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RECENT ADVANCES IN THE PROCESSING, TARGETING AND DATA ASSIMILATION APPLICATIONS OF SATELLITE-DERIVED ATMOSPHERIC MOTION VECTORS (AMVS)

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ABSTRACT

Atmospheric Motion Vectors (AMVs) derived from geostationary environmental satellites have been a long-standing component of the global observational database available to NWP. With the advances in data assimilation and targeted observing techniques, numerical analysis and forecast model resolution, and computing capacity, it is prudent to explore ways to improve both the processing and applications of these datasets.

Three approaches to meet these objectives are being investigated by a team of researchers experienced in AMV production (CIMSS), and application/assimilation (NRL-MRY and RSMAS/Miami). Firstly, on the production side, the focus is on improving the availability of high-quality wind information provided by enhanced AMV datasets. The enhancement comes in the form of expanded vector quantities by increasing the temporal processing of the AMV datasets (i.e. hourly production), and exploring rapid-scanning strategies (i.e. 15-min and 4-min image sampling to produce higher resolution AMV fields). Secondly, testing continues with vector quality flags (EE and QI) passed to the user and/or assimilation system for more effective application of the AMV information content. Thirdly, tests assigning a layer-of best fit rather than assigning a single AMV level are underway to try and minimize some of the height uncertainty inherent in AMV production.

AMVs datasets with the above attributes are being experimentally produced by CIMSS, and have been made available to NRL and other centers for applications in NWP impact studies and targeting approaches. This talk will describe the enhanced AMV datasets, and discuss the impact experiments that are underway. In particular, we will focus on processing and application strategies for selected meteorological events that occurred during the THORPEX-Pacific Asian Regional Campaign (TPARC).

IMPACT OF METOP ASCAT OCEAN SURFACE WINDS ON GLOBAL WEATHER FORECASTS

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ABSTRACT

An Observing System Experiment (OSE) has been conducted to study the impacts of assimilating the Advanced SCATterometer (ASCAT) surface winds product. The assimilation system and forecast model are a recent version of the National Centers for Environmental Prediction (NCEP) Global Data Assimilation/Global Forecast System (GDAS/GFS) at the current operational resolution. The impacts of assimilating the ASCAT surface wind products are assessed during two seasons by comparing the forecasts through 168 hours of control simulations utilizing all the data types assimilated into the operational GDAS with the experimental simulations using this new surface wind product. The forecast impact for the NCEP system will be compared to that of the U.S. Navy's global NAVDAS-AR (NRL Atmospheric Variational Data Assimilation System – Accelerated Representer) and NOGAPS (Navy Operational Global Forecast System) assimilation/forecast suite.

Several aspects of the assimilation of ASCAT will be discussed including Quality Control (QC) procedures, data thinning, and ambiguity tests which are necessary for improving NWP forecasts. Accept/reject quality control criteria based on sea surface temperature, to reject observations which may be contaminated by sea ice, and an innovation vector difference test (observation minus background) has been developed and incorporated into the ASCAT assimilation procedures. We will also show results from thinning the ASCAT data to different resolutions. A vector ambiguity test developed for ASCAT has been incorporated into the QC procedures and will be discussed.

Ongoing projects include additional evaluation the current quality control procedures and thinning routines (or superob generation) used for ASCAT as well as WindSat winds, and the development and testing of advanced QC and data selection methods for ASCAT and WindSat winds vectors. These enhancements will be tested in the Navy's global and mesoscale data assimilation systems and transitioned to the operational systems at Fleet Numerical Meteorology Oceanography Center.

IMPROVEMENTS TO EUMETSAT AMVS

Régis Borde, Greg Dew, Arthur de Smet and Jörgen Bertil Gustaffson

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ABSTRACT

At IWW9 Borde and Oyama (2008) showed the importance of the pixel selection process applied to isolate the pixels used to set the AMV altitude. They described a new method that keeps a closer link between the tracking and the height assignment step in the AMV extraction algorithm proposing to use the individual pixel contribution to the cross correlation coefficient, CCij, to select the pixels that contribute the most to the tracking, which then offers a suitable subset of image pixels for the height assignment. Since IWW9 this method has been tested on a parallel chain at EUMETSAT for two separated periods of one month.

This paper summarizes the main results of these operational tests, which show large improvements of the new scheme on the AMV product for both the Vis0.8, HRVis and IR10.8 channels, increasing the total amount of AMVs (QI>80) and also the amount of good AMV/radiosonde collocations. Speed biases against radiosonde observations are generally a bit larger, especially the known slow biase observed at high levels for IR10.8 AMVs.

SENSITIVITY OF AMV HA METHODS TO CLOUD PROPERTIES USING SIMULATED MSG RADIANCES

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ABSTRACT

This paper presents the sensitivity to various atmospheric parameters of the two Atmospheric Motion Vectors height assignment methods that aim to retrieve the cloud top height of semi-transparent clouds. The use of simulated Meteosat-8 radiances has the advantage that the pressure retrieved by a given method can be compared to the initial pressure set to the cloud in the model, which is exactly known. The methods retrieve the pressure of opaque cloud to within few hPa. However, considering more realistic ice clouds, methods are sensitive to all the tested atmospheric parameters, and especially to the cloud microphysics which can bias the results of the CO2 slicing method by several tens of hPa. The cloud top pressure retrieval is especially difficult for thinner clouds with optical thicknesses smaller than 2, for which the biases can reach several tens of hPa. The methods have also been tested after introducing realistic errors in the temperature and humidity profiles and on the clear sky surface radiances. In multi-layer cloud situations the height assignment methods do not work properly, placing the cloud top height somewhere between the two cloud layers for most cirrus cloud layers with optical thickness between 0.1-10.

ANALYSIS OF ATMOSPHERIC MOTION VECTORS DERIVED FROM MSG-2 RAPID SCANNING SERVICE DATA AT EUMETSAT.

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ABSTRACT

EUMETSAT derives atmospheric motion vectors (AMVs) operationally from the imagery of three geostationary satellites: Meteosat 7 (sub-satellite longitude 57° E), Meteosat 8 (sub-satellite longitude 9.5° E), and Meteosat 9 (sub-satellite longitude 0°). The average dissemination rate for the latter is almost 40,000 winds per hour.

The Meteosat Second Generation (MSG) satellites (currently MSG-1 – known as Meteosat 8 – and MSG-2 – known as Meteosat 9) normally scan the full Earth disc every fifteen minutes. By scanning a smaller area scans can be conducted more frequently. This is known as rapid scanning. Presently the MSG Rapid Scanning Service (RSS) provides images of about one third of the full Earth disc every five minutes.

RSS delivers not only MSG image data but also a selection of advanced meteorological products, the most important of which is the Atmospheric Motion Vectors (AMV) product. RSS from Meteosat-8 commenced on 13 May 2008 from a position at 9.5°E as a follow-on to the successful Meteosat-6 RSS, which ended in 2007.

In the present paper results obtained recently with Meteosat 8 in Rapid Scanning mode are discussed and compared with results from Meteosat 9 in Full-Earth Scanning (FES) mode, with special focus on results from the high resolution visible (HRVIS) winds. The possibility of using smaller target sizes for operational AMV derivation is also presented.

DETERMINING OPTIMAL CONDITIONS FOR MESOSCALE AMV

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ABSTRACT

Most of operational geostationary meteorological satellites offer infrared channel images about 1 to 4 times an hour with horizontal resolution of 3 to 4 kilometers. Atmospheric motion vector (AMV) algorithms have been adapted to these spatial and temporal characteristics of satellite observation which favour the synoptic to meso-alpha-scale wind retrieval. Wind observation data can have more influence on predicting and understanding shorter scale phenomena whose ageostrophic component of dynamics cannot be solely determined by mass field.

To answer the needs of nowcasting and short range forecast, AMVs for small scale winds have been tested by several operational centers. High resolution images of 'rapid scan' mode, which can be offered every 7.5 to 1 minutes, helped the successful tests and operations of mesoscale wind retrieval.

This study investigates optimal conditions for mesoscale wind retrieval. In terms of satellite observation, (1) horizontal resolution of satellite image and (2) time differences between image triplet can reflect the scale of wind that AMV catches. Also, AMV algorithm itself is assuming certain scale of cloud motion though the (3) horizontal size of target. AMVs with every possible condition are examined based on QI (quality indicator) statistics as well as comparison to rawinsonde data. All AMVs are produced by KMA (Korea Meteorological Administration) algorithm and MTSAT-1R data.

