

SUMMARY OF THE 10TH IWW DISCUSSION ON DEVELOPMENT OF A PORTABLE AMV PROCESSING SOFTWARE PACKAGE

This paper summarises the outcomes of the 10th International Winds Workshop (IWW10) plenary discussion on plans to develop a portable AMV processing software package.

This topic generated a lot of debate and addressed the following two objectives:

1. Greater involvement of research groups to help develop and test new approaches for deriving satellite-based AMVs.
2. Increased collaboration between operational AMV producers to speed up improvements to AMV derivation and move towards more consistent approaches.

This paper:

- i) Summarises the aims, main points raised in discussion at IWW10 and input from scientists who have undertaken similar projects.
- ii) Proposes an approach, discussed and agreed at IWW10, to take this project forward and address both of the objectives listed above.

CGMS-38 is invited to discuss the proposal and support efforts to take this forward

The paper is related to Recommendation 37.22: IWW 10 is requested to address the development of a stand-alone software package for the derivation of AMVs from imaging satellite instruments.

Summary of the 10th IWW discussion on development of a portable AMV processing software package

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1 OBJECTIVES

The starting point for this debate was the desire to engage more with research groups by providing them with access to a portable AMV software package. The idea was that this package would provide a very good, read-to-go, starting point for researchers interested in getting involved in the problem of deriving atmospheric winds from satellite measurements. Furthermore, it would serve as the focal point for sharing and comparing developmental code among different research groups. It was also noted that such a portable AMV software package could be used by some for operational AMV production (similar to the NWP SAF scatterometer processing software). This could possibly lead to improved consistency between AMVs produced at different centres. As the system would be designed in a generic way it could also simplify the AMV reprocessing efforts.

During the discussion it became apparent that we should consider these two differing requirements separately:

Greater involvement of research groups to help develop and test new approaches for deriving satellite-based AMVs.

Increased collaboration between operational AMV producers to speed up improvements to AMV derivation and move towards more consistent approaches.

2 ADVICE FROM PEOPLE RUNNING SIMILAR PROJECTS

Information was sought from a number of sources before the workshop in order to gauge the level of work required and to seek advice on how best to set up a project of this type. A summary is provided below:

Agree which language it should be written in

Have good configuration control for the software

Advertise it well to get user take up

Have beta testers for the code

Always compile with the F90 NAG compiler (if using Fortran)

Have a really good administrator

Have good documentation

Provide and enforce coding standards / guidance

Hold a regular discussion forum

Avoid code becoming too 'native' i.e. it works great for one centre but is useless for others

Main challenge with RTTOV is with integration (less of a problem for standalone)– simplify inputs/outputs as far as possible

Will need to develop a test system and test multiple configurations (all takes time).

Don't produce full updates too frequently (time overhead in testing); once per year at most

Consider copyright issues (The GRAS SAF Radio Occultation Processing Package (ROPP) has some examples).

ROPP – GRAS SAF GPSRO pre-processing package resource estimates

120,808 lines of code

6 year effort (~ 1 man year per year), still developing

First release after 3 years. Lesson learned here is not to underestimate the amount of work required, even where code exists.

3 IWW10 DISCUSSION

The plenary discussion session on this topic at IWW10 generated a lot of debate. In order to identify a workable strategy an additional session was organised involving the main interested parties:

Mary Forsythe (Met Office)
Jaime Daniels (NOAA-NESDIS)
Angeles Hernandez-Carrascal (University of Reading)
Peter Muller (Mullard Space Science Laboratory, University College London)
Javier Garcia-Pereda (NWC-SAF)
Wayne Bresky (NOAA)
Andrew Bailey (NOAA-NESDIS)
Chris Velden (CIMSS)
Steve Wanzong (CIMSS)
Ken Holmlund (EUMETSAT)
Arthur de Smet (EUMETSAT)
Regis Borde (EUMETSAT)
Iliana Genkova (ECMWF)
Hee-Je Cho (KMA)

During the two sessions the main points raised were:

The need to cope with variable input – both satellite imagery and model. Simplifying the process of reading these datasets, to the extent possible, was highly desired as a significant amount of time is typically spent by researchers dealing with such issues. Need capability to adjust as these datasets frequently change. There is likely to be a large overhead.

