

REPORT FROM WORKING GROUP 1 (WG1): Wind Extraction Methods

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INTRODUCTION

This working group discussed several topics initiated by the International Winds Working Group (IWWG) co-chairs and from the Report of the 39th Coordination Group for Meteorological Satellites (CGMS) 39 recommendations to the 11th International Winds Workshop (IWW11). Some topics unrelated to AMV extraction methods were also discussed. This report will detail each topic and produce a series of recommendations from the resulting discussions within the group. The recommendations are not in order of priority.

Thoughts on the IWWG Web page

Group members had no comments on the design or content of the web page. Some interest in updating and expanding the “wiki” portion of the web page was shown. Interested IWWG members may look at the two “wiki” sections: [Information](#) and [Activities](#). If members wish to edit content, the contact form under the “Contact Us” tab can be used to request an account on the “wiki” server. WG1 members requested a data “wiki” entry that would detail information for accessing the different data types. The links to the various data types need to be updated. However, no WG1 member was designated for this task.

The idea of a “forum” web server was also discussed. Consensus seemed to point towards simply using the IWWG email list as a first option. If the list becomes too busy, the group would be interested in exploring a “forum” web site.

Workshop Format

WG1 members were open to adding a poster session to the IWWG. The attendance was large enough this year to necessitate shortening the oral presentations from 20 minutes to 15. Consensus in WG1 was to go back to 20-minute talks with a formal poster presentation. An additional approach considered, was to allow at registration, a “non-committing” poster option. This would be in addition to a presentation, enabling the participant to bring along an additional poster if it becomes available. This would allow the organizers time to set up adequate viewing facilities and coordinate the poster sessions. Members were not open to lengthening the Friday session or cancelling the Wednesday afternoon tours to allow for a 20-minute talk only format for the meeting. Everyone agreed the “hot topic” group discussions are beneficial. However some people indicated placing them in-between sessions might be a better idea than waiting until the end of the day.

Feedback on the 5th NWP SAF provided by the Met Office

The release date of the 5th NWP SAF unfortunately coincided with preparations for the IWW11 workshop for most people. This left too short of a time period to properly digest the content before the workshop. Therefore the following recommendation was formulated:

IWW11_WG1 Recommendation I: The NWP SAF Analysis reports should be made available three months in advance to the corresponding International Winds Workshop.

WG1 extends our thanks to the Met Office for preparing the analysis. Everyone agrees the report is very valuable and hopes the reports continue to be produced. As a future enhancement the addition of zonal and meridional plots to coincide with the speed and direction plots was seen as beneficial.

Plan for 2nd AMV Inter-comparison project

The working group members all recognized the importance of a second inter-comparison study. More details are needed from the co-chairs, but should proceed as planned. One suggested part of the study would be to use the same image for the triplet, but shift the line/element space by known quantity. The consensus in our working group indicated that more should be done than simply perturbing the images. Adding noise or introducing rotational shifts was suggested.

IWW11_WG1 Recommendation II: A second inter-comparison project should commence and the results presented at the next International Winds Workshop.

AMV Open Source Software

This working group did not discuss the open source software topic. We felt that this topic was sufficiently addressed during the hot topic discussion during the main meeting.

Tracking

Tracking differs from AMV center to center. However, this working group did not see any issues with the current tracking algorithms. The MISR group indicated that tracking is sensitive to cloud type, resolution and sampling frequency. These observations reiterated what geostationary AMV producers have noted in the past. The nested-tracking algorithm (discussed in Jaime Daniels' talk) has been shown to reduce the slow speed bias of the AMVs. NOAA/NESDIS plans on adopting this software to their real time processing suite in the near future. Eumetsat hopes to collaborate with NOAA/NESDIS with the nested-tracking algorithm. NWC-SAF would also like to test this algorithm but has no solid plans in place. China indicated interest too. Japan has adopted the algorithm with positive results using rapid-scan images.

IWW11_WG1 Recommendation III: All AMV producing centers are encouraged to evaluate nested-tracking and report their results at the next winds workshop.

Height Assignment

The working group discussed the potential of stereo height assignment across most satellite platforms. It was noted that several studies had been done in the past, but with improved instrumentation and improvements in ground resolution and navigation, together with advances in data assimilation, the previous work may be out of date. The MISR/MSG-AMV comparisons were seen as very beneficial and an expansion across AMV producers and satellite types garnered increased interest. Additional verification datasets, such as Concorde-IASI should also be investigated. The working group also indicated that an evaluation of inversion technique height assignments should be compared to the cloud base method. Lastly, a more detailed examination of height assignment issues over snow and ice was proposed. Looking at surface types could be a focus in these cases.

IWW11_WG1 Recommendation IV: All AMV producing centers are encouraged to evaluate stereo height assignment techniques.

IWW11_WG1 Recommendation V: Further AMV inter-comparison studies using additional data sets like MISR and Concorde-IASI are encouraged.