High-resolution-visible (HRV) channel images are commonly used for mesoscale AMVs. It is obvious that frequent observations can degrade the precision of extracted winds with infrared images whose spatial resolution is about a few kilometers. Especially for mesoscale wind observation which focuses on rather subtle acceleration in mid- to low-level troposphere, precision can be a serious matter.

Extremely small size of target can cause physical and numerical problem. Because small target lacks the cloud structure and the number of image pixels, wind estimation by correlation matching results in wrong determination. By examining AMV data with various conditions of satellite image sets and target sizes, it seems that the target has to be larger than about 16 kilometers in physical size. Moreover, current resolution of HRV image, as distinct from infrared band image, seems to have enough number of pixels for 16 kilometers target.

AMV MONITORING: RESULTS FROM THE 4th NWP SAF ANALYSIS REPORT

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ABSTRACT

The main aim of the NWP SAF atmospheric motion vector (AMV) monitoring is to improve our understanding of the complicated error characteristics in the AMV data. This plays a key role in facilitating improvements to AMV derivation, quality control and assimilation, with the ultimate aim of improving NWP forecasts.

The core of the analysis report is the maintenance of a record of features and anomalies identified in the O-B monitoring. For some of these, further investigations have highlighted possible causes and solutions. The report also provides feedback on new AMV data sets such as the Meteosat-8 rapid scan winds.

In this talk I will highlight recent developments to the NWP SAF AMV monitoring, present examples of the features identified and propose some options for how we can take this work forward within the AMV community.

RECENT PROGRESS IN USING SATELLITE WINDS AT THE GERMAN WEATHER SERVICE

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ABSTRACT

Atmospheric motion vector (AMV) wind fields - derived from tracking cloud and water vapour image sequences - provide the only global tropospheric wind information for numerical weather forecast models and therefore make an important contribution to the global observing system, particularly over the oceans or polar regions, were there are either no other or only very few conventional wind observations. Additionally, space-bourne scatterometer data provide near surface wind observations (both wind speed and direction) over the global oceans with high temporal and spatial resolution under most weather conditions. Results of various impact studies demonstrate the positive benefit of using AMV and scatterometer wind products in the data assimilation system of the German Weather Service (DWD). Currently, the DWD uses AMV wind data from 5 geostationary satellites (GOES 11/12, METEOSAT 7/9, MTSAT-1R and 2 polar satellites (MODIS from TERRA and AQUA). Since mid 2009, scatterometer wind data from QuikScat and ASCAT are used routinely.

Monitoring of AMV wind vectors, product upgrades and the evaluation of new wind products which have the potential to improve the quality of analyses and forecasts, are an ongoing tasks at DWD. This presentation will give an overview of recent progress in the assimilation of AMV and scatterometer data at the German Weather service. Polar winds have been recently derived by CIMSS and EUMETSAT from infrared AVHRR imagery from the NOAA and METOP satellites. Having in mind, that the MODIS instrument is already operating beyond its lifetime and that no mission is planned to replace the MODIS WV channel instrument in the near future, the AVHRR winds can be used to either supplement MODIS winds through additional spatial and temporal resolution or to replace the winds after the instrument stops working. Several month long impact experiments showed a comparable quality between MODIS and AVHRR polar winds and a slightly positive impact on both hemispheres and Europe could be detected. In addition, direct-broadcasting MODIS winds are available now to improve the timeliness of polar winds in the assimilation resulting in a greater coverage for the early cut-off run at DWD. Furthermore a larger number of polar winds can be used in the assimilation run resulting in a small but consistent positive impact on both hemispheres in spring and summer. In addition, results of an impact study, initiated by the International Wind Working Group, demonstrating the positive impact of wind vectors derived from geostationary and polar satellites for the winter 2007/2008, will be presented. The assimilation of scatterometer data from QuikScat and ASCAT requires a careful data selection with regard to rain and ice contamination and in case of QuikScat a bias correction is needed. In general, using the scatterometer data lead to improved analysis and forecast impact in regions were there are only few other wind observations (Southern Hemisphere, Tropics) or in areas with large impact weather systems (tropical cyclones or extra tropical low pressure systems). Additionally, first results of using scatterometer data in the regional forecast model COSMO-EU will be presented.

A NESTED TRACKING APPROACH FOR REDUCING THE SLOW SPEED BIAS ASSOCIATED WITH ATMOSPHERIC MOTION VECTORS (AMVS)

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ABSTRACT

The GOES-R Algorithm Working Group (AWG) Winds team is working on the development and validation of algorithms for the generation of Atmospheric Motion Vectors (AMVs) from the future GOES-R Advanced Baseline Imager (ABI). Meteosat SEVIRI imagery is currently serving as an important GOES-R ABI proxy data source for the development, testing, and validation of the GOES-R AMV algorithms.

Statistics comparing satellite-derived motion estimates to collocated radiosonde observations often show a pronounced slow speed bias at mid and upper levels of the atmosphere. One possible explanation for this slow bias is poorly assigned heights (too high). Recent work by Sohn and Borde (2008), however, suggested a link between the size of the window or target box used and the magnitude of the slow bias. Specifically, they found that a smaller target box leads to both a faster wind estimate and a lower height assignment. Both of these factors will contribute to a smaller slow bias. Independent tests performed by the authors of this paper that involved varying target size (5 to 21 pixels) and temporal intervals (5 to 30 minutes) have confirmed these earlier findings. This testing, as well as subsequent analysis of individual case studies, have led the authors to develop a new approach to tracking that relies on a smaller target box (5x5 pixels) "nested" within a larger one (15x15 pixels) to derive a field of vectors valid over the domain of the larger window. Statistical comparisons of AMVs derived via this new approach show a significant improvement in the overall quality of the derived AMVs characterized by significant reductions in the slow speed bias without a corresponding increase in spatial variability. In addition, results from case studies involving use of Meteosat-8 rapid-scan SEVIRI imagery will be shown.

IMPROVEMENT OF STEREO-DERIVED CMVS FROM MISR AND COMPARISON AGAINST COINCIDENT NCEP/NCAR REANALYSIS DATA

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And
MISR Science Team

ABSTRACT

We will report on improvements to the MISR wind retrieval algorithm since the previous Winds Workshop. The new technique is still being assessed, but the main change appears to be vastly improved coverage, up to a factor of 2 for some orbits, brought about by a variation in the acceptance of parallax matches. The previous version, which had similar accuracy but lower coverage, has been reprocessed over the 10-year mission life of MISR on Terra. We have analysed comparisons with 10^6 coincident (same region and within 3 hrs) wind data from the NCEP/NCAR reanalysis.

The comparisons show generally good agreement in the Northern Hemisphere, with larger differences over the data sparse regions of the Southern Hemisphere. We detect speed biases at low altitudes, due to both a slow CMV bias over land, and a fast surface wind bias in the model data over ocean. Above the surface, the zonal wind components agree very well, but the meridional wind components show some interesting differences, the possible causes of which will be discussed.

THE ART OF VERIFYING ALGORITHM IMPROVEMENTS

Arthur de Smet

EUMETSAT

ABSTRACT

EUMETSAT derives atmospheric motion vectors (AMVs) operationally from the imagery of three geostationary satellites: Meteosat 7 (sub-satellite longitude 57° E), Meteosat 8 (sub-satellite longitude 9.5° E), and Meteosat 9 (sub-satellite longitude 0°). The average dissemination rate for the latter is almost 40,000 winds per hour.

The numerical weather prediction (NWP) centres, being the most important users of the wind data, assimilate only a small fraction of the winds in their models. A large number of winds are either blacklisted or get rejected in the data thinning process.

There is a continuous effort at EUMETSAT, and at other wind producing organisations as well, to improve the quality of the winds. This is becoming increasingly more difficult. Gone are the days when a simple algorithm change had an unambiguously positive impact on the forecast models. It is not uncommon these days that a modification in the height assignment leads to very mixed results: for example, better scores when compared to independent observations (radiosonde data), but at the same time worse results in forecast impact studies.

In this presentation the various methods applied to verify changes in the AMV algorithms are discussed. Improvements to the verification methodology are suggested, and ways to speed up the process are also discussed.

