Status on the use of satellite-derived AMVs in the GDAS/GFS to mitigate the impact from satellite data gaps

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Overview

Introduction

Satellite-derived tropospheric winds from geostationary and polar orbiting satellites continue to be an important source of dynamical information for data assimilation systems. Recent results of experiments with a new, dynamically-adaptive QC method for MODIS polar winds are encouraging, and the method will be applied to the upcoming VIIRS polar winds. Having a consistent QC method for high-latitude winds from multiple satellites will be important over the next several years as MODIS, AVHRR, and VIIRS winds will be used in concert and interchangeably, both now and as a potential JPSS satellite gap approaches. In addition, the use of new techniques to derive winds from combined polar and geostationary satellite data, and from sounding retrievals will be evaluated as maturity of the products and resources permit. The overarching goal is to transition these advances into the operational GDAS, to improve the use of satellite-derived winds in NCEP's global system and increase the resiliency of the model in data-gap situations.

Project Status

LNVD QC method applied to VIIRS

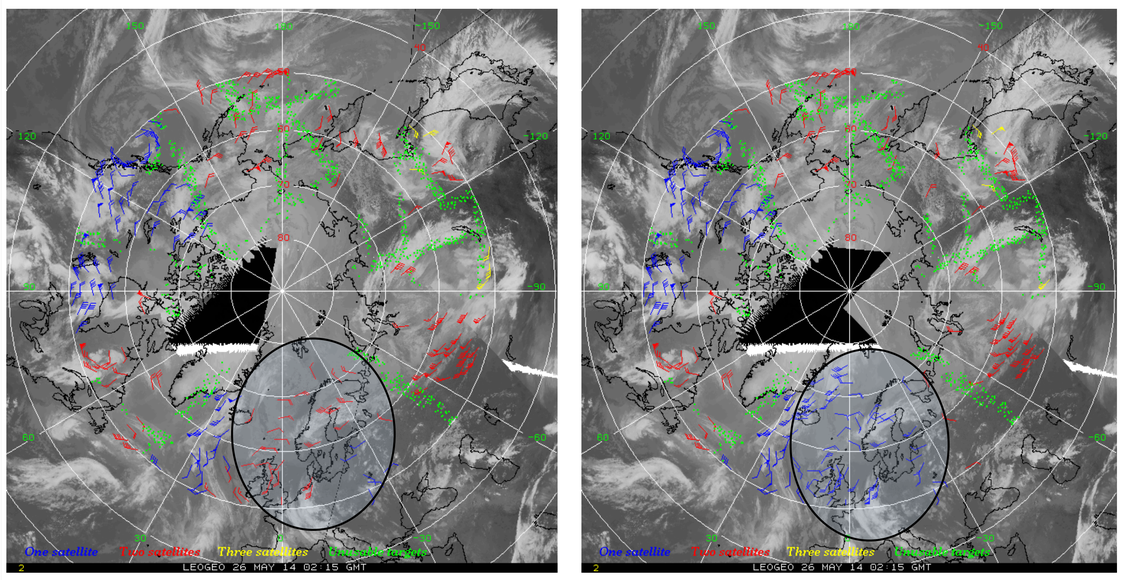
Log Normalized Vector Departure (LNVD) was transitioned to NCEP in the summer of 2014. Status from 27 January 2015:
These changes have been merged to HyEK_NSST branch at r50566. This ticket will remain open until HyEK_NSST branch has been merged to the trunk.

I. Genkova (NCEP) is currently running GDAS/GFS experiments for AVHRR and VIIRS winds.

Satellite data gap simulations: LEO/GEO Winds

One of the data sets proposed to mitigate the impact from a satellite data gap is the LEO/GEO winds product. It is designed to optimally derive the winds from all available satellite platforms.

Example below shows that by removing the Aqua MODIS data, the winds in the circled region are only generated from Meteosat, rather than the higher resolution MODIS imagery, which in this case is also used for the AMV height.

