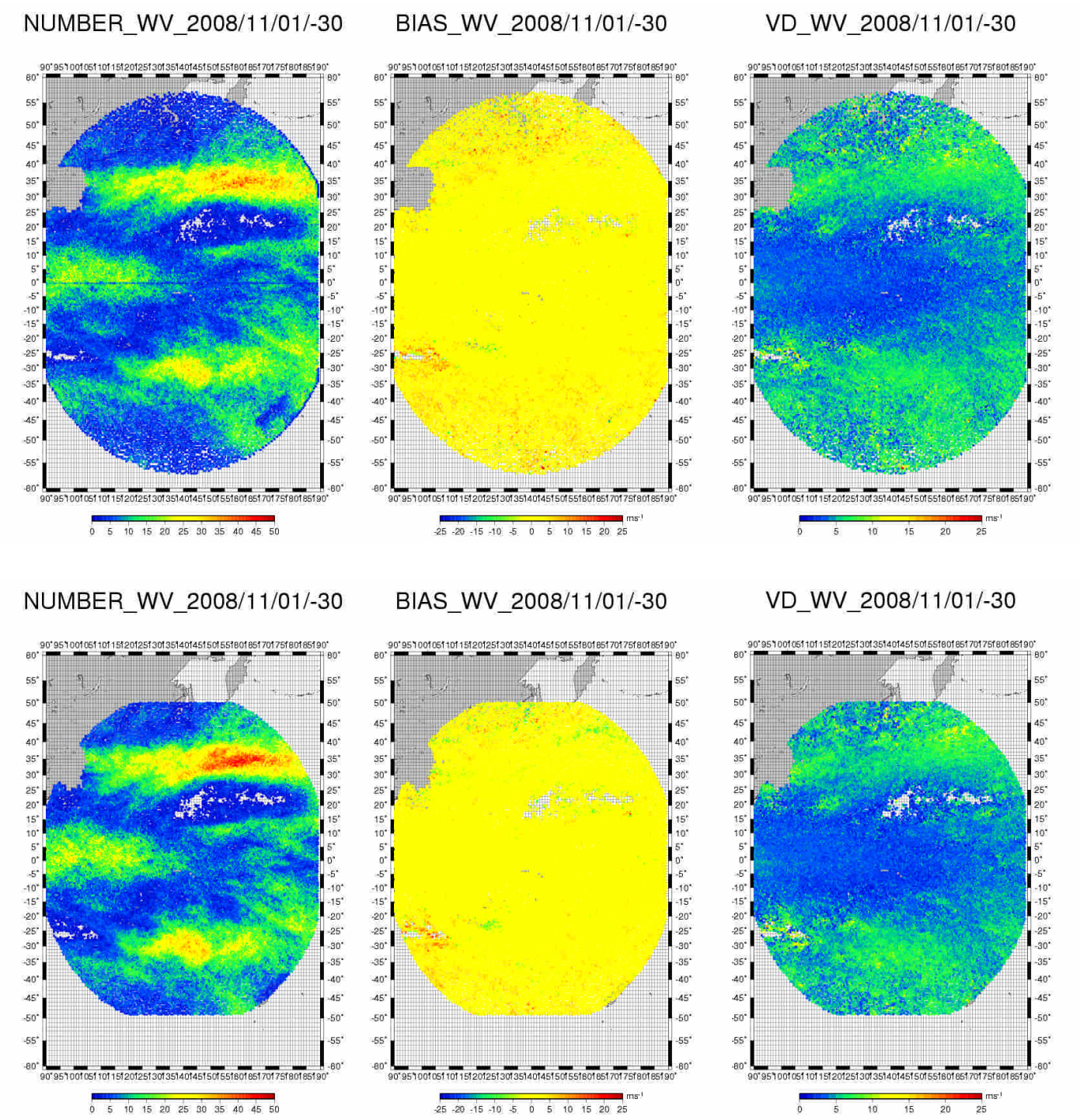

Figure 4: Same figure as Figure 3, but for cloudy-region WV AMV (QI>0.85).