AVHRR POLAR WINDS DERIVATION AT EUMETSAT: CURRENT STATUS AND FUTURE DEVELOPMENTS

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ABSTRACT

The Advanced Very High Resolution Radiometer (AVHRR/3) is an imaging radiometer on board the polar orbiting Metop-A satellite, which was launched in October 2006. The 1 km pixel resolution at nadir provides the opportunity to derive winds from consecutive orbits by evaluating the overlapping swaths in polar areas. The initial stages of the polar cap winds processing activities at EUMETSAT were reported at the previous Winds Workshop in 2008. This paper describes the subsequent progress at EUMETSAT to derive polar winds. EUMETSAT has used the CIMSS software suite as a basis to develop a prototype version of the AVHRR polar winds generation. This has been used as a validation tool for development of the EUMETSAT AVHRR operational polar winds product and for the generation of reference test data sets. The technical approaches adopted for the CIMMS prototype and EUMETSAT operational versions have differed in some areas which are discussed in this paper. As EUMETSAT makes progress towards the operational availability of a polar winds product, results are presented, the challenges encountered so far are discussed and future developments outlined.

HIGH LATITUDE ATMOSPHERIC MOTION VECTORS: APPLICATIONS OF ANTARCTIC AND ARCTIC COMPOSITE SATELLITE IMAGERY

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ABSTRACT

Wind information has been estimated with geostationary satellite data for many years (Velden et al., 2005) and more recently using polar-orbiting satellites (Key et al., 2003). However, from the point of view of the Antarctic and the Arctic, there is a latitudinal gap in coverage between these two wind sets. This has inspired an investigation using Antarctic and Arctic composite imagery – a combination of geostationary and polar orbiting observations (Lazzara et al., 2003; Lazzara and Knuth, 2009) – for the generation of atmospheric motion vectors (AMV).

AMVs are being derived routinely from hourly Antarctic composite images to build a dataset large enough to assess the quality of the winds. While the composites have the strength of observations from both geostationary and polar-orbiting platforms, it is not yet clear how accurate the wind information is, given the very limited radiosonde and aircraft data in the Southern Hemisphere that can be used for validation. Initial comparisons with radiosonde and aircraft wind observations indicate a vector root mean squared error that is higher than typical satellite-derived AMVs. This is most likely due to assigning a single time to the composite, which is made of data +/- 30 minutes from a nominal time. The varying times within images will be accounted for in a future release of the winds derivation software, which is expected to reduce the error.

While verification and validation activities are currently ongoing, it is expected that this activity will continue through the upcoming 2009-2010 field season. This brings rise to the critical importance of aircraft reports (AIREPs) from US Antarctic Program aircraft and other aircraft that fly missions between the middle latitudes and the Antarctic. Their observations of winds enroute has the potential to provide a significant set of validating observations needed to determine if the composite AMVs will be on the order of accuracy as its cousin polar-orbiting and geostationary wind sets. Similar datasets will be utilized for the Arctic verification and validation, where additional radiosonde observations will be of help in evaluating the AMVs.

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A NEW APPROACH TO THE DETECTION AND TRACKING OF MESOSCALE CONVECTIVE SYSTEMS IN THE TROPICS USING MSG

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ABSTRACT

The tropical hydrological cycle and heat budget depends strongly on the Mesoscale Convective Systems (MCS), which are characterized by various morphological parameters. Among them, the documentation of the life cycle of cloud systems is of major importance. Many previous studies using the METEOSAT observations yielded to a large corpus of information on the life cycle of the West African systems. Nevertheless the tracking technique usually suffers from some limitations (use of single IR threshold, area-overlapping…) in depicting coherent convective systems life cycle. In particular, the characterisation of life cycle of convective systems can be affected by splits and merges artefacts.

Considering these problems, a new algorithm, based on an elaborated multi steps 3D clustering approach is introduced as an attempt to overcome the split and merge issues. The imagery is segmented in space and time in an iterative manner that builds on the space-time homogeneity to delineate the convective systems. The method is threshold independent and does not rely on any area-overlapping assumptions.

The technique is currently applied on the 10.8µm images of MSG used together with the result from the SAFNWC multispectral cloud classification for the summer 2006. Indeed the detection of the systems is performed over the full upper level cloud shields extracted from the classification.

The result of the new tracking method is then compared both statistically and on some individual case studies to the previous technique. The statistics for the season (life cycle, propagation speed, occurrence, etc…) will be shown. The emphasis will be put on the improvements brought up by the use of the 3D clustering methodology in the identification of the individual systems all along their life cycle.

IMPROVING AMV IMPACT IN NWP

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ABSTRACT

Atmospheric motion vectors (AMVs) provide a high temporal frequency near-global coverage wind product, which will continue to play a role in constraining numerical weather prediction (NWP) analyses for many years to come. However, realising the full potential of AMVs for NWP remains a challenge, partly due to the complicated nature of the AMV errors and the ever-increasing requirements for high quality observations as NWP models improve.

In recent years we have seen improvements in forecasts from assimilating AMVs in the polar regions, from assimilating new better quality datasets (e.g. from Meteosat Second Generation) and from adjustments to quality control and the way we represent observation errors in the assimilation. Looking ahead, where may we benefit from further developments?

In this talk, we will consider (i) how new datasets may help to improve data coverage and timeliness, (ii) the role of AMVs in high resolution NWP and (iii) options for improving quality control and assimilation.

POLAR WINDS FROM HIGHLY ELLIPTICAL ORBITING SATELLITES: A NEW PERSPECTIVE

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ABSTRACT

The Polar Communications and Weather (PCW) mission is a Canadian proposal for two satellites in a highly elliptical orbit with period 12-h and inclination 63.4 deg. Currently in Phase A, the mission is planned for 2016. The main meteorological instrument is an advanced imager similar to that proposed for MTG or GOES-R (ABI). The constellation would provide seamless imagery covering the entire circumpolar domain 50-90 N. The well known AMV gap between 50-70 N would be filled and the availability of imagery every 15 minutes would provide in principle improved AMVs compared to current polar winds based on LEO satellites. Recent AMV impact experiments using up to 7 LEO satellites will be presented. Results indicate a relatively modest positive impact in both polar regions in comparison to earlier results obtained by most centres a few years ago. This is attributed to improved trial fields from better model physics and additional assimilated data sources such as radiances from hyperspectral sounders. It is also noted that low-level AMVs are currently not assimilated.

An objective on this presentation is to stimulate further discussions on how to best evaluate the anticipated impact of AMVs from a mission such as PCW. At present, Environment Canada can generate proxy ABI radiances at 10 km resolution over the circumpolar domain, and 2.5 km resolution radiances over smaller Arctic domains of order 1300 X 1300 km. Our experience with simulated radiances showed that cloud transmittance available from model output provides a robust definition of cloud top which corresponds well to the physical height as seen from lidar (Calipso) data. It is then possible to infer from simulated AMVs conditions leading to a reliable height assignment. It is hoped that studies based on proxy radiances will help to improve the quality and yield of AMVs, notably at low levels.

ATMOSPHERIC MOTION VECTORS AT ECMWF: OPERATIONAL STATUS AND RESEARCH ACTIVITIES

Iliana Genkova , Niels Bormann , Peter Bauer

ECMWF

ABSTRACT

The operational status of the actively assimilated AMVs from GOES-11, GOES-12, MTSAT-1R, Meteosat-7, Meteosat-9 and MODIS, and the monitored MODIS DB, AVHRR and FY-2C winds will be presented, focussing on the recent algorithm changes at JMA, and the implementation of RTTOV at EUMETSAT.

Results from assimilation experiments with MODIS DB and AVHRR winds will report on the preparedness for their operational assimilation. Novel data sets, such as the Cross Correlation Contribution Height Assignment winds and the Metop-A AVHRR polar winds from EUMETSAT are assessed and results from preliminary data assimilation experiments will be shown.

First results from the overall revision of the quality control, blacklisting process, observation error and thinning during data assimilation will be highlighted.

GLOBAL ATMOSPHERIC MOTION VECTOR INTER-COMPARISON STUDY: FINAL RESULTS

Iliana Genkova (1), Regis Borde (2), Johannes Schmetz (2),
Chris Velden (3), Ken Holmlund (2), Niels Bormann(1), Peter Bauer(1)

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ABSTRACT

Winds have been assimilated operationally for years by a number of Numerical Weather Prediction (NWP) centres. Global Atmospheric Motion Vectors (AMV) coverage is achieved by combining data from EUMETSAT, NOAA-NESDIS and JMA. China and South Korea are working towards operational production and dissemination of AMVs as well. Each producer applies their own retrieval algorithms, thus winds of different quality arrive at the NWP centres. The individual AMV's quality indicator (QI) is the only common measure used during assimilation to select what winds to be used. However, QI's implementation varies slightly across the AMV extraction algorithms and is not informative of the wind vector accuracy.

