REPORT FROM THE WORKING GROUP ON VERIFICATION STATISTICS

Chair: W.P. Menzel

The Working Group was tasked to address the following items from the CGMS input listed in the Workshop Summary under Section 2.1.

CGMS 6) **Proposing an appropriate reporting format for the comparison of Cloud Motion Winds with radiosonde data;**

CGMS 7) **Investigating, and proposing, a common approach to the establishment and regular maintenance of a directory of accurate sources of radiosonde data;**

CGMS 9) **Compiling a report on the accuracies assigned to winds during the assimilation process at all NWP centres;**

III/1 CMV Reporting Format

The WG III started with a discussion of an appropriate reporting format for the comparison of Cloud Motion Vectors (CMV) with radiosonde data. The goal of the reporting is to assist in achieving international production of like quality motion vectors. It was noted that the working paper submitted by the US at CGMS XXIV was a good starting point. WG III suggested reporting MVD, RMSVD, BIAS, SPD, NCMV, and NC for low (>700 hPa), medium (700 to 400 hPa), and high (<400 hPa) levels for all winds as well as those segmented by latitude bands in the northern extratropics (north of 20N), tropics (20N to 20S), and southern extratropics (south of 20S). Some definitions follow for clarification.

The mean vector difference (MVD) is given by,

$$(MVD) = \frac{1}{N}\sum_{i=1}^{N}(VD)_i \,.$$

where the vector difference $(VD)_i$ between an individual CMV report (i) and the collocated rawinsonde (r) report used for verification is,

$$(VD)_i = \sqrt{(U_i - U_r)^2 + (V_i - V_r)^2}.$$

The root-mean-square vector difference (RMSVD) traditionally reported is the square root of the sum of the squares of the mean vector difference and the standard deviation about the mean vector difference,

$$(RMSVD) = \sqrt{(MVD)^2 + (SD)^2}.$$

where the standard deviation (SD) about the mean vector difference is,

$$(SD) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}((VD)_i - (MVD))^2}\,.$$

The speed bias (BIAS) is given by

$$(BIAS)_i = \frac{1}{N}\sum_{i=1}^{N}(\sqrt{{U_i}^2 + {V_i}^2} - \sqrt{{U_r}^2 + {V_r}^2})$$

The number of of wind vectors produced is given by NCMV and the number of collocations found with raobs is indicated by NC. Collocation with radiosondes should be within 150 km.

An example template for reporting is

	ALL REGIONS	**NH EX-TROP**	**TROP**	**SH EX-TROP**
ALL LEVELS **MVD** **RMSVD** **BIAS** **SPD** **NCMV** **NC**				
HIGH LEVEL **MVD** **RMSVD** **BIAS** **SPD** **NCMV** **NC**				
MEDIUM LEVEL **MVD** **RMSVD** **BIAS** **SPD** **NCMV** **NC**				
LOW LEVEL **MVD** **RMSVD** **BIAS** **SPD** **NCMV** **NC**				

This reporting should be done for cloud motion vectors (CMV) derived from infrared window images (CMV), water vapor motion vectors (WVMV) derived from water vapor images (indicating whether only gradients in cloudy regions were tracked or both cloudy and clear; separation of cloudy and clear statistics is desirable, if possible), motion vectors derived from

visible images (VISMV), and the total combined wind field (TOTMV). Statistics should be reported for three month segments (Dee to Feb, Mar to May, Jun to Aug, and Sep to Nov) and should be submitted the month after the segment is finished.

In addition, a plot of the monthly MVD and BIAS of the full disk winds for each wind type category for the last twelve months should also be submitted to assist in indicating trends. A history of processing changes should also be appended.

It is recognized that existing trend analysis produced locally at different operational wind production centres may be based on different collocation requirements or statistical parameters; maintaining these will require some additional effort at each site.

III/2 Directory of Acceptable Raobs

Discussion then turned to establishing and maintaining a directory of accurate sources of radiosonde data that would be used for the wind statistics. It was decided that the annual reports from the RSMC ECMWF (lead centre for radiosondes) for CBS standard verification should initially be used by all preparers of operational wind statistics. These are released in June to the WMO and will be forwarded to the wind contact points (Schmetz, Menzel, Yamauchi, Uspensky, Bhatia, and Xu). In these reports ECMWF lists the suspect stations and indicates the problem areas with the station wind reports. ECMWF also issues six monthly consolidated lists. Additions or deletions from the suggested raob list should be explained when submitting wind performance reports.

III/3 ANNEX 9 of the "Consolidated Report of CGMS Activities"

Annex 9 of the "Consolidated Report of CGMS Activities" defines the rules followed by CGMS operators to produce wind quality statistics. A revised version of Annex 9 will be prepared by the chairman of WG III and distributed in time for review and editing before the next CGMS.

III/4 Accuracies Assigned to Satellite Derived Winds During the Assimilation Process at all NWP centres.

There is a need to increase dialogue between NWP centres and satellite operators. A report regarding the quality assigned at the NWP centres to satellite winds is desired by WG III; these should be presented at each CGMS and at each Wind Workshop. WG III requests that this recommendation be passed on to the CGMS and the CBS WGSAT Rapporteur in order to bring this to the attention of NWP centres and initiate the reporting of this information through WMO mechanisms.