OPERATIONAL SATELLITE WIND PRODUCT PROCESSING AT NOAA/NESDIS: A STATUS REPORT

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ABSTRACT

This paper summarizes the status of the operational satellite wind product system at NOAA/NESDIS. Recent improvements, new additions, processing changes, future plans and product quality assessment of the Atmospheric Motion Vector (AMV) product suite will be discussed. The current satellite constellation for operational winds processing includes GOES-12 as the eastern operational geostationary satellite and GOES-11 serving as the western operational geostationary satellite. GOES-N, the first in the new GOES-N/P series of satellites, was launched in May 2006 and following extensive science post-launch checkout of radiances and derived products, that included AMVs was placed in stand by mode. SATEPS winds processing currently done at the NOAA Science Center will be migrated to the new ESPC facility at the NSOF campus in Suitland, Maryland beginning in late March of 2008. New operational methodologies would be discussed including the introduction of several new enhancements into the NESDIS winds operational processing. These enhancements include but are not limited to, introduction of the Expected Error parameter in an effort to improve the quality of the GOES and MODIS AMVs, Parallax corrected MODIS AMVs, combined MODIS AMVs and GOES hourly winds. Updates on the status of these enhancements and other future plans will be discussed.

1. INTRODUCTION

NOAA/NESDIS and the Cooperative Institute for Meteorological Satellite Studies (CIMSS) continue a fruitful collaboration aimed at improving the quality of Atmospheric Motion Vectors (AMVs) derived from the GOES-I/M series of satellites. The NOAA/NESDIS winds processing system continues to be incrementally upgraded with updated wind algorithms, new wind products, and new processing strategies. High quality LWIR and WV are now being generated from the MODIS aboard the AQUA and TERRA satellites on an operational basis for the Northern and Southern Hemispheres. NOAA/NESDIS has incorporated the 3.9um cloud-drift winds into its operation. This product will supplement the low-level visible and 10.7um cloud-drift wind products currently being generated operationally. The operational NESDIS wind products are being distributed in BUFR. This opens up opportunities for improved use of the wind products by the major numerical weather prediction (NWP) centers. New operational processing strategies take advantage of the higher frequency interval imagery available to derive the wind products. These new strategies have resulted in improved wind products that, in turn, have resulted in improvements in their utility in numerous applications. These geostationary wind products serve as critical

input to a wide range of applications that include assimilation into regional and global prediction systems, oceanic analyses, tropical storm analyses, and real-time forecasting.

1.1 NESDIS OPERATIONS STATUS REPORT

- Status of GOES Satellites

NOAA/NESDIS currently maintains a continuous stream of data from two operational geostationary satellites. At the present time, these two satellites are GOES-12 at 75oW and GOES-11 at 135oW. To reduce the risk of a break in operational service, the GOES constellation also includes GOES-10, currently on loan to South America and located at 60W and GOES-13 a fully capable on-orbit spare located at 105W. The launch of GOES–O is expected sometime in the fall of 2008.

- Operational GOES Wind Products and Dissemination

The current operational wind products being generated at NOAA/NESDIS are shown in Table 1. The frequency at which each product is produced, together with the GOES image sector used, and image interval, and GTS WMO header is presented in this table. Beginning in March 2008, all high-density winds processing will be done on P570 IBM servers with Linux partitions. This change represents the culmination of the migration of all GOES operational products from Linux Dell servers to the new architecture in NESDIS's new facility NSOF. Table 2 shows the current formats supported for the current suite of operational winds products as well as the strategy used for dissemination from the servers on which they are staged.

AMV Product	Frequency (Hours)	Image Sector(s)	Image Interval (min)	GTS WMO Header
GOES IMAGER				
LWIR (11um) Cloud-drift	3	RISOP	7.5	JACX11-GOES-E JCCX11-GOES-W
	3	CONUS	15	
	3	Extended NH; SH	30	
SWIR (3.9um) Cloud-drift	3 (Night-time)	RISOP	7.5	JQCX11-GOES-E JRCX11-GOES-W
	3 (Night-time)	CONUS	15	
	3 (Night-time)	Extended NH; SH	30	
Water Vapor (6.7um)	3	Extended NH; SH	60	JECX11-GOES-E JGCX11-GOES-W
Vis Cloud-drift (0.65um)	3 (Daytime)	RISOP	7.5	JHCX11-GOES-E JJCX11-GOES-W
	3 (Daytime)	PACU/CONUS	15	
	3 (Daytime)	Extended NH; SH	30	
GOES SOUNDER				
Sounder WV (7.4um)	3, 6	CONUS/Tropical	60	JKCX11-GOES-E JMCX11-GOES-W
Sounder WV (7.0um)	3,6	CONUS/Tropical	60	JNCX11-GOES-E JPCX11-GOES-W

