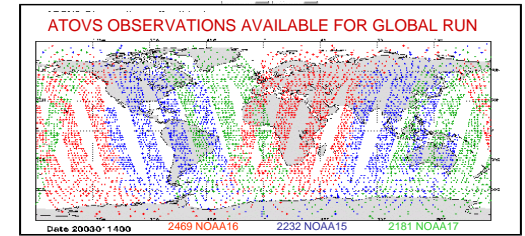
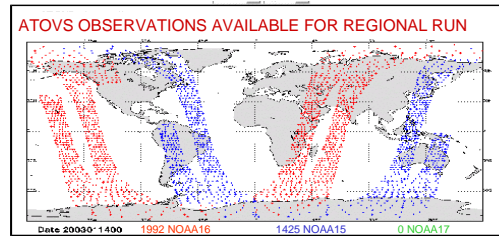


Operational Assimilation of GOES Water Vapor Imager Channel at MSC

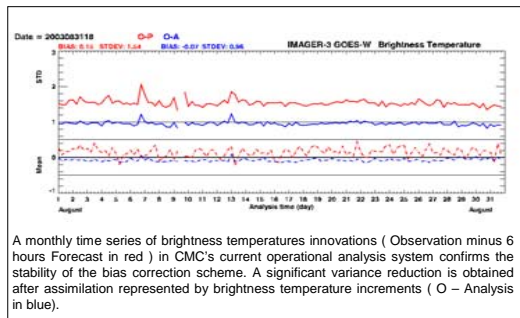
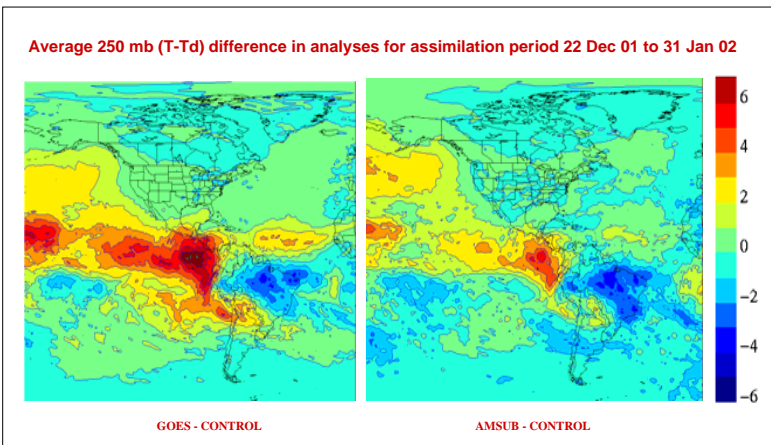
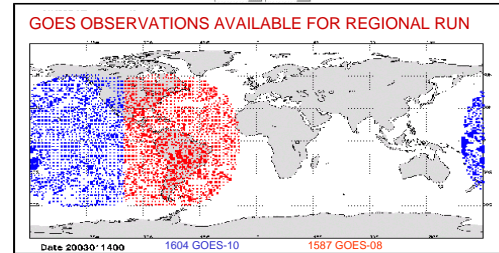
Nicolas Wagner and Louis Garand
 Meteorological Service of Canada, Dorval, P.Q., Canada

Introduction:

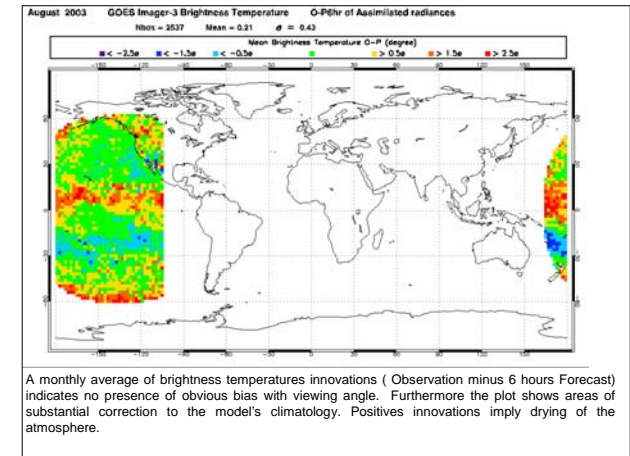
- > The assimilation of GOES imager radiance data at 6.7 micron (channel 3) was made operational in the Canadian Meteorological Center global 3Dvar analysis system June 19th 2003. This channel is sensible to moisture in the atmosphere at 500 to 250 mb. The MCFAST (Garand, 1999) physical radiative transfer model is used as forward operator. This implementation was made concurrently with TOVS AMSUB data.
- > Impact of these two data sets assimilated separately is quite similar for overlapping areas of in the 500 to 250 mb layer. Averages of increments over a month of assimilation cycle testing independently the impact of channel 3 GOES Imager and AMSUB data show remarkably similar corrections to the moisture field (figure below).
- > The improvement of adding independently GOES imager channel 3 on moisture analysis and forecasts is shown. Positive impact on quality of forecast of moisture field is present up to day 2. Quantitative precipitation forecasts improvement over North America is also noted.
- > The monitoring suite of data treatment shows stable innovations statistics ("cardiograms"). Also geographical maps of monthly averages of innovations show no viewing angle bias problems yet significant local monthly mean corrections.
- > These data are to be implemented in the regional system as the new main frame computer will become operational.



