

NWP working group report

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The strong turn-out of operational NWP centres for the 11th International Winds Workshop was noted at several times during the workshop, and it led to a strong NWP working group with well over 10 operational centres being represented. This provided a good basis for constructive discussions, resulting in pertinent recommendations to satellite agencies, winds producers, and NWP centres.

1. AMV impact intercomparison

The AMV impact intercomparison coordinated by James Cotton (Met Office) and Christophe Payan (Météo France) is considered a great success, and the group thanked the coordinators for their efforts so far. Nine centres participated and produced results from Observing System Experiments (OSEs) for all AMVs over the same two 1-½ month periods, with MODIS OSEs and scatterometer OSEs for one of the periods, respectively. The much longer study period was seen as a significant advantage over the first AMV impact intercomparison. Results from the impact of all AMVs have been compared so far, based on the centres that have submitted their results, and participating centres showed consistent positive impact in most areas.

The group discussed how to finalise the project, noting that a draft summary of the results received so far has been sent out by James Cotton and Christophe Payan to the participants. The following steps were agreed:

- Those centres who have yet to submit their contributions, should email them to James Cotton and Christophe Payan by the end of March 2012.
- Participants should review the draft report and report back to the coordinators any comments, also regarding possible explanation of some differences in the impact.
- An updated draft report will be circulated to participants once the missing contributions have been added, and the report should be finalised in time for the WMO Observation Impact Workshop in Sedona in May 2012.
- Jamie Daniels will present a summary of the findings at the Sedona Workshop.
- Summarising the results as a peer-reviewed paper will be considered once the final report is available.
- James Cotton and Christophe Payan also intend to summarise the results of the MODIS and scatterometer winds impact experiments.

2. Opportunities for better error characterisation for each AMV

The group noted from the workshop presentations that a number of new methods are emerging for the AMV derivation, in terms of the tracking (e.g., nested tracking), the linking of tracked targets and height assignment (Cross-Correlation Contribution, CCC), and the actual height assignment (optimal

estimation-based methods with error estimates, cloud phase estimates, etc.). These provide new information on the winds derivation and situation-dependent AMV characteristics. Hence, they offer an opportunity to address a long-standing request from NWP centres: Improve the error characterisation of the AMVs and its height assignment. For instance, ancillary output from the nested tracking could be used to characterise AMV quality; this was shown by Sharon Nebuda at the present Workshop to be a promising possibility. More work in this area is needed, to improve the quality control and error specification for AMVs in NWP. Therefore, the group made the following recommendation:

Recommendation to winds producers: to investigate how to provide enhanced situation-dependent error estimates of wind and pressure with new AMV derivation techniques. NWP centres offer to work with winds producers on the evaluation of the suitability of such additional information.

3. MISR AMVs

The group noted the further improvements made in the quality of the MISR AMVs (e.g., presentation by Kevin Mueller), with the move to a new 17.6 km product. Also, the possibility of a near-real time data stream was raised by JPL, with a latency of around 5h possible, making these global AMVs with stereo-based height assignment techniques a feasible candidate to be (partially) included in operational NWP systems. Offline experimentation in assimilation systems was seen as the most suitable approach to strengthen the case at this stage. As an initial step, JPL agreed to make MISR AMVs available to interested NWP centres in ASCII format for the two periods used for the AMV impact intercomparison. The provision of the data in BUFR format will also be investigated. Most NWP centres represented in the group showed interest in evaluating this test dataset in monitoring or assimilation experiments. In addition, the group formulated the following recommendations:

Recommendation to NWP centres: to evaluate MISR winds in offline assimilation tests.

Recommendation to JPL: to provide MISR winds with improved latency (~5h) to allow operational assimilation in NWP.

Recommendation to all space agencies and data producers: to provide any data for NWP centres in BUFR format.

4. New and future AMV products

A number of new AMV products have been developed recently or are going to be developed, as presented at the Workshop, such as the leo/geo AMVs derived from a blend of instruments over the high latitudes, VIIRS polar AMVs which continue the AVHRR heritage, or the Metop-A/B mixed AMVs which should provide global coverage using the two AVHRR instruments operated in tandem on the Metop-A and Metop-B spacecrafts flying in the same orbit approximately 50 min apart. The group supports the development and near-realtime dissemination of these products (in BUFR).

Polar AMVs are considered to remain an important component of the observing system, and the group is encouraged by the efforts by the Canadian Space Agency (CSA) to embark on providing imager data from a highly elliptical orbit (Polar Communications and Weather satellite, PCW). This will result in geostationary-like wind coverage in the polar regions, with expected lower tracking errors due to higher temporal resolution images. Therefore, the group recommends:

Recommendation to the CSA: to realize the PCW mission, which will deliver unprecedented continuous satellite images in the Arctic region.

The launch of the Aeolus LIDAR is currently scheduled around the time of the next International Winds Workshop. An Aeolus-specific workshop is planned about one year before launch, and would benefit from wide NWP participation.