In the presented benchmark study, five AMV producers retrieved AMVs from one MSG-SEVIRI image triplet applying their own retrieval algorithm as it is used in operations, using the same first guess forecast model from ECMWF. Winds from the 10.8 μm IR channel are inter-compared with regard to spatial coherence, agreement in height assignment, and quality indicator consistency. Next, they produced AMVs from the same SEVIRI images, but using consistent target and search box sizes, allowing for a more meaningful comparison of target height assignments and target height estimation algorithms. Each retrieval algorithm strengths and weaknesses are discussed to improve the interpretation of the winds sets prior and during their assimilation into NWP models. Furthermore, despite their limited size the data sets are compared against ECMWF forecast fields for a final quality assessment with and without mimicking the ECMWF winds assimilation quality control routines.

COMPARISON OF MISR STEREO-DERIVED CMVS WITH COINCIDENT NCEP/NCAR REANALYSIS DATA AND 10-YEAR TREND ANALYSIS

Aaron Herber and Roger Davies

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ABSTRACT

The MISR (Multi-angle Imaging SpectroRadiometer) instrument on the Terra satellite has been measuring stereo-derived height-resolved cloud motion vectors (CMVs) almost continuously since early in 2000. Because its stereo retrievals are insensitive to calibration drift, MISR measurements provide a useful type of climate data record that can be analyzed for trends over the ten-year period, as well as for interannual differences and other comparisons of interest. The algorithm for wind retrieval has undergone a number of improvements and the entire dataset has been reprocessed to the latest production version to provide a completely consistent data record.

The first part of this presentation will address the results of a comparison of the MISR CMV climate data record with that from coincident NCEP/NCAR Reanalysis data. The CMVs are compared to spatially area-weighted data and temporally to within 3 hours of measurement. We analyze over 1,000,000 matched winds. The comparisons are fairly uniformly sampled spatially and temporally throughout the last decade, but always at about 10:30 am local time.

The second part of this presentation will address trends and anomalies in the regional data, taking into account the lessons learned from the reanalysis comparison. Of particular interest are relatively large oceanic regions with statistically significant trends in the wind speed over the course of the last decade, Areas of decrease appear to outweigh areas of intensification.

A COMPARATIVE EVALUATION OF SCENE-SELECTION METHODS

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ABSTRACT

Most operational processes for the derivation of atmospheric motion vectors use a template matching technique, such as Euclidean distance or cross-correlation. With these techniques, the selection of suitable scenes is an essential preliminary step. Some scenes yield well formed correlation surfaces, while other yield ambiguous plateau-like surfaces. Usually, selection criteria involve properties such as local contrast, standard deviation or gradient. This paper focusses on the characterization of good scenes, and presents a comparative evaluation of methods to detect promising neighbourhoods.

CURRENT STATUS OF THE EUMETSAT OPERATIONAL ATMOSPHERIC MOTION VECTOR PRODUCTS

Kenneth Holmlund, Leo van de Berg, Joergen Gustafsson, Arthur de Smet and Greg Dew

EUMETSAT

ABSTRACT

EUMETSAT currently operates two geostationary satellite systems and one polar satellite system. Wind data, or relevant information, is derived both by tracking atmospheric features in consecutive multi-spectral images or by scatterometry. The paper will give an overview of the EUMETSAT wind products and the recent changes that have been introduced. A special focus will be given to the introduction of a new baseline radiative transfer model into operations, enabling consistency between development and end user applications. As the change was at the core of product generation from geostationary satellite data, a complete validation of comparable to the commissioning of a new satellite had to be performed. With respect to the Atmospheric Motion Vectors the change affected directly the height assignment of the vectors, one of the pertinent problem areas of this data.

VERIFICATION OF AMVS IN THE T-PARC PERIOD

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ABSTRACT

In the T-PARC period, the rapid scan observations with MTSAT2 were carried out in addition to the operational MTSAT1-R observations, and the 15-min and 4 or 7-min AMVs are calculated. In this study, we verified these AMV products with the sonde data and the dropsonde data launched by the aircraft. The AMVs are calculated not only over the active convective area (no Cb area) like operational products, but also for the Cb area, because our main objective of T-PARC is to get the wind distribution inside and around the tropical cyclones with the AMVs.

For the wind speed, the RMSEs are 8 – 10 m/s for the IR AMVs (the upper and middle levels) and Water Vaper (cloudy) AMVs. For the vector differences, the RMSE are 10 – 15 m/s. The distributions of the vector differences are not significant in different time interval data sets.

SEA SURFACE WIND SPEED ESTIMATION FROM SPACE-BASED LIDAR MEASUREMENTS

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ABSTRACT

Global satellite observations of lidar backscatter measurements acquired by the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) mission and collocated sea surface wind speed data from the Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E), are used to investigate the relation between wind driven wave slope variance and sea surface wind speed. The new slope variance – wind speed relation established from this study is similar to the linear relation from Cox-Munk (1954) and the log-linear relation from Wu (1990) for wind speed larger than 7 m/s and 13.3 m/s, respectively. For wind speed less than 7 m/s, the slope variance is proportional to the square root of the wind speed, assuming a two dimensional isotropic Gaussian wave slope distribution. This slope variance – wind speed relation becomes linear if a one dimensional Gaussian wave slope distribution and linear slope variance – wind speed relation are assumed. Contributions from whitecaps and subsurface backscattering are effectively removed by using 532 nm lidar depolarization measurements. This new slope variance – wind speed relation is used to derive sea surface wind speed from CALIPSO single shot lidar measurements (70 m spot size), after correcting for atmospheric attenuation. The CALIPSO wind speed result agrees with the collocated AMSR-E wind speed, with 1.2 m/s rms error. Ocean surface with lowest atmospheric loading and moderate wind speed (7–9 m/s) is used as target for lidar calibration correction.

This presentation will introduce the high spatial resolution wind product using the CALIPSO lidar measurements from June 2006 to present. We will also introduce the vertical turbulence transfer velocity at the air-sea interface using the mean square wave slope derived from the lidar ocean surface measurements and comparing that with varies parameterization schemes using ocean surface wind speeds. The data is available to the community.

ACCOUNTING FOR ATMOSPHERIC MOTION VECTOR ERROR CORRELATIONS IN THE ECMWF 4D-VAR AND ENSEMBLES OF DATA ASSIMILATIONS

Lars Isaksen and Gabor Radnoti

ECMWF

ABSTRACT

ECMWF has implemented and tested a new method to account for observation error correlations in 4D-Var. This has been evaluated extensively for AMV observations, where we have knowledge about the horizontal error characteristics from previous research. The method is based on a highly truncated Eigen-value representation of the error correlation matrix where typically 100 leading Eigen-pairs have been used. The method will be described in this paper. But the focus will be on presenting and interpreting the promising AMV results. The representation of AMV error correlations in ECMWF's Ensembles of Data Assimilations will also be discussed.

DIAGNOSING THE IMPACT OF ATMOSPHERIC MOTION VECTORS IN THE ECMWF 4D-VAR ASSIMILATION SYSTEM

Lars Isaksen, Dingmin Li and Carla Cardinali

ECMWF

ABSTRACT

The forecast sensitivity to observations (FSO) diagnostic tool has recently been implemented at ECMWF. FSO calculate the third-order sensitivity gradient for, typically, the 24h forecast error. Sensitivity gradients are provided at the start of the minimization and the linearized equations are solved to provide the sensitivity of the forecast error with respect to the observations. The FSO tool has been used to diagnose the impact of Atmospheric Motion Vectors in ECMWF's variational assimilation system. Some of these results and comparison with Observing system Experiments (OSE) will be presented and the implications discussed.

INVESTIGATING HEIGHT ASSIGNMENT TYPE ERRORS IN THE NCEP GLOBAL FORECAST SYSTEM

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ABSTRACT

Within the Numerical Weather Prediction community the observation errors for Atmospheric Motion Vectors (AMV) are assigned by the image type (infrared, visible, water vapor) and/or tracking feature (cloud top, clear air). We are investigating a new approach which involves basing the observation error on AMV height assignment type. We will be presenting AMV statistics for the various height assignment types with respect to the GFS background. We will also be discussing potential quality control and thinning procedures.

POLAR WINDS: NEW PRODUCTS, IMPROVEMENTS, AND RESULTS

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ABSTRACT

In 2001, an experimental polar wind product was developed using imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite. Early the next year, two numerical weather prediction centers demonstrated a positive impact of the MODIS winds on forecasts not only in the polar regions, but globally. Routine generation of the Terra MODIS winds began in 2002, with Aqua MODIS winds following soon thereafter. Today the MODIS winds are produced operationally at NOAA/NESDIS, and eleven NWP centers in seven countries use the data in their operational forecast systems.