Caution against developing too simple a system as any research results will not be meaningful for operations. The question was raised whether we should target operational use also (similar to NWP SAF scatterometer processing software).

Angeles commented that it would be good for research, but foresees a lot of problems: configuration control, language choice, compiler, platform dependencies etc.

Javier emphasised the potential of the Nowcasting SAF portable AMV software to be further developed for this purpose.

Ken proposed some steps we can take that may be simpler – work towards simpler or standard interfaces/formats and more modular code design.

There were perceived benefits from developing a generic system which could be used widely by research and operational groups. However, this would take a lot of time and resources to develop, test and maintain and there were reservations within the group how it would be coordinated and paid for and whether the level of effort was justifiable. In consequence, the second discussion instead focussed on what steps we could take to address the two differing

needs of the research and operational communities in a simpler way. These steps do not preclude further efforts in the future.

4 PROPOSED APPROACH

This section outlines the proposed approach to address the following two requirements:

1. Greater involvement of research groups to help develop and test new approaches for deriving satellite-based AMVs.
2. Increased collaboration between operational AMV producers to speed up improvements to AMV derivation and move towards more consistent approaches.

The proposed approach to address requirement 1:

Put together a research starter kit via the IWWG web pages:

- Provide a simple tutorial to get people started, including a list of up-to-date key references.
- Provide links to the NWC SAF AMV portable software, which should be of sufficient skill for research users to use as a test AMV derivation system. In support of this we should make more effort within the IWWG community to evaluate and support development of this system. See also CGMS-38 EUM-WP-28.
- Provide guidance on how to access and read geostationary/polar imagery and provide format conversion tools if required.
- Provide guidance on how to access and read Numerical Weather Prediction (NWP) forecast model information for use in the height assignment step.
- Provide links to visualisation software (McIDAS-V is one example that was proposed, but there may be others).
- Provide a training dataset (e.g., inputs and outputs) so that research users can quickly start running and familiarising themselves with the software. One proposal was to provide the next AMV inter-comparison SEVIRI image case in an agreed format (e.g. netcdf). For background and comparison we could also provide access to the AMV inter-comparison producer datasets and analysis of results.
- Provide an up-to-date record of the methods used by the operational producing centres (covered by section below).

Encourage participation at the International Winds Workshops from research groups

Promote collaborative work within universities through studentships, presentations in university seminars, and conferences such as the annual EUMETSAT Meteorological Satellite Conference or the American Meteorological Society Conference on Satellite Meteorology and Oceanography.

Improve the literature in this field – ideally want current methods described in sufficient detail to allow replication.

The proposed approach to address requirement 2:

Producing centres encouraged to work towards standard interfaces and formats, and more modular code design to enable easier exchange and use of code by other centres.

Develop the IWWG web pages to provide:

- Improved documentation of the AMV derivation system to help centres that are trying to develop and improve their set-up.

- Development of a new web page to highlight where we may benefit from further inter-comparisons or development. The idea, proposed by Ken Holmlund, is outlined below:
 - Summarise the main AMV derivation steps e.g. target selection, tracking etc.
 - For each one identify the different methods that have been tested e.g. for tracking: optical flow, Euclidean distance, cross-correlation – providing details as necessary
 - Summarise whether the different approaches have been well-compared in the past (reference as appropriate) or if they would benefit from further inter-comparison to determine best practise. Also identify whether we would benefit from further research to develop new approaches (e.g. if thought to be an error-prone step).
- Provide a library of code modules so centres can pick up and plug in new code modules and compare to existing techniques.

5 SUMMARY

A discussion on the potential development of a portable AMV processing software package was held at the 10th International Winds Workshop. This development would serve two key requirements that were identified:

1. Greater involvement of research groups to help develop and test new approaches for deriving satellite-based AMVs;
2. Increased collaboration between operational AMV producers to speed up improvements to AMV derivation and move towards more consistent approaches.

A number of steps were identified during discussions at the 10th International Winds Workshop, which should help to address the needs of the research and operational communities, with the ultimate aim of improving the AMV derivation approach. These are described in Section 4. CGMS 38 is invited to discuss the proposals and provide support to take this forward.