Status of Atmospheric Motion Vectors production and use at CPTEC/INPE

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Introduction

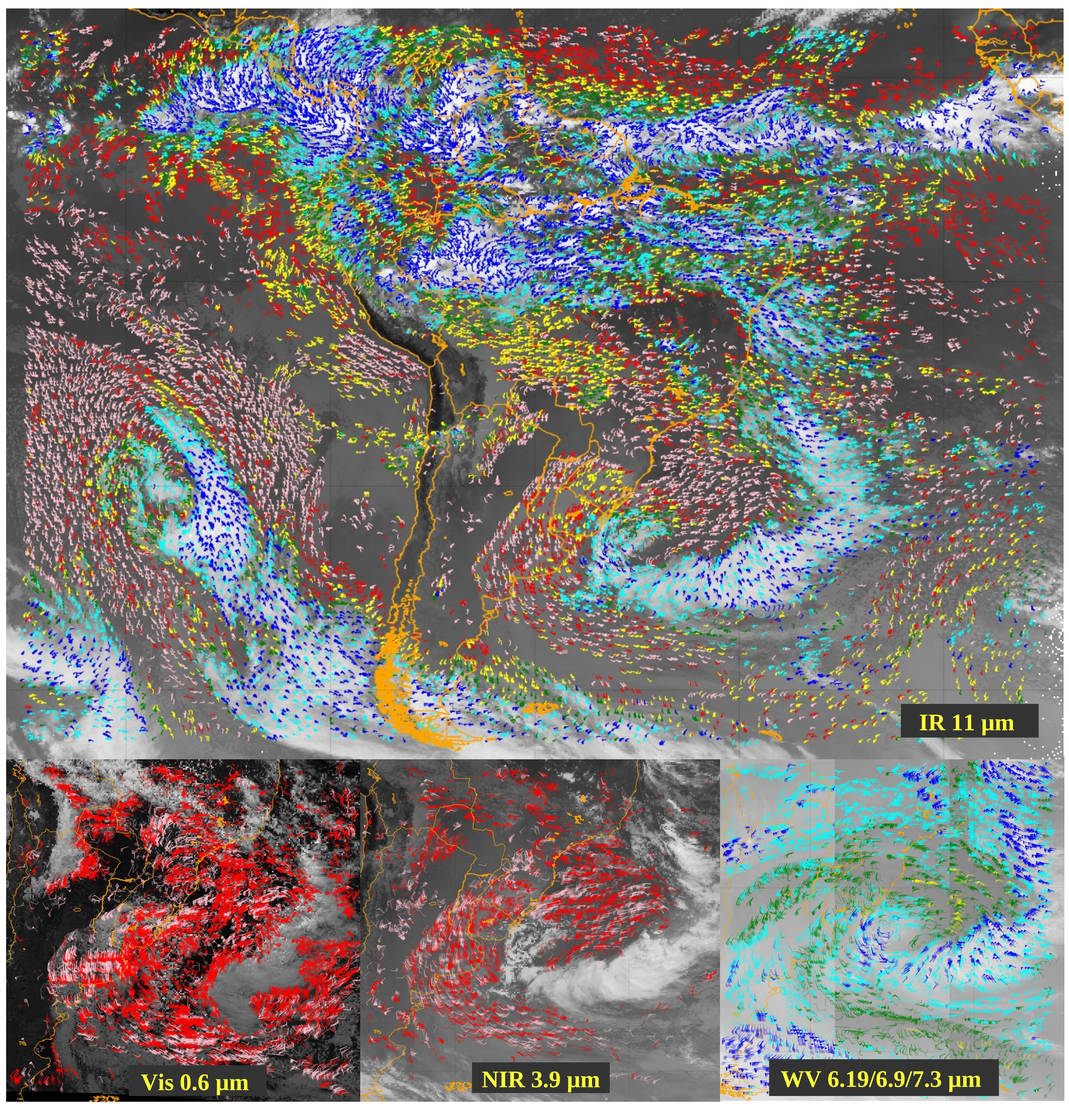
Atmospheric Motion Vectors (AMV) have been operationally produced at CPTEC/INPE since the early 2000s. Several GOES satellites were used during this period. Nowadays, visible 0,6 µm, near infrared (3.9 µm) water vapor absorption (6.2, 6.9 and 7.3 µm) and window infrared (10.3 µm) channels from GOES-16/ABI are used in operational AMV derivation. The higher spatial and temporal resolution of GOES-16 ABI, compared to previous GOES satellites, improved the AMVs coverage over South America and surroundings oceans. Higher AMV amount allows to set a more restricted QI and it still have a good spatial coverage of AMVs to be effectively used in data assimilation.

The use of these AMVs in data assimilation has show to be very effective in improving the CPTEC/INPE numerical weather models. GOES-16 AMVs generated by CPTEC are being tested within the CPTEC's data assimilation system in order to assess their impact on analysis and forecast. The AMVs are also used as an ancillary data to nowcasting and weather monitoring activities at CPTEC/INPE.

This work presents the status of operational production of AMVs using GOES-16/ABI channels and their use in data assimilation and weather monitoring activities at CPTEC/INPE as well the adjusts done to the algorithms since the last AMV algorithms intercomparison experiments.