5. Surface winds

Opportunities for improved provision of surface wind data from satellites were discussed, recognising that some instruments have been launched, but are not yet available to the global user community (e.g., the HY-2A scatterometer of the Chinese State Oceanic Administration), or that some products are in danger of being discontinued (surface winds from the polarimetric microwave imager Windsat). The group made the following recommendations:

Recommendation to Chinese State Oceanic Administration and partner agencies: to make global HY-2A scatterometer data available to the international community and investigate the possibility of real-time data dissemination.

Recommendation to the US navy: to continue the processing of Level 2 Windsat data for use by NWP centres.

6. Organisation of the International Winds Working Group

The group was generally supportive of the current workshop format. Especially the “hot-topic” discussion sessions are seen as a very useful vehicle to allow wider exchange of ideas and opinions, and to take selected topics further.

The group felt that the move to 15 min presentations considerably limits the material that can be shown in oral presentations, and instead the old format of 20 min presentations is preferred. The possibility to allow participants to choose different lengths of presentations at the abstract submission stage was raised. The group supported the idea of allowing poster presentations, provided they are well-integrated in the general program (e.g., poster viewing combined with coffee breaks, brief oral introductions of each poster). They were also seen as a means to ease the pressure on the timetable in case longer presentations are causing problems, as some presentations currently made orally may be better done through a poster.

The IWWG website was generally seen as useful, including the new Wiki pages. It was suggested to open the Wiki pages up to more members of the IWWG, provided this can be supported by CIMSS who hosts the Wiki pages. At the same time, the usefulness of having “lead authors” for certain pages was pointed out. Further options could also be investigated, such as email notifications when “watched” pages have been changed.

7. NWP SAF monitoring activities

The group was very supportive of the NWP SAF monitoring activities, in particular the 5th analysis report which was distributed shortly before the meeting. The analysis report is seen as a very useful and comprehensive summary of features noted in the monitoring of AMVs against Met Office and ECMWF background fields. More in-depth investigations of some features would require stronger collaboration with winds producers, and winds producers are encouraged to engage in this activity.

The pages providing information on the AMV usage in NWP centres were also discussed, and the group decided on the following actions:

- **NWP centres with situation-dependent AMV errors to provide indications of typical observation errors used on the NWP SAF information page on use of AMVs in NWP (via James Cotton).**

- **NWP centres to provide information on observation errors used for radiosonde wind observation on the NWP SAF information page on use of AMVs in NWP (via James Cotton).**

8. Simulated Winds studies

Simulated winds studies are seen as a useful tool to further characterise current AMVs, study whether AMVs should be treated as layer or level estimates of winds, and to prepare for future instruments. Activities in this area are on-going at CIMSS, ECMWF, and University of Reading/Met Office, and the group was supportive of these activities. For instance, results presented by Angeles Hernandez at this workshop demonstrated the possibility to provide estimates of spatial, temporal, and vertical error correlations for current AMVs, or to highlight aspects of vertical/spatial averaging in combination with height assignment.

9. Mesoscale AMVs

The use of AMVs in mesoscale NWP systems was discussed. Possible issues include: Do we require AMV datasets with higher spatial resolution/sampling? The QI aims to favour synoptically consistent AMVs - should the QI thresholds be adjusted to avoid penalising mesoscale features? Is different (less) thinning/superobbing required for mesoscale assimilation systems and if so are there implications from spatial error correlations in the AMVs? Studies addressing some of these aspects are underway in some NWP systems in cooperation with CIMSS. Summarising the discussion, the group made the following recommendation:

Recommendation to NWP centres: to investigate whether additional high density winds are needed for mesoscale models and what modifications are needed to make best use of AMVs in mesoscale assimilation systems.

10. Use of AMVs in tropics

The AMV impact intercomparison has highlighted that AMVs have the largest and most robust impact for different centres at high levels in the tropics, whereas more mixed results are obtained, for instance at NCEP or ECMWF, in the low and mid-level tropics. Some of the more mixed results can be attributed to verification problems or model deficiencies rather than problems in the AMVs themselves. However, it is also considered important for global systems that the assimilated AMVs represent the synoptic flow. It was suggested to investigate superobbing to help with this, and to assess whether the new nested tracking technique provides further insights, as it has the potential to capture different flow regimes in different clusters.

11. Other avenues in AMV assimilation

The group discussed future plans and research opportunities at the various centres represented. The superobbing procedure developed at NRL will be subject of further investigations, in terms of how it performs compared to thinning procedures used at other centres, and in terms of how the superobbed data performs in other centres (NASA GMAO). Initial results presented at the meeting suggest a relatively small benefit compared to thinning in the NRL system, whereas replacing the normally used AMV dataset with the NRL-superobbed data in the NASA GMAO system indicates a significant improvement. The Met Office and ECMWF will continue to investigate the role of layer averaging in the observation operator for AMVs, in conjunction with the simulated winds studies undertaken at these centres. ECMWF also has plans to re-visit the benefits of hourly winds

compared to less frequent sampling once GOES hourly winds are available. There is also a continued need to investigate which metrics of forecast impact to use in addition to the standard metrics, for instance in order to highlight particular aspects of forecast performance (e.g., impact on cyclones, severe weather).