PANEL DISCUSSION

VERIFICATION TECHNIQUES

Chairperson: J.F.W. Purdom

The working group opened with a discussion on "Why do we perform verification?" There was agreement that verification was performed for a number of reasons. Among them:

a) to determine how to improve wind accuracy;
b) to determine how to better use CMW in numerical weather prediction models;
c) to monitor how well we are doing so that we can see impacts of changes in CMW derivation techniques; and,
d) to help isolate problem areas.

The discussion then addressed the question of "What is verification". This proved to be lively indeed. It was immediately pointed out that what we were seeing in many cases was not an "error" but rather a difference since the type measurement systems were almost always inherently different. It was realized that what was occurring were actually comparisons.and that there needed to be some assumptions of validity made: if not, one could quickly come to the conclusion that there is no such thing as "ground truth" (which in some instances may well be true). It was recognized that atmospheric variability exists on small scales, and that we must be sure that when verifications are undertaken that natural atmospheric variability is not mistaken as an "error".

It was noted that there are a number of different types of base lines, and that each base has its own error characteristics which must be taken into account when doing a comparison. Among the readily recognized base lines are: Rawinsonde, ACARS, ASDAR, Numerical Models and ground truth stereographic cameras. It was also noted that the quality of rawinsondes can vary considerably, and that in some instances rawinsondes that were not quality controlled were used in satellite CMW verification studies - this should not occur. Some concerns were expressed in the area of verification of CMWs using numerical models. The concerns were mainly ones of "independence". For example, models use satellite CMWs in defining their initial state and then forecast using that information as a part of their data base. It was agreed upon that model improvement over time in regions where CMWs were used extensively (as in the tropics and southern hemisphere) was a positive verification statement concerning CMWs.

The question of verification next focused on two separate questions, with the first relating to the second as far as CMW verification is concerned. First - how well do the various CMW producers trace targets and assign their height: independent of how well the target represents the wind. Second, how well do CMWs represent the wind? Certain examples of concern include upslope fog and stratus and mountain waves, where there may be no cloud movement but strong winds; gravity waves and cumulonimbus, which

have shear considerations; and anvil cirrus which may or may not be a good tracer depending on the life-cycle in which the Cb was at the time of the measurement. It was generally agreed that trade cumulus and cirrus in jet stream regions were good tracers.

Finally, the Verification Group discussed presentation techniques. It was aware of the present CGMS procedures for producing the semi-annual inter-comparisons and felt that different methods of presenting statistical information may be more appropriate. The Group felt that the newer geographical and time series presentations such as found in the papers presented at the First Wind Workshop would be more valuable than the present method.

There were some suggestions for further activities:

1) CMW producers should undertake local verification studies, including the studies of the type Dr. Fujita reported on, to see how well they are able to track a cloud and determine its height.

2) Case studies between various CMW producers should been encouraged in overlap areas. This is one way of assuring that the positive interaction evidenced at this workshop continues.

3) For monthly comparison (or statistics) tables the following should be added:

   a) stratify the comparison (or statistics) with respect to type of systems being compared (GMS vs Rawin, METEOSAT vs Forecast model, GOES vs ACARS, etc.);

   b) stratify statistics with respect to wind speed (i.e.,10 m/s intervals);

   c) do detailed reports twice a year;

   d) define co-location as a function of both space and time;

   e) provide an indicator of how reference data has been treated in their cloud motion wind production (i.e. quality control). Has there been prior quality control of the satellite or rawin data used in the comparison, for example;

   f) add variance to the statistical data base;

   g) it was recognized that among the main improvements that have occurred are those related to height assignment, and that some indicator of height of best fit wind, or the like, needed to be included in the statistics. It was not decided what, or how, this might be accomplished;

   h) add to or change the presentation method to include geographical distribution of comparisons, time series to better view trends and comparisons with NWP. Examples of these presentation methods can be found in the Proceedings of the First Wind Workshop.

Conclusion

Verification leads to innovation. We must continue to work together in a spirit of co-operation. Inter-comparison and verification is not a contest, but rather a joint effort aimed toward improved products and services.

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