REPORT FROM THE WORKING GROUP ON DATA ASSIMILATION (WG-II)

Chairperson: Mary Forsythe

1. INTRODUCTION

The working group on data assimilation focused on concerns that we are not seeing the full benefit of satellite wind data in NWP. Topics relating to actions from CGMS XXX-XXXII were also discussed and recommendations made.

2. CGMS ACTIONS

Action 30.31) What is the perspective of satellite wind data for regional models?

Recommendation (IWW7_WG2_1): NWP centres to consider modifying quality indicator thresholds for regional data assimilation.

Recommendation (IWW7_WG2_2): Satellite operators to consider re-tuning quality indicators for mesoscale wind products.

It was also noted that use of MODIS polar winds would be very restricted in regional models due to the tighter time constraints.

Action 30.32) What else is needed for height assignment methods beyond an inventory?

An inventory of height assignment methods was considered useful. In addition, two recommendations were made.

Recommendation (IWW7_WG2_3): Satellite operators to work towards providing an estimate of height uncertainty with each wind.

Recommendation (IWW7_WG2_4): Satellite operators to use a decision tree rather than an averaging technique for the final height assignment.

Action 31.34) Discussion on hyperspectral imagers/sounders

The working group agreed that this was a promising approach and we would support further research in this area.

3. ARE WE SEEING THE FULL BENEFIT OF AMV DATA?

The working group agreed that we are seeing positive benefit from operational AMV assimilation, particularly in the tropics and southern hemisphere. However, there was also general agreement that we are not yet seeing full benefit from the AMV data. Discussion of this problem was prompted by an email from John Eyre

(Met Office) before the Winds Workshop. In the follow-up e-mails and in the working group discussion it was agreed that progress in this area would benefit greatly from increased collaboration between NWP centres and satellite operators.

Recommendation (IWW7_WG2_5): NWP centres and satellite operators to collaborate with the aim of improving impact from AMV data in NWP. Initially results of investigations should be emailed to the CGMS winds list server, but other options include using a separate email list or linking results to a web page.

There are various reasons why we may not be seeing the full benefit of the AMV data in NWP. These include:

1. Height assignment errors.
2. The targets tracked may not accurately depict the real wind.
3. The AMV errors are poorly represented in data assimilation. This is partly due to a poor understanding and characterization of the errors, but also because the spatially and temporally correlated error is not allowed for directly in the assimilation.
4. Model dependence introduced at some stages of the derivation system.

To approach this problem, WGII recommends:

Recommendation (IWW7_WG2_6): NWP centres to investigate AMV-model differences (through the NWP SAF satellite wind monitoring report) and to run case studies. The aim is to gain a better understanding of the errors and identify whether they are seasonally, geographically or synoptically dependent.

Recommendation (IWW7_WG2_7): Satellite operators to re-examine the physics and to work towards producing physically-based estimates of the vector and height error with each wind.

Recommendation (IWW7_WG2_8): Satellite operators to produce winds with simpler errors where possible. In part, this may be achieved through reducing the dependence on model forecast data.

To maximize the benefit to data assimilation, WGII recommends:

Recommendation (IWW7_WG2_9): NWP centres and satellite operators to concentrate on areas where the AMV data has most to offer. Examples include regions where other data types provide poor coverage or are problematic and in physically important regions such as near jets, tropical cyclones and in areas of rapid growth.

Recommendation (IWW7_WG2_10): Further work is also recommended to improve the data assimilation of AMVs. Ideas include:

1. Development of bias correction schemes, for example Bormann et al., 2002.
2. In the short-term, development or use of more realistic observation errors along the lines of Le Marshall et al., 2004. In the longer-term, consideration of how to use estimates of vector and height error in data assimilation.
3. Improvement in the treatment of correlated error, possibly through the use of estimates of the correlated error and lengthscale, which may soon be provided within the BUFR (Le Marshall et al., 2004).
4. Investigations into using model independent quality indicators and data that is more independent of NWP models.
5. Improvement to quality control including re-assessment of blacklisting and thinning options.
6. Re-evaluation of the observation operators, particularly for CSWV winds, for example Rao et al., 2002 and work in progress by Lüder von Bremen at ECMWF.
7. Evaluation of alternative assimilation strategies e.g. assimilation of wind derivatives including upper level divergence fields (e.g. Schmetz et al., 2004) and gradient wind fields.

4. GENERAL DISCUSSION

From the general discussion, two further recommendations were proposed.

Recommendation (IWW7_WG2_11): ECMWF to carry out assimilation experiments to compare the use of CSWV winds to the use of CSWV radiances.

Recommendation (IWW7_WG2_12): Satellite operators and NWP centres to consider the best way to approach the varied requirements of the user community. Some centres do not have the resources to optimize assimilation and would prefer to receive a best final product. Other users would prefer to receive data with simpler errors that can be modeled more accurately in the assimilation. Increased collaboration between NWP centres and satellite operators is required to share expertise and to negotiate the best course of action.

5. REFERENCES

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Rao, P.A., Velden, C.S. & Braun, S.A, 2002. The vertical error characteristics of GOES-derived winds: description and experiments with Numerical Weather Prediction. *Journal of Applied Meteorology*, **41**, p253-270.

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