The polar wind product suite has expanded considerably in recent years. In addition to Terra and Aqua MODIS winds being produced separately, a mixed-satellite product was developed in order to improve the timeliness of the winds. To take advantage of the additional temporal coverage provided by the NOAA satellites, polar wind products using data from the Advanced Very High Resolution Radiometer (AVHRR) on NOAA-15, -16, -17, -18, -19, and Metop were developed. MODIS and AVHRR wind processing systems have been implemented at direct readout sites in the Arctic and Antarctic, providing wind information in minutes rather than hours. At present, MODIS or AVHRR winds are generated on-site at McMurdo, Antarctica, Rothera, Antarctica, Tromsø, Norway, Sondankylä, Finland, Fairbanks, Alaska, and Barrow, Alaska.

This presentation will provide an overview of the polar wind product suite, and will describe new research products, operational product transitions, and additional direct readout sites. Recent improvements to the retrieval methodology will be evaluated, notably a parallax correction and the specification of per-pixel times. A robust comparison of winds from the various satellites and radiosondes will provide an assessment of product quality. Finally, plans for wind products from future systems, such as the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Visible Infrared Imager Radiometer Suite (VIIRS) operational imager, will be described.

HIGH SPATIAL AND TEMPORAL RESOLUTION ATMOSPHERIC MOTION VECTORS – GENERATION, ERROR CHARACTERIZATION AND ASSIMILATION

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ABSTRACT

Data from the Japanese geostationary satellite MTSAT -1R data have been received at the Bureau of Meteorology (BoM) satellite groundstation at Crib Point, Victoria, and calibrated and navigated sequential radiance data have been used to calculate high density Atmospheric Motion Vectors (AMVs).

These AMVs have been generated almost continuously throughout the day using sequential images separated by 15-minutes, 30 minutes or an hour. Winds have been calculated using infrared (11 μm), (high resolution) visible (0.5 μm) and water vapour absorption (6.7 μm) band images. The AMVs have been error characterized with error characteristics including estimates of the correlated error, the length scale of the correlated error and estimation of the Quality Indicator and Expected Error.

These AMV data are important for operational NWP, research and particularly for severe weather forecasting, including tropical cyclone track forecasting. The data have been used in real time data assimilation experiments and their benefit to operational regional Numerical Weather Prediction (NWP) at the BoM has been documented. The near continuous generation of winds has also been taken advantage of using 4D-Var where their utility in regional forecasting has also been recorded. Their utility for tropical cyclone prediction has already been demonstrated in a number of studies. In recent studies using the Australian Community Climate Earth-System Simulator (ACCESS), which will become the Bureau of Meteorology's next operational NWP system, locally generated high spatial and temporal resolution AMVs from MTSAT-1R have been used with 4D-VAR and their impact , in the region and with tropical cyclone track prediction, has been recorded.

WINDS ON VENUS FROM CLOUD TRACKING

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ABSTRACT

The approach to measuring the circulation of the atmosphere of Venus was first attempted by following clouds in ground based images nearly five decades ago, even before the use of clouds to determine the atmospheric flow on Earth from geosynchronous weather satellite images. Mariner 10 images of Venus taken through an ultraviolet filter from television cameras in 1974 were the first spacecraft data to be used to estimate the global circulation of the atmosphere of Venus which also revealed the organization of the circulation in the form of two global scale vortices, one in each hemisphere centered over the respective poles. The basic technique was a minor adaption of the same software used to measure winds from Earth geosynchronous weather satellites developed at the Space Sciene and Engineering Center and used extensively in the Global Atlantic Tropical Experiment (GATE).

Since then, the basic technique of cloud tracking to observe the global atmospheric circulation has been used extensively on Jupiter, Saturn, Uranus and Neptune. Variations of the same cloud tracking method have been used with considerable success. The measured cloud-tracked winds have been confirmed by direct entry probes, balloons (Venus) as well as from estimates of thermal structure using the balance equation or the thermal wind equation. At present European Space Agency's Venus Express orbiter is returning images of Venus from ultraviolet (reflected solar light) to near infrared (emitted radiation from Venus on the night side) spectral range. These are being used to monitor the atmospheric circulation of the Venus atmosphere from ~ 55 km to 70 km level. In December 2010 Japan's Venus Climate Orbiter is expected to go into orbit around Venus carrying ultraviolet and infrared cameras to monitor Venus from a near equatorial, eccentric orbit with a period that will give an approximate synchronous view of the Venus cloud cover over about 75% of the orbit, much like the view of Earth from geosynchronous weather satellite. Tracking of clouds from the returned images will provide vital data towards solving the puzzle of the super rotation of the Venus atmosphere.

COMPARISON OF MISR AND METEOSAT 9 CLOUD MOTION WINDS

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ABSTRACT

A detailed evaluation of cloud motion winds from the Multi-angle Imaging SpectroRadiometer (MISR) against a similar product from a geostationary satellite was sorely lacking. Previously, MISR winds were only compared to radiosonde and wind profiler observations, or forecast models. Although such comparisons showed relatively good agreements, they were limited in scope and suffered from representativeness and sample size issues. This study offers the most detailed evaluation of cloud motion winds from MISR to date. MISR's purely geometric stereo technique retrieves cloud motion and height simultaneously, and is potentially more accurate than traditional satellite winds relying on ancillary information for height assignment. Here, we analyzed one year of MISR and state-of-the-art Meteosat 9 wind retrievals, producing robust statistics based on 225,155 coincident wind pairs. Retrieval differences were investigated as a function of quality control metrics, geographic location, season, surface type, cloud elevation, MISR stereo matching technique, and Meteosat 9 height assignment method.

We found that MISR winds had no substantial speed bias compared to Meteosat 9; however, the meridional (MISR along-track) wind components showed significantly larger rms differences than the zonal (MISR cross-track) components. There was also a land-ocean contrast with vector differences being larger over land. In general, the worst agreement between wind retrievals was observed in the Tropics.

Contrarily, MISR wind heights were systematically larger by 450 m on average than Meteosat 9 heights. Case studies for the Southeast Atlantic Ocean demonstrated that height differences could often be traced to a low bias in the Meteosat 9 brightness temperature height assignment method, which put winds unreasonably close to the surface, especially in broken cloud fields. Investigating cloud-free land scenes, where MISR tracks topographic features, we established the minimum error characteristics, and the relationship between along-track wind error and height error in the multiangle stereo retrievals. Applying these findings to cloudy scenes, we identified large geographic areas where the observed MISR-Meteosat 9 height differences could not possibly be explained by MISR height errors alone.

Based on our results, we concluded that the current MISR wind product, although probably inadequate for weather prediction purposes due to its limited spatial coverage, could still be very useful pinpointing particular situations where geostationary height assignment methods face serious difficulties and, hence, need further improvement. In addition, cloud motion winds from a future MISR-like instrument with a much wider swath could even be used in numerical weather prediction models to cover the data-void latitude band where neither geostationary nor MODIS winds are available.

AMVS FROM ATSR2-AATSR AND THE PROPOSED UNCOOLED THERMAL IR PUSHBROOM MISRLITE CONSTELLATION

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ABSTRACT

The NASA MISR (Multiangle Imaging Spectro-Radiometer) has been employed to produce a ten year time series of cloud-top heights and winds (Atmospheric Motion Vectors, AMVs) using the stereo matching system described by Muller et al., (2002). A review will be presented of different validation approaches for cloud-top heights which have been assessed. These indicate that ground-based radar+lidar systems such as those employed by the Chilbolton Radar Facility for Atmospheric Research are optimal for such purposes. Independent work suggests that for both radiosonde and Doppler wind match-ups, accuracies are within the specification of 3 m/s RMS and from the CFARR and ARM analyses that cloud-top heights are within 600m RMS.

Results will be presented on an assessment of obtaining AMVs from ATSR2-AATSR 30 minute time interval imagery using the ATSR2 stereo processing system described in Muller et al., (2007). Where possible, match-ups have been obtained and an initial assessment will be presented of these results.

Taking the MISR follow-on WindCam concept described in Diner et al., (2008), we have developed a breadboard system using INO uncooled microbolometers which we call MISRlite[1] (Multi-angle Infra-red Stereo Retrieval). MISRlite aims to retrieve winds and heights irrespective of solar illumination for use in improving NWP and severe weather forecasts. Initial laboratory and field results will be shown of MISRlite and a preliminary assessment made of a constellation system for obtaining global wind-fields with ≤3m/s and ≤300m RMS height errors.

Cited references

Diner, D. J., M. Mischna, R. A. Chipman, A. Davis, B. Cairns, R. Davies, R. A. Kahn, J.-P. Muller, and O. Torres, 2008: WindCam and MSPI: two cloud and aerosol instrument concepts derived from Terra/MISR heritage. *SPIE Earth Observing Systems XIII*, San Diego, SPIE, 70810T-70810T-9.