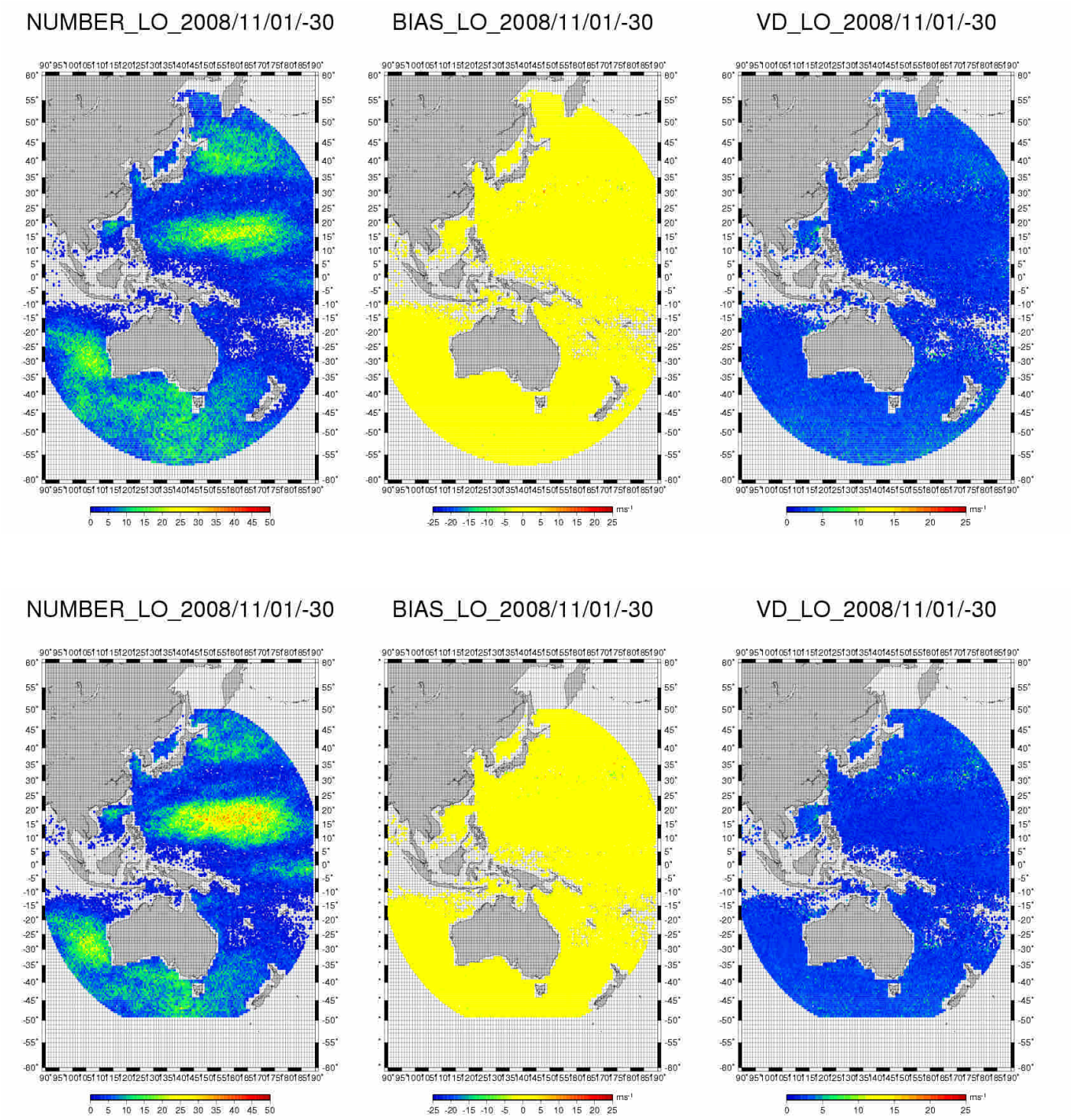

Figure 5: Same figure as Figure 3, but for low-level (below 700 hPa) IR AMV (QI>0.85).