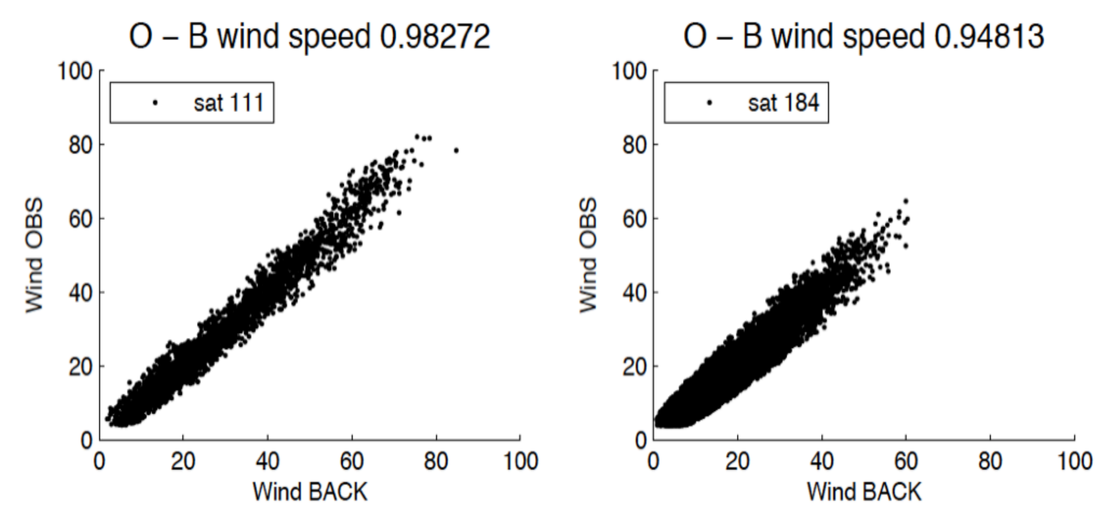


An example spatial distribution of AMVs from 26 May 2014 at 0215 UTC: Real-time (left) and reprocessed without Aqua MODIS (right) LEO/GEO composite images with AMVs superimposed. Wind barbs are color-coded based on the number of satellites used to generate AMVs: Single (blue), two (red), three (yellow) satellites. Green dots represent targets that cannot be used to generate winds due to data from multiple satellites contained in individual target and/or search boxes.

Project Status

Satellite data gap simulations: LEO/GEO O-B statistics

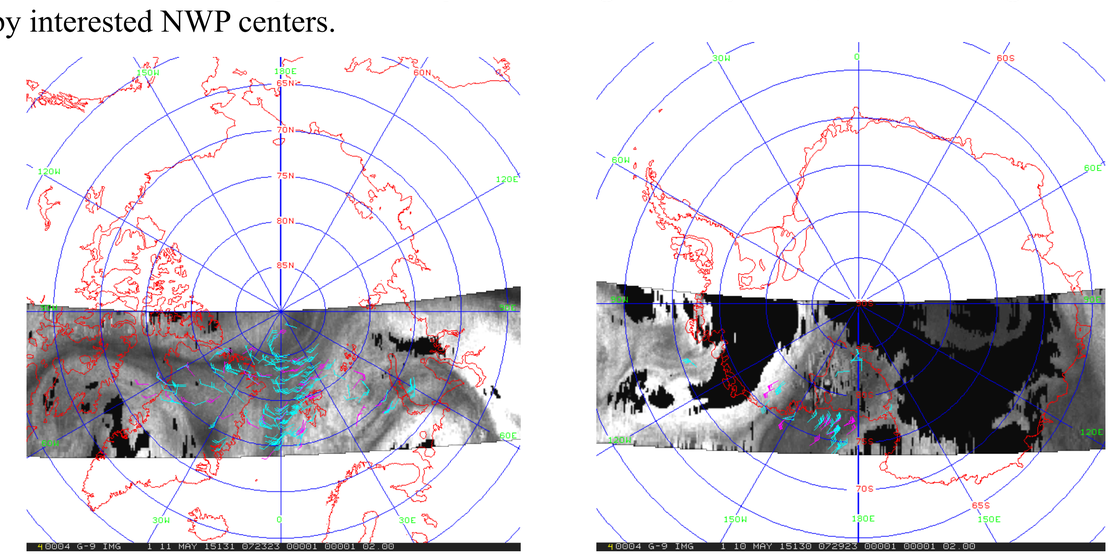
When O-B is computed for individual satellites used in the height assignment, the correlation ranges from 0.98 for Aqua MODIS (left) to 0.95 for GOES-15 (right). Thirteen different satellites are used for the height assignment; only the results for the highest and lowest correlations are shown here. The slightly larger spread in the wind O-B for GOES-15 is expected and likely results from an inferior height assignment determination due to lower spatial resolution and larger viewing angle at these high latitudes, as compared to the Aqua MODIS.



Plots of observed (ordinate) and interpolated model background (abscissa) wind speeds from AMVs where Aqua MODIS (left) and GOES-15 data are used to determine the height assignment.

AMVs from sounding retrievals

AIRS retrieval AMVs are being generated in real-time at CIMSS.
Distribution of winds product is expected to begin in May 2015, for monitoring and use by interested NWP centers.



AMVs derived from AIRS moisture retrievals on pressure surfaces: 700-400 hPa (cyan); above 400 hPa (magenta). 11 May 2015 at approximately 0700 UTC for North Pole (left) and South Pole (right). http://stratus.ssec.wisc.edu/cgi-bin/polarwinds?airs

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