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USE OF THE STANDARD CGMS ATMOSPHERIC MOTION VECTORS (AMV) STATISTICS AND COLLOCATION CRITERIA

In response to CGMS Action 34.22

This working paper discusses the use of the standard CGMS AMV statistics and collocation criteria used at NOAA/NESDIS. A historical perspective of this practice performed by all operational satellite operators is given as well as the underlying reasons and benefits offered by this practice. Several suggestions for improving the utility of the statistical reports generated by all satellite operators are made.

Use of the Standard CGMS AMV Statistics and Collocation Criteria

1. Introduction

All operational satellite operators today that generate Atmospheric Motion Vectors (AMVs) on an operational basis generate a monthly report that includes intercomparison statistics between their satellite-derived AMVs and those obtained from conventional rawinsondes. This practice was initiated as a result of an agreement reached between satellite operators at the 8th meeting of the Coordination Group for Meteorological Satellites (CGMS) in March 1977 on the need for two forms of intercomparison statistics involving satellite-derived AMVs. The first form of statistics involved intercomparisons between satellite-derived AMVs in areas of overlap between adjacent satellites. The second form of statistics, and the subject of this working paper, involves intercomparison statistics between satellite-derived AMVs and AMVs from conventional observations. As a result of a report from a IWWG working group on AMV verification statistics (Menzel, 1996), the 25th CGMS adopted common standards for collocation criteria, statistical metrics to be computed, the geographic coverage over which the statistics would be generated, and the satellite AMV types to be included in the statistics. The over-arching goal of these agreed upon practices was to assist in achieving international production of like quality AMVs.

The standardized collocation approach and resulting reports provide for accurate statistical comparisons that are needed for proper AMV error analysis by both satellite operators and their respective AMV users. Numerical Weather Prediction (NWP) users, for example, can use these statistics to help in the proper assignment of observational error to the AMVs. Satellite operators can intercompare, on a first-order basis, their AMV statistics for their own operational satellite(s) against AMV statistics generated by other operational satellite operators for their respective satellite(s). The existence of large differences in the magnitudes of the statistical metrics is expected to trigger inquiries and discussion between satellite operators regarding AMV algorithms and quality control procedures.

2. Current Use of Standard CGMS AMV Statistics at NOAA

AMV algorithm developers at NOAA/NESDIS routinely review the standard CGMS AMV statistics reports produced by the other operational satellite operators in order to keep abreast of the intercomparison statistics and how well AMV algorithms from other satellite operators are performing. In fact, these reports are archived, albeit in an adhoc manner, by AMV developers at NOAA/NESDIS. The current archive contains reports back to 2001.

3. Recommendations

It is recognized that the standard CGMS AMV statistical reports may be under-utilized by the community. These statistics are important for the reasons

discussed above. As such, they should continue to be generated by all satellite operators. Suggestions for increasing their utility are as follows:

- Increase the visibility of the reports and make them more accessible. This can be achieved by:

    1. Communicating to the AMV user community that these reports exist, that they are generated on a monthly basis by all satellite operators, and where they can be found.

    2. Adding the reports to the IWWG web site which is hosted by the Cooperative Institute for Meteorological Satellite Studies (CIMSS).

- Provide graphical displays of the statistics in the reports where links to these graphical displays could be added to the IWWG web site. The most obvious form of graphical display would be time series of these statistics which could provide a good quantifiable view of progress made in the quality of satellite-derived AMVs over time.

4. Current Collocation Criteria Used at NOAA to Derive AMV Comparison Statistics

At NOAA/NESDIS, the following criteria are used in the process of collocating operational AMVs to rawinsonde observations:

- Horizontal radius
    - 150km
- Time window
    - 90 minutes
- Rawinsonde must report winds above and below the satellite assigned pressure
- Rawinsonde wind report must be close enough to satellite assigned pressure
    - 25mb for P <= 500mb
    - 50mb for P > 500mb
- Satellite AMVs must be of sufficient quality as indicated by quality flags
    - RFF >= 50
    - QI >=50

5. Summary

Operational satellite operators continue to generate monthly reports that contain intercomparison statistics between AMVs derived from their respective operational satellite(s) and rawinsonde observations of AMVs. The collocation and statistical reporting methodologies are standardized and used by all satellite operators. The over-arching goal of this agreed upon practice by operational satellite operators, was to assist in achieving international production of like quality AMVs. Participants of the International Winds Working Group (IWWG) continue to work hard together to achieve this goal, with the CGMS AMV statistical reports being one of several tools that contributes to

meeting this goal. Recommendations have been provided to further increase the utility of these reports.

6. References

Menzel, W.P, 1996: Report from the working group on verification statistics. Proceedings of the Third International Winds Workshop, Ascona, Switzerland, 10-12 June 1996. Published by EUMETSAT, EUMP 18, 17-19.

Tokuno, M, 1998: C-location area for comparison of satellite winds and radiosondes. Proceedings of the Fourth International Winds Workshop, Saanenmoser, Switzerland, 20-23 October 1998. Published by EUMETSAT, EUMP 24, 21-28.