TERRA/AQUA MODIS

LWIR (11um) Cloud-drift	2	NHEM; SHEM (poleward 65° Lat)	100	JBCX11-Terra JICX11-Aqua
Water Vapor (6.7um)	2	NHEM; SHEM (poleward 65° Lat)	100	JFCX11-Terra JLCX11-Aqua

Table 1.

AMV PRODUCT	BUFR WMO FM94	McIDAS MD FILE	ASCII WMO No. 306
LWIR (11 um)	X	GP16, GP12	GP16, GP12, GTS
SWIR (3.9 um)	X	GP16, GP12	
WV (6.7 um)	X	GP16, GP12	GP16, GP12, GTS
Visible	X	GP16, GP12	GP16, GP12, GTS
LWIR MODIS	GP16, GP12, GTS		
WV MODIS	GP16, GP12, GTS		
Sounder Ch. 10	X		
Sounder Ch. 11	X		
MTSAT	AWIPS		
ASCAT	AWIPS		
QUICKSCAT	AWIPS		

X = GP16, GP12, GTS, AWIPS

Table 2: Dissemination of NESDIS Operational Wind Products and Formats Supported

2. RECENT IMPLEMENTATIONS

Recent additions to the operational GOES winds processing system include the following

- New web page display to include display of production statistics as well as comparison of AMV to radiosonde observations. The URL for the new website is http://www.goes.noaa.gov/WINDS.

- Implementation of the Expected Error (EE) Technique. The EE is an AMV quality identifier that was originally developed by Dr. John LeMarshall while at the Bureau of Meteorology in Australia. It is essentially an extension of the currently available Quality Indicator (QI) developed at EUMETSAT, but provides an output in the form of most likely (expected) root-mean square (RMS) error for each vector. The EE software has been implemented into the GOES NESDIS operational winds processing and is routinely produced within our experimental parallel systems.

3. NEW PRODUCTS, CAPABILITIES

The following new products are expected to be implemented into the NESDIS operations during the summer of 2008.

- Parallax Corrected Winds

Starting in the summer of 2008 NOAA/NESDIS will introduce into its operations the combined use of imagery from both Terra and Aqua. Utilizing mixed Terra and Aqua MODIS imagery to derive AMVs will require that imagery be corrected for parallax, as the two satellites will view the same cloud or water vapor features from different angles. NOAA/NESDIS will employ in its operations the parallax correction

method which has been developed and tested at CIMSS (Santek et al, 2004). These winds will replace the MODIS AMVs which are generated separately for the Terra and Aqua satellites

- AVHRR winds from NOAA 15 – 18

NOAA/NESDIS will introduce into its operations cloud tracking with AVHRR data which is based on the established procedure used for the Geostationary Orbiting Environmental Satellites (GOES), (Nieman et al. (1997) and Velden et. al. (1998)). NOAA/NESDIS have already been distributing these winds on behalf of our CIMSS partner but will incorporate them into its own operation in the summer of 2008.

- Hourly Winds

NOAA/NESDIS will begin testing the generation of AMVs on an hourly basis instead of a three hourly basis. This activity was delayed because of the consolidation and migration of applications from Linux Dell Servers to IBM P570 systems. Additionally the AMV algorithms were redesigned to take advantage of the new architecture and allow for more efficient deployment of new enhancements.

4. SUMMARY

NOAA/NESDIS, together with its CIMSS partner, continue to improve the operational wind product suite at NOAA/NESDIS. All of the NOAA/NESDIS wind products are being encoded in the BUFR template. Updates to the BUFR encoder, which corrects deficiencies and problems noted by users, are now in place. All GOES wind BUFR datasets are now being distributed over the GTS under new WMO bulletin headers. New products and techniques include a new web page for displaying and monitoring AMV winds processing and quality control; the implementation of the new Expected Error technique; the implementation of the Parallax corrected MODIS Terra and Aqua winds and the implementation of the AVHRR winds from NOAA 15 – 18.