Muller, J., M. Denis, R. D. Dundas, K. L. Mitchell, C. Naud, and H. Mannstein, 2007: Stereo cloud-top heights and cloud fraction retrieval from ATSR-2. *International Journal of Remote Sensing*, 1921-1938.

Muller, J. P., A. Mandanayake, C. Moroney, R. Davies, D. J. Diner, and S. Paradise, 2002: MISR stereoscopic image matchers: Techniques and results. *IEEE Transactions on Geoscience and Remote Sensing*, **40,** 1547-1559.

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A TOOL TO DETECT INNER CLOUD TOP DYNAMICS OF DEEP CONVECTIVE SYSTEM

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ABSTRACT

The knowledge of deep convective system formation process is a key feature in climate change and nowcasting. However the inner flows at the top of deep convection towers are not well understood due to several uncertainties linked to the dynamic itself. The new technique described in this study had been developed to extract concrete information about such features. This could help clarifying ring and U/V structures in deep convection and be potentially useful in nowcasting application. Indeed, the use of high resolution NWP models, which now include explicit microphysical processes, requires data assimilation at very high resolution as well. The usual atmospheric motion vector tracking algorithm has been applied to pair of images composed by combinations of Spinning Enhanced Visible and Infrared Imager (SEVIRI) water vapour and infrared channels. Several ranges of channel differences were used in the tracking process, such intervals being expected to correspond to specific cloud top microphysics structures. Various consistent flows of motion vectors with different speeds and/or directions have been extracted at the same location depending on the channel difference intervals used. These differences in speeds/directions can illustrate local wind shear situations, or correspond to expansion or dissipation of cloud regions that contain specific kind of ice crystals or droplets. Comparisons of the results against European Centre for Medium-Range Weather Forecasts (ECMWF) forecast profiles allowed identifying situations for which the direction and speed differences describe wind shear situations. In a second step, wind fields extracted from channel combinations have been compared to collocated winds obtained by Velocity Volume Parcel (VVP) technique using Massachusetts Institute of Technology (MIT) Niamey Doppler radar data collected during the African Monsoon Multidisciplinary Analysis (AMMA) project.

RECENT UPGRADES OF AND ACTIVITIES FOR ATMOSPHERIC MOTION VECTORS AT JMA/MSC

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ABSTRACT

The Meteorological Satellite Center (MSC) of the Japan Meteorological Agency (JMA) generates Atmospheric Motion Vectors (AMVs) using the successive images of MTSAT-1R. The presentation reports the recent upgrades of MTSAT-1R AMVs and activities for the AMVs at JMA.

JMA started to disseminate AMVs in BUFR at 03, 09, 15 and 21UTC to users via GTS, in addition to ones at 00, 06, 12 and 18UTC, on 18 August 2009. With this change, the scan start and end times of images for deriving two intermediate vectors, AB (from the first and second images) and BC (from the second and third images), and the wind speeds and directions of the vectors, were newly stored in BUFR.

To improve the quality of AMVs, JMA conducted the following upgrades on AMV derivation in 2008 and 2009: First, with the upgrade of JMA's Global Spectral Model (GSM) in 2007, JMA started to use GPVs with higher time and spatial resolutions from the GSM forecast fields in computing AMVs at 05UTC 9 October 2008. The introduction of the GPVs slightly improved the qualities of AMVs against sonde observation and GSM first-guess fields. Second, JMA introduced three new derivation algorithms at 05UTC 19 May 2009. First, a new height assignment scheme was introduced into computing IR AMVs. In the new scheme, image pixels contributing to feature tracking are selected and used to compute the height level. The introduction of the scheme has improved the less amount of number above 400hPa level and the fast wind speed biases at levels between 500 and 700 hPa in the previous AMVs. Second, the image segment to track clouds/ water vapor pattern (template image) was resized from 32 pixels to 16 or 24 pixels depending on the time interval of images. With the resizing of template image, slow wind speed biases which are recognized in high and middle level AMVs have been mitigated. Third, the AMV derivation area was expanded from 50S-50N and 90E-170W to 60S-60N and 90E-170W. Finally, JMA improved a defect of starting point error in cross-correlation matching scheme for feature tracking at 05UTC 15 September 2009. Because of the improvement, the number of high-quality AMVs increased compared to the previous AMVs.

As a follow-up work for T-PARC (THORPEX-Pacific Asian Regional Campaign) held in the summer of 2008, JMA has been seeking the proper size of template image to compute AMVs using images at intervals less than 15 minutes.

JMA is reprocessing AMVs from the images of past geostationary satellites, i.e., GMS series, GOES-9 and MTSAT-1R using the latest derivation algorithms to contribute to the JMA's second reanalysis project (JRA-55) and Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM).

STATUS ON THE USE OF SCATTEROMETER DATA AT METEO-FRANCE

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ABSTRACT

Scatterometer provide 10m-wind data over sea, trough an heuristic relation, called Geophysical Model Function (GMF). These data have been assimilated operationally in the Numerical Weather Prediction models of Meteo-France since 2003: first from the Seawinds scatterometer on-board the satellite QuikSCAT, then from the AMI instruments on-board the satellite ERS-2 and ASCAT on-board the satellite Metop-A, respectively in 2007 and in 2008.

Significant changes were made in the use of these data in the last 2 years. First, 4 wind solutions, different in direction, are now taken into account in the assimilation process of QuikSCAT instead of the 2 closest to the GMF initially. These changes reduce the departure with respect to the model in areas of high departure, without loss of information when this departure is lower. Last, as wind data are now considered as neutral, the stability effect in the boundary layer can be ignored, whereas it was treated implicitly only in GMF. The main impact is a reduction of the speed bias with respect to the model, mainly for QuikSCAT data, and a better agreement between the model and its analysis in the extra-tropical hemispheres.

NEW DEVELOPMENTS IN THE HIGH RESOLUTION WINDS PRODUCT (HRW), AT THE SATELLITE APPLICATION FACILITY ON SUPPORT TO NOWCASTING AND VERY SHORT RANGE FORECASTING (SAFNWC)

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ABSTRACT

The evolution of the SAFNWC High Resolution Winds product between 2008 and 2010 is to be explained. This product, which allows its users a detailed in coverage and time calculation of Atmospheric Motion Vectors, locally and in real time in the geographic area of their interest, has been greatly expanded for its version 2010.

Due to user requirements, wishing to have AMV data during all hours of the day, HRW algorithm has been adapted to calculate AMVs with both MSG/HRVIS and MSG/IR108 channels, and is prepared to calculate AMVs with other MSG/SEVIRI channels in future versions. With both channels and an important optimization of the algorithm, HRW product can now calculate more than double number of AMVs in a similar running time, with similar or better validation parameters, and can now provide users with a continuous set of AMV data during both daytime and nighttime.

Besides, SAFNWC/HRW product has been adapted to run in Rapid Scan mode. A study has been made to define the best time lapse between the initial and final slot for the AMV calculation, considering the amount of calculated winds and the validation errors. As a compromise, a 10 minute time lapse has been defined for both channels (HRVIS & IR108), with the ability to be run with every SEVIRI Rapid Scan slot.

OPERATIONAL WIND PRODUCTS AT NOAA/NESDIS: A STATUS REPORT

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ABSTRACT

This paper summarizes the status of the operational wind products at NOAA/NESDIS. Recent improvements, new additions, processing changes and monitors, future plans and product quality assessment of the Atmospheric Motion Vector (AMV) product suite will be discussed. The current satellite constellation for operational AMV winds processing includes GOES-12 as the eastern operational geostationary satellite and GOES-11 serving as the western operational geostationary satellite. GOES-13 (GOES-N), the first in the new GOES-NOP series of satellites, was still placed in stand by mode. GOES-O, the second one, was successfully launched in June 27, 2009. The following GOES-O extensive science post-launch checkout of radiances and derived products including AMVs is being implemented. NOAA/NESDIS began to generate operationally MTSAT-1R Wind products and distribute them to NOAA/NWS AWIPS in February, 2009. AVHRR Polar wind products (NOAA N15-19 and METOP) have been available in the operational NOAA/NESDIS wind processing system. In addition, several new enhancements in the NOAA/NESDIS winds operational processing are implemented and being implemented. These enhancements include but are not limited to, introduction of the Expected Error parameter in an effort to improve the quality of all AMVs, Parallax corrected MODIS AMVs, combined MODIS AMVs. Updates on the status of these enhancements and other future plans will be presented. Besides AMV product suite, NOAA/NESDIS acquires, processes, and distributes QuikSCAT and ASCAT (working collaboratively with EUMETSAT and KNMI) products. An overview of the NOAA/NESDIS NRT processing and distribution of QuikSCAT and ASCAT wind products are also presented.

