

REPORT FROM THE WORKING GROUP ON METHODS (WG-I)

Chairperson: Jaime Daniels

This working group discussed a variety of topics related to the methodology used to generate Atmospheric Motion Vectors (AMVs) from existing instruments aboard both operational and non-operational satellites. The group also discussed the need for new innovative approaches for deriving estimates of atmospheric motion from hyper-spectral instrumentation which will be available in the near future. A number of recommendations based upon these discussions and results presented at the workshop are described below. The working group was also directed to address a number of CGMS XXX-XXXII action items (30.31, 30.33, 31.33-31.35).

The CGMS XXXI-XXXII Action Items that were addressed by the group are presented below with pertinent discussion items and subsequent recommendations.

Action 30.31) The co-chairs are requested to invite representatives of the regional modeling community to IWW7. What is the perspective for regional models?

The IWW7 co-chairs solicited invitations to modeling groups to present Atmospheric Motion Vector (AMV) impact studies and results at the IWW7. Session IV of the IWW7 focused on regional and mesoscale applications involving the use of AMVs. The mesoscale model impact results reported at the IWW7 and IWW6 have generally been positive. Rapid scan imagery has often been used to generate the AMVs used in these model impact tests. Despite these successes, however, the information revealed in rapid scan imagery is very much under-utilized in regional and mesoscale models.

Recommendation (IWW7_WG1_1): New ideas and innovative approaches are needed to generate products from smaller scale features observed in animated imagery which could be used in mesoscale models. Examples of such products include upper-level divergence and complex smaller-scale wind motions.

Recommendation (IWW7_WG1_2): The Numerical Weather Prediction (NWP) modeling community is encouraged to continue mesoscale model development so that complex, smaller-scale motions evident in high resolution, rapid-scan imagery, can be utilized to improve short-term forecasts

Action 30.33) NOAA/NESDIS is invited to present a paper on AMVs from MODIS instruments on the Terra and Aqua satellites.

Several presentations were given at the IWW7 which addressed the derivation of AMVs from MODIS measurements aboard the Terra and Aqua satellites. Numerous other presentations were also given at the IWW7 which demonstrated the positive impact that the MODIS wind products were having on forecast skill. Plans are underway at NOAA/NESDIS for routinely generating MODIS AMV products and making them available to the NWP community via an anonymous ftp server and to the Global Telecommunication System (GTS).

Recommendation (IWW7_WG1_3): The NWP community expressed concern about the timeliness of the MODIS AMV products at the IWW7. This issue was discussed by this working group (WG). The WG encourages NOAA/NESDIS to look at ways to improve the timeliness of the MODIS AMV products. Furthermore, the WG encourages organizations that have the means, to help with the problem of making MODIS imagery available via direct broadcast access methodologies.

Recommendation (IWW7_WG1_4): Serious consideration should be given to support ongoing efforts aimed at acquiring a satellite in a highly elliptical orbit (HEO). A satellite in this type of orbit could significantly

improve the observational coverage over the polar regions. Current efforts by satellite operators to generate AMVs from Low Earth Orbiting (LEO) satellites should continue and should be expanded to include AMV derivation from HEO, if and when available. A pilot study is suggested in order to perform algorithm studies to simulate data from an HEO in order to understand and characterize issues such as parallax, varying footprint resolution with time, and feature tracking. Investigate the possibility of using older GEO satellites for the collection of "training" datasets to support such a pilot study.

Action 31.33) Address the topics of Polar Winds, Re-Analysis of AMVS, and Image Pre-Processing on the basis of IWW7 papers and presentation

Recommendation (IWW7_WG1_5): *Polar Winds:* The WG strongly recommends the inclusion of a water vapor channel on the VIIRS-3 instrument based upon the unprecedented success of the MODIS water vapor winds on NWP forecast accuracy. The WG encourages a validation campaign aimed at intercomparing MISR AMVs with other AMVs from other satellites (GEO and LEO). Satellite operators should take advantage of geometric height software tools available to validate their wind products. Comparisons should be done between MISR geometrically determined tracer heights and other GEO/LEO temperature determined tracer heights for the same tracers.

Recommendation (IWW7_WG1_6): *Re-Analysis of AMVs:* Satellite operators are encouraged to build the capability to reprocess satellite winds from imagery residing in their agency's data archive. The WG recognizes that such a reprocessing capability is resource intensive, but that such an effort could significantly contribute to re-analysis projects.

Recommendation (IWW7_WG1_7): *Image Pre-Processing:* Satellite operators are encouraged to investigate the impacts of the following on the derivation of AMVs: i) Image enhancement ; ii) Adaptation of cloud classification schemes within AMV processing schemes; iii) Tracking in derived product imagery or combinations of imagery.

Action 31.34) NESDIS is requested to consider submission of a paper to IWW7 on preparatory work on the derivation of AMVs from high-spectral resolution IR sounding instruments (e.g. GIFTS).

Two presentations were given at the IWW7 which addressed the issue of AMV derivation from hyper-spectral imagers/sounders.

Recommendation (IWW7_WG1_8): While the concept of deriving AMVs from hyper-spectral instruments has been demonstrated, more work is needed. High resolution AMVS are not truly feasible at this time given the availability of data. The WG recommends that higher spatial resolution data (ie., full resolution AIRS soundings) be made available to support further studies involving the development of methodologies for the derivation of AMVs from hyper-spectral instruments.

Action 31.35) CGMS request that the Windsat Coriolis evaluation be performed in a manner similar to AIRS (with distribution of data sets for outside evaluation as soon as possible) as a matter of urgency.

Recommendation (IWW7_WG1_9): The WG encourages the IWW chairs to invite a talk at the next IWW on the use of passive, polarized microwave observations for retrieval of surface winds.

A WG discussed a number of other topics related to AMV derivation that prompted the following recommendations.

Recommendation (IWW7_WG1_10): In order to improve the exploitation of satellite-derived AMVs in NWP data assimilation systems, satellite operators are encouraged to go back to the drawing board to quantitatively characterize all errors resident in their AMVs. Error sources include: correlated errors, height assignment, navigation, calibration, and tracer tracking. Once these errors are characterized, satellite operators are encouraged to assign error bars to vectors and height assignments attached with their AMV products. The WG encourages increased collaborative efforts between the satellite centers that generate

AMVS and NWP centers that assimilate these AMVs. The WG encourages the IWW co-chairs to formulate an action plan to address this issue.

Recommendation (IWW7_WG1_11): Further development of new feature tracking techniques, such as the optical flow technique. Compare performance of such techniques to the standard tracking techniques used today operationally.

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