

Report from Working Group 2 (WG2): Data Assimilation

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1. Aeolus

For the first time, results with real observations from a space-borne DWL were presented at an International Winds Workshop (IWW), with an overwhelmingly beneficial impact of Aeolus winds in all of the global NWP systems. WG2 acknowledges the substantial progress as documented at IWW15 and two earlier Aeolus NWP workshops. The impact is complemented by studies demonstrating the benefit of Aeolus in AMV validation and height assignment. Follow-on DWL missions delivering improved-quality winds in the next decade are hence strongly supported by the IWWG.

Further to the discussion and recommendation from the plenary discussion about Aeolus, the WG discussed the complementarities of measurements of wind from DWL and wind information from high-temporal resolution passive sounders. The two observing systems are seen as providing different strengths, and both are required to fill the present gap in global coverage of height-resolved wind observations. Work to highlight this aspect using the now available real data was presented in a few talks at the workshop, but more work on this aspect is considered useful to further strengthen the case.

Recommendation IWW15-WG2-1 to the wider satellite winds community: Further work is required to assess the unique strengths and weaknesses of DWL and other methods (e.g., high temporal-resolution passive sounders) in providing vertically-resolved global wind information and to underline further how these are complementary.

It was noted that combined OSSEs with Aeolus and high-temporal resolution sounders are being planned by the University of Wisconsin.

2. Processing and satellite changes

The working group recalled some standing recommendations from previous workshops regarding product or satellite changes, and decided that these remain valid:

Standing recommendations to winds producers:

- **To provide a 9-month overlap period when transitioning to a new generation of satellite and for major derivation changes.**
- **For like-for-like satellite changes a 3-month overlap period is considered sufficient.**
- **To communicate upcoming significant changes in product provision via the IWWG email list (as well as through existing other user notification channels) several months in advance.**

2.1 Planned JMA processing changes

JMA requested feedback on their plans to implement a range of changes for the Himawari-8 processing in November 2021 (new BUFR template, algorithm update, ½ hourly product, etc; see presentation by Kazuki Shimoji). A 1-2 months parallel dissemination of the old and the new data is currently planned.

The group welcomed the planned improvements, but considered the short parallel dissemination and the combination of format and algorithm changes very challenging for operational NWP centres. When other providers transitioned to the new BUFR template it has been extremely valuable to have the same data available in the old and new format, in order to identify issues from the format transition. The group hence made the following recommendation:

Recommendation IWW15-WG2-2 to JMA: to consider a longer parallel dissemination period (3+ months) for the upcoming change in November 2021, with the BUFR format change and algorithmic update implemented as separate steps at different times a couple of months apart. If a longer parallel dissemination is not feasible, the WG recommends providing separate sample data a few months in advance. The group also recommends a clear announcement of the finalised implementation dates via the IWWG email list.

The group also remarked that the end of a calendar year can be particularly problematic for operational changes due to holidays and suggests taking this into account in revisions of the transition plan.

In addition, JMA asked for feedback regarding the intended consolidation of the dissemination of winds derived from the WV channels. JMA aims to keep only one or two out of the three channels (ie 6.2, 6.9, 7.3 μm), as they are considered to provide largely the same information. Feedback from the group showed that the use of the WV channels varies between NWP centres. While some centres only use one channel, with the selected channel differing between centres, others use all of them. There is hence no established view which channel usage is best for all systems (see also <https://nwp-saf.eumetsat.int/site/monitoring/winds-quality-evaluation/amv/amv-use-in-nwp/> for information on the channel usage by centre). To allow further evaluation of this aspect, the group hence made the following recommendation:

Recommendation IWW15-WG2-3 to JMA: to consider keeping AMVs from all 3 WV channels in the sample dataset to allow NWP centres to evaluate the impact of eliminating one or two channels.

The group also took note of the planned transition from Himawari-8 to -9, with parallel dissemination foreseen between Oct 2022 and January 2023. The group welcomed the period of parallel dissemination for this like-for-like change which is in line with previous recommendations. Ample advance warning about the finalised transition plan, via the IWWG email list, is requested.

During the plenary presentation of the WG outcomes, it was remarked that if Himawari-8 will still be operated after the transition, a repositioning of the satellite could be considered to facilitate stereo applications.

2.2 Plans for POES satellites and MODIS processing

As reported during MW15, NOAA is considering to decommission the POES satellites (NOAA-15, -18, and -19) in September 2022. This would mean the loss of a significant source of polar AMVs, in addition to the loss of MW sounding and other NWP-relevant observations. Discussions are ongoing at NOAA, following feedback on these plans from several NWP centres, requesting for NOAA to continue operating the satellites beyond September 2022. In line with this feedback from NWP centres, the WG expressed the following:

Recommendation IWW15-WG2-4 to NOAA: to continue operating NOAA-15, -18, and -19 as long as the sensing instruments perform adequately. These satellites continue to provide useful polar AMV datasets.

Even if POES satellites continue to operate, NESDIS currently plans to discontinue the derivation of AMVs from the POES satellites and from MODIS in September 2022 and only produce level 1c data. AMVs will still be available for instruments from these satellites from CIMSS, albeit with different processing configuration and in different BUFR format. Hence a switch to CIMSS-datasets will mean a considerable disruption to users of the NESDIS data-stream.

Recommendation IWW15-WG2-5 to NOAA/NESDIS: to keep processing AMVs from POES and MODIS for the lifetime of the instruments.

Alternatively, the group suggests to NESDIS to offer support in utilizing CIMSS's POES and MODIS winds (e.g., BUFRisation, GTS dissemination, etc) as required. If needed, CIMSS (Dave Santek) offered to submit a proposal to NESDIS to coordinate details (i.e. cloud product availability, PDA accessibility, etc.).