STATUS OF OPERATIONAL AMVS FROM FY-2 SATELLITES

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ABSTRACT

This paper describes operational status of NSMC AMVs. Since the 9th wind workshop, FY2-C (105ºE) and FY-2D (86.5ºE) are both in operation. In order to reduce the difference between NSMC AMVs and radiosonde winds, the following measures are taken:

- Use radiation energy quantity rather than brightness temperature quantity to calculate IR/WV measurements statistic relationship;
- NWP data used to perform opaque cloud IR/WV relationship calculation is increased from 17 to 36 levels;
- In order to separate high level clouds from the low-level clouds, the correlations between the IR and WV matching template are calculated. Tracers with high (low) clouds are associated with the correlations between the IR and WV measurements high (low). Such correlation check was origionally performed at the earlier stage of hight assignment. Now, it is performed at the latest stage of hight assignment.
- Image navigation is further improved.

The improvements from those measures will be shown.

In the recent future, inter calibration of FY-2 satellites with AIRS will be in operation. The improvement carried out by calibration will also be shown.

IMPROVING THE USE OF QUALITY CONTROLLED AMVS IN THE NCEP GLOBAL FORECAST SYSTEM

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ABSTRACT

Satellite winds (AMVs) are used operationally by global NWP centers including the Environmental Modeling Center of NOAA/NCEP in the United States. However, in terms of overall impact on forecast skill, most operational centers rate AMVs significantly lower than temperature sounding data from microwave and infrared sensors. The lack of vertical resolution is one possible reason for this discrepancy, but even this does not explain the occasional negative impacts of satellite winds seen in the NCEP GFS. A more likely cause of these are cases where clusters of AMVs with anomalous errors pass through the quality control of the data assimilation system and generate a negative overall impact. It has long been known that contrary to the assumption built into many data assimilation systems, actual observation errors are rarely Gaussian. The errors of AMVs in particular are known to have a frequency of large errors that cannot meaningfully be described by normal distributions. The goal of the quality control is to keep the AMVs with gross (non-Gaussian) errors out of the system, and a number of strategies to achieve this goal have been discussed in the community. We will report on examples of negative forecast impact on the Global Forecast System operated by NCEP and show attempts to mitigate this phenomenon via more sophisticated screening strategies.

A 27-YEAR RECORD OF SATELLITE-DERIVED POLAR WINDS FOR RETROSPECTIVE ANALYSES

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ABSTRACT

A major gap has historically existed in the global observing system because very few routine measurements of winds are made over the Arctic Ocean and most of the Antarctic continent. This gap has been somewhat mitigated since the early 2000s with the routine retrieval of tropospheric winds in the polar regions by tracking cloud and water vapor features in Moderate Resolution Imaging Spectroradiometer (MODIS) data from the Terra and Aqua satellites. Model impact studies from numerical weather prediction centers worldwide have demonstrated a positive impact on forecasts in the Arctic, Antarctic, and extending into the extratropics with the assimilation of the MODIS winds.

Unfortunately, the era of MODIS polar winds will be limited to approximately the current decade as the Terra and Aqua satellites are already beyond their designed lifetimes. Winds derived from NOAA's Advanced Very High Resolution Radiometer (AVHRR) instrument complement the current MODIS winds dataset, though the AVHRR is less robust in terms of spectral channels and spatial resolution. Future polar satellite sensors, for example the Visible/Infrared Imager/Radiometer Suite (VIIRS) on the NPOESS satellites, are similar to the MODIS, but lack a water vapor channel. Therefore, a long-term record of satellite-derived polar winds will only be available using AVHRR-like instruments.

We have begun reprocessing 27 years of AVHRR data to generate a polar winds dataset that can be used in reanalysis efforts. Select time periods are being identified to run limited experiments using time-coincident MODIS and AVHRR winds. The forecast impact of these short-term datasets will be evaluated, in collaboration with the NASA GMAO, using the Goddard Earth Observing System Data Assimilation System Version 5 (GEOS-5). This is in preparation for the entire AVHRR winds dataset to be input into the GMAO's Modern Era Retrospective-analysis for Research and Applications (MERRA) and similar systems in future reanalysis cycles.

A status of the data processing, preliminary results of initial experiments in the GEOS-5, and future plans will be presented.

THE DEVELOPMENT FOR MTSAT RAPID SCAN HIGH RESOLUTION AMVS AT JMA/MSC

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ABSTRACT

Recently, the Meteorological Satellite Center (MSC) of the Japan Meteorological Agency (JMA) is developing Atmospheric Motion Vectors (AMVs) derived from rapid scan observation by Japanese geostationary satellite MTSAT for resolving mesoscale phenomena. One of the MSC's aims to compute the rapid scan AMVs is to study the mesoscale phenomena over tropical region. It is needed to minify size of template image utilized in tracking process because low spatial error correlation of AMVs, which is important factor for data assimilation, is dependent on the size of template image. The rapid scan AMVs specified for resolving mesoscale phenomena are required to be higher space resolution AMVs than normal AMVs for NWP.

Using small template size for tracking process (by Pattern Matching in cross correlation method) is one of the good methods to make high resolution AMVs. But too much small template image does not involve enough number of pixels to determine correlation coefficients utilized as similarity index. In other words, it is thought that very small template (such as 9x9 pixels or less) does not keep enough information to determine reasonable cloud motion. Hence the high resolution AMVs are required to compensate this lack of information of template image.

To resolve this problem caused from the lack of information of template image, MSC is developing high resolution AMVs based on new tracking method. Aim of this proposal method is effective use of the information involved in rapid scanned multiple (3 or more) sequential satellite images. At MSC, this is a first attempt which utilizes redundant fast time resolution of data realized by rapid scan as deficient high space resolution of AMVs.

The proposal method consists of 3 steps, and utilizes not only 2 consecutive images but also 3 or more images in same time. First step is to compute multiple matching surfaces corresponding to all possible combinations of sequential satellite images. Second step is conversion matching surfaces computed in first step into probability density functions of motion vector per unit time. In third step, final probability density function of motion vector per unit time is computed by multiplying all of probability density function achieved in second step. And motion vector selected as a final output is estimated from position which gives maximum value of the final probability function. By using this method, it is expected to estimate accurate likelihood of motion vector field for high resolution AMVs throughout rapid scan observations.

OPTIMIZATION OF ADM-AEOLUS VERTICAL SAMPLING

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ABSTRACT

The European Space Agency prepares the Atmospheric Dynamics Mission, called Aeolus, that aims to provide the first atmospheric wind profiles from space by employing a Doppler Wind Lidar (DWL) system in a 400-km polar orbit. The DWL will measure the backscattered and Doppler shifted light both from moving air molecules and particles, i.e., cloud and aerosol. The molecular and particle detection is independently range gated in 24 vertical bins in order to provide the wind profile information. Several considerations apply to the vertical sampling, such as a minimum and maximum vertical bin size of resp. 250 and 2000 m, the limitation to switch vertical sampling 8 times per orbit, the need for ground (wind) calibration, wind cross calibration, the need for particle knowledge in the molecular wind processing, height assignment of optical structures in case of vertical wind shear, the feasibility of Quality Control, geographical and seasonal dependency of the optical and dynamical properties of the atmosphere and, last but not least, the expected impact in meteorological analyses. These effects are elaborated in an ESA study led by KNMI and the results of this study will be shown at the workshop. Analyses with cloud-resolving models, high-resolution radiosondes, CALIPSO optical data in combination with NWP wind data, Ensemble Analysis techniques and more simplified information content analyses are all combined to prioritize a selected set of different vertical sampling scenarios.