GEO AMVs

The discussion on the geostationary winds briefly touched on the idea that AMVs are sometimes not tracking passive tracers, especially in the tropics. It was noted that the AMV errors are larger in the

tropics. Wayne Bresky indicated that he would like to examine the use of the second dominant cluster within the nested-tracking algorithm for tracers in the tropic. A detailed description of issues from the NWP perspective can be found in the 5th NWP SAF document. In particular a fast bias in the midlevels has been observed. These are AMVs that are assigned too low in comparison to model best-fit pressure.

Polar AMVs

The polar AMV discussion covered several topics. Though not polar AMVs the opportunity to derive global winds from polar orbiting satellites were also discussed. A tandem configuration with two satellites in the same or nearly the same orbit, but with a phase difference provides an interesting opportunity to create global AMVs from satellites with a significant overlap in imagery data. Several potential configurations will become available in the future including Metop-A/Metop-B, Suomi-NPP/MODIS, and Sentinel 3A and 3B. With respect to a concern on BUFR table codes for a mixed satellite, the consensus was that this is a pure WMO Codes Group activity and not a concern for the IWWG at this stage. A question about the utility of the water vapor channel on polar satellites was addressed in the Friday discussion. The NWP community all agreed that polar water vapor AMVs are an important subset of data assimilation, and recommend that the water vapor channels be reintroduced in future missions. It was noted that NOAA and Environment Canada have reached a formal agreement to produce AMVs from the Polar Communication and Weather (PCW) mission, if the satellite is launched.

IWW11_WG1 Recommendation VI: Investigate the potential of global AMVs from tandem satellites: dual Metop, MODIS/VIIRS, and the future Sentinel-3A/B.

IWW11_WG1 Recommendation VII: The Working Group recommends the satellite operators to maintain or include water vapour imaging capabilities on future polar orbiting satellites.

Mesoscale AMVs

Two tracks on mesoscale AMVs were discussed. The first is that the QI is not tuned towards mesoscale AMV processing. Significant QI drops are observed in high curvature areas (tropical cyclones). The second discussion involved NWP and mesoscale AMVs. The global NWP group is not interested in these AMVs. However mesoscale modelers (Hurricane WRF users) have stated they would like hourly AMVs. Chris Velden also mentioned the importance of rapid scan AMVs to mesoscale models. A mesoscale NWP presence would be welcome at the next IWWG.

IWW11_WG1 Recommendation VIII: Mesoscale NWP modelers should be invited to IWWG12.

Quality Control

Each AMV producing center reviewed how their QI score is computed. Eumetsat is the only center that includes a height component in its QI score. Currently Eumetsat, NESDIS and JMA all provide a forecast independent QI. CMA and NWCSAF supply forecast dependent QI. NWCSAF has plans to move towards supplying the forecast independent QI. Comparing best-fit pressure statistics from the background model was discussed. Kirsti Salonen's presentation could be used as a potential template for a new output variable from the AMV software. This is something all AMV centers could produce, as the background profile should be available to each AMV. All users should use the exact same methodology. AMV producers would want to constrain the search to a +/- 200-hPa layer. NWP is not interested in this new output but would be useful for internal monitoring of the AMV software. Finally everyone agreed that the CGMS statistics should continue to be produced, but have a more visible presence on the IWWG web page.

IWW11_WG1 Recommendation IX: AMV production centers should derive best-fit heights for their winds for monitoring and analysis purposes.

Scatterometer AMVs

No scatterometer representatives were present in the working group 1 session. It was noted that scatterometer AMVs represent a potential dataset to inter-compare low-level AMVs.

MISR AMVs

The new MISR algorithm, described in the Thursday morning session represents a significant advancement in the AMV product. The AMV resolution has decreased from 70.4km to 17.6km and the latency has decreased to approximately 5 hours. Better agreement between MISR AMVs and RAOBS, GOES, and MODIS AMVs is also observed. The entire 10 plus years of data will be reprocessed with the new algorithm.

IWW11_WG1 Recommendation X: MISR should be introduced into reanalysis data streams, such as the ECMWF ERA-CLIM program.

Hyperspectral AMVs

Two active hyperspectral AMV projects are ongoing. CIMSS makes use of AIRS single-level retrieved moisture fields to calculate AMVs over the Polar Regions. It is limited by low resolution (~16km) and noise in the single field of view retrievals. There are plans to continue this algorithm for IASI (Metop) and CrIS (Suomi NPP, JPSS). The second project involves using the Met Office UKV 1.5km model to generate simulated MTG-IRS simulated spectra, and eventually single-level humidity fields from a 1DVar retrieval algorithm. As with the CIMSS project, the Met Office findings are hindered by noisy retrievals and fewer AMVs (albeit good quality).

IWW11_WG1 Recommendation XI: Research in the use of hyperspectral data for AMV retrievals should be continued.