Operational AMV algorithm setup

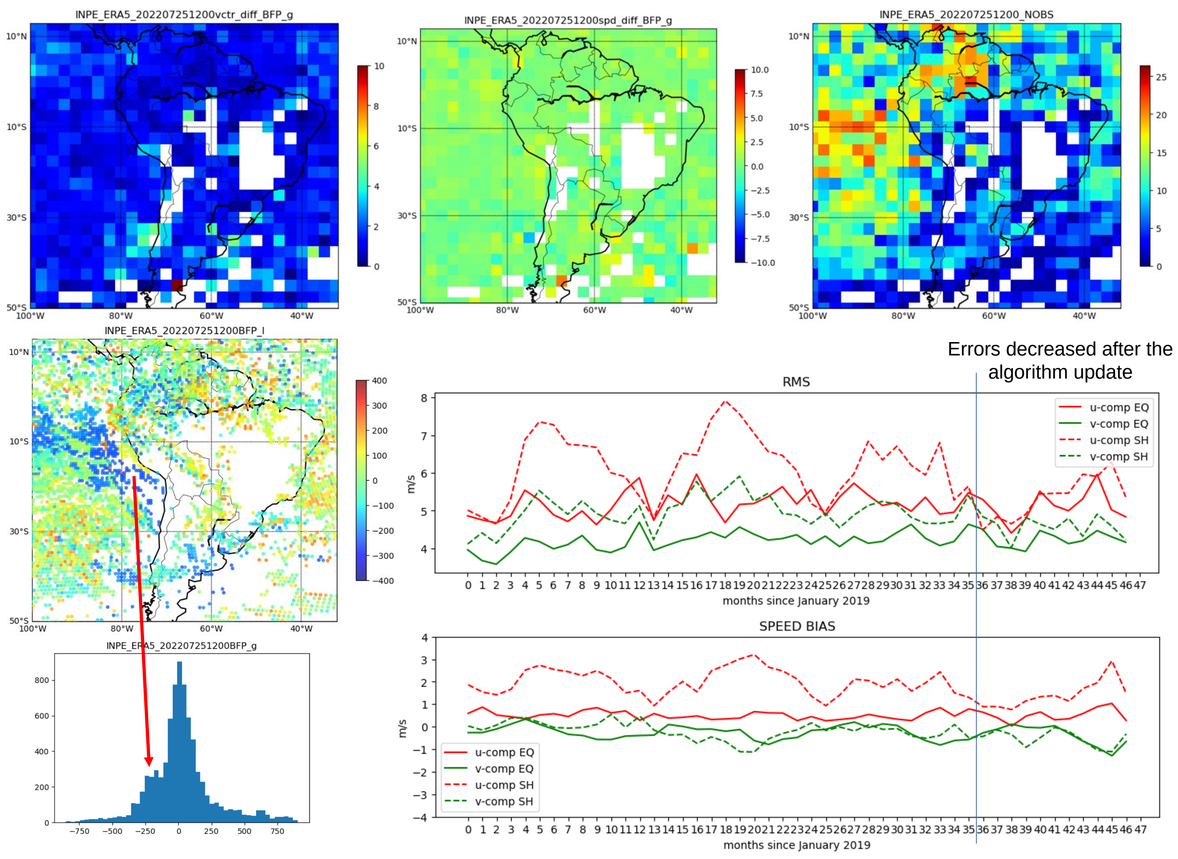
Satellite	GOES-16			
Channels Used	Visible 0.6 µm	NIR 3.9 µm	WV 6,19/6.9/7.3 µm	IR 11 µm
Period	day	night	all day	all day
Layers	low	low	mid/high	low/mid/high
Target Window	12x12	16x16	24x24	16x16
Covering Area	South America			
Height Assignment	Internal routines (EBBT, WV-intercept, CO2-slicing)			
Production frequency	30 minutes			
Quality Control	Spatial and temporal tests (no NWP coherency check)			



Error assessment

The AMVs quality are assessed through the comparison with radio sounding, the INPE Brazilian Atmospheric Model global forecasts and ERA-5 reanalysis.

This validation are done over the whole spatial domain covered by the INPE AMV operational algorithm allowing to assess the spatial errors distribution. Spatial daily means of RMSVD and BIAS at Best Fit Pressure (BFP) and original AMV levels are calculated using the ERA-5 (0.25 x 0.25 deg, 31 pressure levels, hourly) reanalysis and BAM at the main synoptic times.



Data Assimilation

Operational DA scheme uses AMVs from intenational operational meteorological centers as well the locally dataset produced.

Brazil is developing a Community Unified Earth System Model (MONAN) with a single modeling system and computational code (MPAS: Atmospheric dynamic core) for the entire Earth System components: atmosphere, biosphere and continental soils, cryosphere, oceans, upper space. Key points:

- Unified for various atmospheric phenomena scales and for nowcasting, weather, sub-seasonal, seasonal, and climate change time scales;
- More Accurate by a reduced number of approximations and use of state-of-the-art numerical methods for solving the system of differential equations in supercomputers;
- Uses a robust Data Assimilation System for satellites and local measurements using the JEDI system;
- Built up by the Brazilian scientific community to the Brazilian society.

Development strategy of data assimiation

•Identification of the most relevant components of the assimilation process;

•Each component is revised/updated when a essential component is changed;

•Each revision of the assimilation system is evaluated against the previous one;

•The whole process must involve the atmospheric modeling group.

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