VERIFICATION OF SCATTEROMETER WINDS

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ABSTRACT

The EUMETSAT Numerical Weather Prediction (NWP) and Ocean and Sea Ice (OSI) Satellite Application Facilities (SAFs) are developing scatterometer processing software and apply this in the wind processing centre at KNMI. The freely available software and operational data products are diverse and span the MetOp-A ASCAT, QuikScat SeaWinds and ERS-2 AMI scatterometers. Moreover, these products are on different spatial grids from 100 km to 12.5 km and we experiment ASCAT processing near the coast. The KNMI satellite wind group is also involved in the future OceanSat-2 (launched 23/9/'09), CFOSAT, and Post-EPS (EUMETSAT Polar System) scatterometers. It is important that users are informed about the information content and potential application of all these wind products. To this end, we perform triple wind collocation analyses and spatial spectral analyses of the processed scatterometer swath wind fields. These analyses show that the 100-km wind products compare best to global NWP winds fields, i.e., ECMWF, while the 12.5-km ASCAT winds compare best to available global buoy observations. In line with this, global NWP wind spectra show a deficit in wind variance on scales smaller than 1000 km with an order of magnitude deficit at the 100-km scale. Also, due to spatial filtering in the scatterometer processing for SeaWinds, which is not needed for ASCAT, the ASCAT spatial wind spectra are more filled than those of SeaWinds. The ASCAT spectra are close to the $k^{-5/3}$ spectral slope for 3D turbulence, that should indeed closely apply below scales of 500 km. These results will be further elaborated at the workshop.

THE IMPROVED USE OF SATELLITE WINDS IN NCEP GLOBAL DATA ASSIMILATION AND FORECAST SYSTEM

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ABSTRACT

Satellite derived winds have been used in the NCEP global data assimilation and forecast system since 1979. These winds provide valuable information for the numerical forecast model initialization. However it has been found that the satellite winds have a slow bias and correlated errors, especially for high density satellite wind products. These issues can cause some degradation in the forecast skills for our system. This study try to address these issues by applying asymmetric gross check inside data assimilation system and thinning the high density satellite winds. Various criteria and schemes were tested and the one with the optimal forecast impacts were selected for further test in our data assimilation system.

OPERATIONAL USE OF SCATTEROMETER WINDS AT JMA

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ABSTRACT

Scatterometer wind vectors have been used not only for operational Numerical Weather Prediction (NWP) but also for various analyses such as weather map, typhoon and wave analysis at Japan Meteorological Agency (JMA).

The JMA operates global and mesoscale models with four-dimensional variational data assimilation system in which QuikSCAT/SeaWinds winds are assimilated. We started to use Metop-A/ASCAT winds data operationally in the global model in July 2009, but so far the usage is limited due to the wind speed bias between NWP and scatterometer winds. To use the scatterometer data more effectively so as to improve the forecasts further, we have a plan to apply the bias correction method of wind speed. In addition, use of ASCAT data in the mesoscale model is also planned in 2010. We will present some preliminary results of assimilation experiments.

EXPLORING THE BEHAVIOR OF ATMOSPHERIC MOTION VECTOR (AMV) ERRORS THROUGH SIMULATION STUDIES

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ABSTRACT

The Cooperative Institute for Meteorological Satellite Studies (CIMSS), in cooperation with NOAA's GOES-R Algorithm Working Group (AWG), has been using simulated Advanced Baseline Imager (ABI) radiances to evaluate potential instrument effects on atmospheric motion vector (AMV) errors.

Simulated GOES-R ABI Top of Atmosphere (TOA) radiances derived from the Weather Research and Forecasting (WRF) model, and the CIMSS fast solar/infrared forward model are used within a new framework to produce AMVs. The use of this framework is a departure from the current operationally derived GOES AMVs, but is employed in this study since this framework will mimic what will be in place for the GOES-R ground system data processing. Adaptive changes to the operational feature-tracking algorithms were necessitated for inclusion into this system. For example, pixel-level cloud heights derived from the AWG cloud team algorithms are used in the AMV height assignment routine.

As a first step, unaltered TOA radiances (no noise) are used to derive a baseline set of AMVs. The TOA radiances are then altered at 1- and 3-times the ABI threshold specifications with several different induced noise effects: calibration offsets, navigation shifts, degraded sensor signal-to-noise, image striping, and all the effects combined.

AMV datasets are derived with the above instrument effects for a selected case study time period. They are then compared to the WRF model U and V wind fields ("truth") to assess which effects are most sensitive to the AMV processing software within the framework. The results will provide important tolerance guidance to the GOES-R Program Office in the selection of instrument specification thresholds.

INNER-CORE DYNAMICS, ROTATION GRADIENTS, AND INTENSITY OF TROPICAL CYCLONES AS OBSERVED BY MISR

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ABSTRACT

Conventional cloud motion measurements are associated with insufficient accuracy in height assignment of the wind vectors. Unlike other cloud-track wind techniques, the Multiangle Imaging SpectroRadiometer (MISR) on NASA's Terra satellite can determine both cloud wind speed and height with much better accuracy. Using stereoscopic techniques from 9 consecutive viewing angles (±26.1°, ±45.6°, ±60.0°, ±70.5° and nadir), MISR cloud winds, retrieved at 1.1 km resolution, reveal very interesting structures of tropical cyclone (TC) inner-core dynamics, such as the rotational velocity variation as a function of radial distance. In the Hurricane Alberto (2000) case, two distinct rotational velocities of 4.8 cyc/day and 18 cyc/day are observed inside the eyewall. The faster velocity is closer to the eyewall and associated with two mesovortices as the cyclone underwent its second intensification during August 18-22, 2000. Since 2000 MISR has encountered numerous tropical cyclones with a clear view of the TC center, which is a valuable database for better understanding cyclone inner-core dynamics and intensification processes. We find a strong relation between the inner-core rotation and TC intensity from several cases MISR has good measurements.

UPGRADED USAGE OF MODIS-DERIVED POLAR WINDS IN THE JMA OPERATIONAL GLOBAL 4D-VAR ASSIMILATION SYSTEM

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ABSTRACT

Polar winds data derived from the Moderate Resolution Imaging Spectroradiometer (MODIS) on board the Terra and Aqua satellites produced by the Cooperative Institute for Meteorological Satellite Studies (CIMSS) have been assimilated in the JMA operational global 4D-Var assimilation system since 2004. The data are acquired from the public via anonymous FTP on CIMSS.

Recently, MODIS polar winds are produced operationally by NOAA/NESDIS. The data are also broadcast internationally in BUFR format through the Global Telecommunication System (GTS). To reduce the entire processing time, CMISS also produces direct broadcast (DB) MODIS data.

The qualities of MODIS/NESDIS and DB MODIS polar winds data were investigated statistically against first-guess of the JMA model was almost equivalent to the MODIS/CIMSS polar winds data.

To acquire the MODIS polar winds data stably and instantly via GTS and to use them in the operational global 4D-Var assimilation system, we are planning to switch from MODIS/CIMSS winds to MODIS/NESDIS and DB MODIS winds in March, 2010. We are going to revise our quality control (QC) system for the new data.

We will give a presentation about the revised QC and its results of assimilation experiments at the workshop.

AN OBSERVING SYSTEM EXPERIMENT OF MTSAT-2 RAPID SCAN ATMOSPHERIC MOTION VECTOR FOR T-PARC2008 USING THE JMA OPERATIONAL NWP SYSTEM

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ABSTRACT

A special observation experiment project that examines the effectiveness of next generation forecast technology, "Interactive forecast system", has been performed under THORPEX Pacific Asian Regional Campaign (T-PARC) for track forecasts of three typhoons in the summer of 2008 at JMA. Special observations for T-PARC2008 are dropwindsonde observations, extra radiosonde observations at JMA observatories and ships observations. The Meteorological Satellite Center (MSC) of JMA produced MTSAT-2 Rapid Scan Atmospheric Motion Vectors (MTSAT-2-RS-AMV) derived from cloud images of the intervals of 15-minutes (MTSAT-2-RS-AMV_15MIN), 7-minutes (MTSAT-2-RS-AMV_7MIN) and 4-minutes (MTSAT-2-RS-AMV_4MIN) for T-PARC2008.

Typhoon-track and intensity forecast experiments for typhoons Sinlaku and Jangmi are being performed using MTSAT-2-RS-AMV data in the JMA operational NWP system. Neither special observational data nor typhoon bogus data are used in the observing system experiment (OSE) to evaluate the effect of only MTSAT-2-RS-AMV data.

We will give a presentation about the results of the OSEs at the workshop.

TWO APPLICATIONS OF IMPROVEMENTS FOR AMVS OF NSMC/CMA -- RE-NAVIGATION BASED ON FULL EARTH DISC IMAGE & CALCULATION OF RADIATION TRANSFER USING NWP DATA

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ABSTRACT

This paper describes two applications of improvements which were added to AMVs system of NSMC/CMA in recent years. The one is re-navigation which is operated in order to reduce or eliminate the error of forecast navigation and calculated using S-VISSR data (including full earth disc image, orbit and attitude data). The other is radiation transfer calculation which uses NWP data as atmosphere profile, simulates the radiation received by satellite from optical cloud assumed at different height and provides data for height assignment of AMVs.