The group also noted that the length of the MODIS winds dataset (approaching 20 years) makes it particularly attractive for climate and reanalysis applications, and reprocessing efforts would be very valuable.

2.3 Move to new BUFR template

The group appreciated that several providers have already moved to the new AMV BUFR template and reflected on the transition. It was noted that the transitions were not without complications and required great care at the producer's and user's side. Some issues were only discovered late, leading to late changes in the transition implementation. The group re-iterated the need for early communication of changes, but also the need for thorough early testing of changes at NWP centres.

3. Quality information for global and regional systems

The discussion considered the provision of quality information in general and discussed these aspects in response to CGMS A46.06 ("IWWG to look at improving quality indicators for high resolution wind derivation for mesoscale and regional applications. Ref. CGMS-46-IWWG-WP-01").

While the QI continues to be used for quality screening, NWP centres are increasingly looking for other ways to characterise AMV quality (e.g., use of correlation surfaces, cloud parameters). The move to the new BUFR template further facilitates this as new entries for such parameters are now available. It was noted, however, that many of these entries are not yet filled.

Recommendation IWW15-WG2-6 to AMV producers: to make use of the new BUFR template to provide further information on the AMV derivation and auxiliary cloud information, as available in their processing.

Recommendation IWW15-WG2-7 to AMV centres: to continue to evaluate this new information for enhanced AMV quality treatment. This also includes the Common QI which has been rolled out since the last IWWG meeting.

The group also noted the encouraging new results with methods such as optical flow, machine learning, stereo views, etc. It was remarked that it is important to be able to distinguish the different methods in the disseminated BUFR data (e.g., stereo height assignment as a distinct height assignment method). Some of these methods may also offer possibilities for enhanced quality characterisation of AMVs. Producers of these novel dataset are hence encouraged to devise and document alternative quality parameters to the QI, tailored to the capabilities of the derivation methods.

4. Configurations of wind derivation for global and regional NWP

The group continued discussion on configuration requirements tailored to global and regional systems, responding to HLPP item 4.2.2 of CGMS (“Investigate the best configurations to be used by the AMV producers for use in global and regional NWP models respectively, and clearly define the appropriate requirements for each of them”) and CGMS action item A46.04 (“NWP community to define the best configuration to be used by the AMV producers, for use in global and regional NWP models”).

Following discussions at MW14, Mary Forsythe (Met Office) has prepared a community document to summarise requirements for global and regional NWP. The document includes a summary of typical assimilation aspects and is intended to be a living document expected to be updated from time-to-time as requirements evolve. The document has already been circulated to some NWP centres, but could benefit from further feedback.

Action IWW15-WG2-A1 on Mary Forsythe (Met Office): To distribute the requirements document to the IWWG NWP community for further comment (deadline 15 May 2021).

Action IWW15-WG2-A2 on IWWG NWP community: To comment and update as appropriate (deadline end of May 2021).

Further experimentation is considered useful regarding target size and tracking interval to produce the best product for global and regional applications. Some existing experience regarding thinning or superobbing may be relevant, but ideally this requires dedicated experimentation.

Action IWW15-WG2-A3 on Iliana Genkova (NCEP): To collate information available from relevant experimentation in global systems and report back at IWWG16.

Action IWW15-WG2-A4 on Roger Randriamampianina (met.no): To experiment with different target sizes to investigate configurations most suitable to regional NWP and report back at IWWG16.

5. NWP SAF and OSI SAF monitoring activities

The NWP SAF continues to provide in-depth monitoring (e.g., real-time monitoring of all satellite observations used in NWP; monthly AMV monitoring; AMV analysis reports, etc). This continues to be very valuable and is supported by the WG. DWD will start contributing monitoring statistics (in addition to Met Office and ECMWF) in the coming years. NCMRWF offered to provide monitoring statistics, and this could be considered.

The NWP SAF analysis report provides the latest examination of features seen in the AMV monitoring and their evolution as processing or satellite capabilities have changed. Analysis of features often requires detailed knowledge of the specific AMV derivation algorithms. To follow up on some of the features seen, the NWP SAF hence invites stronger input from winds producers.

The NWP SAF also provides an overview of the AMV usage at different NWP centres (see <https://nwp-saf.eumetsat.int/site/monitoring/winds-quality-evaluation/amv/amv-use-in-nwp/>). It was noted that keeping this information up-to-date requires the assistance from all NWP centres involved.

Action IWW15-WG2-A5 on James Cotton (Met Office): To ask NWP centres to provide updates on the pages summarising how AMVs are used at each centre.

Action IWW15-WG2-A6 on NWP centres: To respond to James’ request.

6. Scatterometer

Scatterometer items have usually been discussed in dedicated side-meetings of the Ocean Vector Winds Task Team during WWG meetings. Due to the more limited common time available in the

virtual format, such a side-meeting did not happen this time. Ad Stofflen plans a separate online meeting in mid-June 2021.

Ad Stoffelen updated IWW15 on activities of the Ocean Vector Task Team during the closing plenary.

7. Feedback on Workshop organisation and online format

WG2 appreciated the hard work of the workshop co-chairs and hosts to organise a very effective virtual IWW15. It was noted that the virtual format of the IWW15 led to higher attendance with more 1st-time attendees (and some old-timers!). Offline interactions were missed, but Slido, comment boxes accompanying the abstracts, and the in-advance availability of all presentations were much appreciated. The in-advance posting of presentations in particular made it possible to better prepare for the meeting and helped with better-informed follow-on discussions. Advance posting of presentations could be encouraged for future meetings which we expect to be in a physical format.