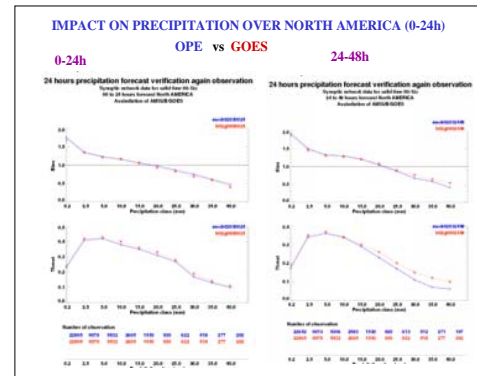
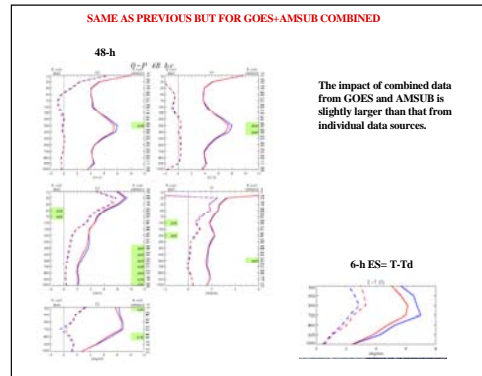
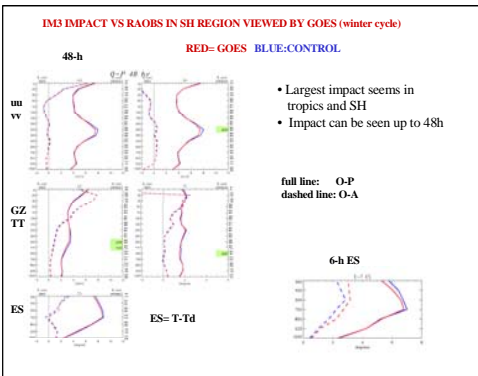
The global amount of ATOVS data is much larger for the global model than the regional model due to a longer cutoff time. Goes data will nicely complement ATOVS data. This is especially evident for the regional analysis where major gaps in ATOVS data coverage are noted.



A monthly time series of brightness temperatures innovations (Observation minus 6 hours Forecast in red) in CMC's current operational analysis system confirms the stability of the bias correction scheme. A significant variance reduction is obtained after assimilation represented by brightness temperature increments (O - Analysis in blue).



A monthly average of brightness temperatures innovations (Observation minus 6 hours Forecast) indicates no presence of obvious bias with viewing angle. Furthermore the plot shows areas of substantial correction to the model's climatology. Positives innovations imply drying of the atmosphere.



Conclusions :

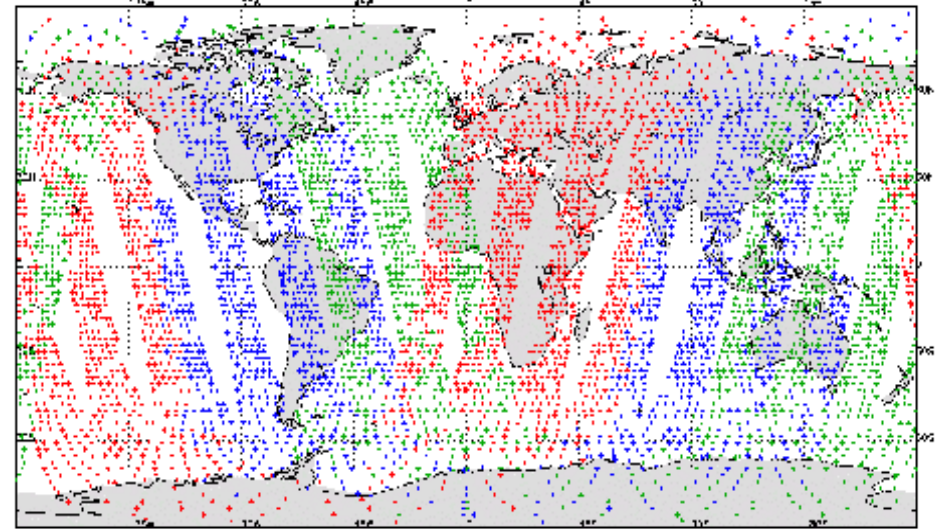
- > GOES water vapor channel has a positive impact on analysis and forecasts, especially over South America.
- > A good synergy with AMSUB data is noted.
- > The availability within 15 minutes of GOES data makes possible its use in CMC's regional model (centered over North America) despite its short cutoff time.
- > Work is under way in order to include radiances from recently activated GOES-12 satellite.
- > Assimilation at higher temporal frequency is foreseen with implementation of 4Dvar (2004).
- > Surface channels imager 4 and 5 are also monitored and available for eventual assimilation.
- > Applying a similar procedure to MSG and MTSAT water vapor channels is planned.

ATOVS Observations after thinning

2465 NOAA16

2232 NOAA15

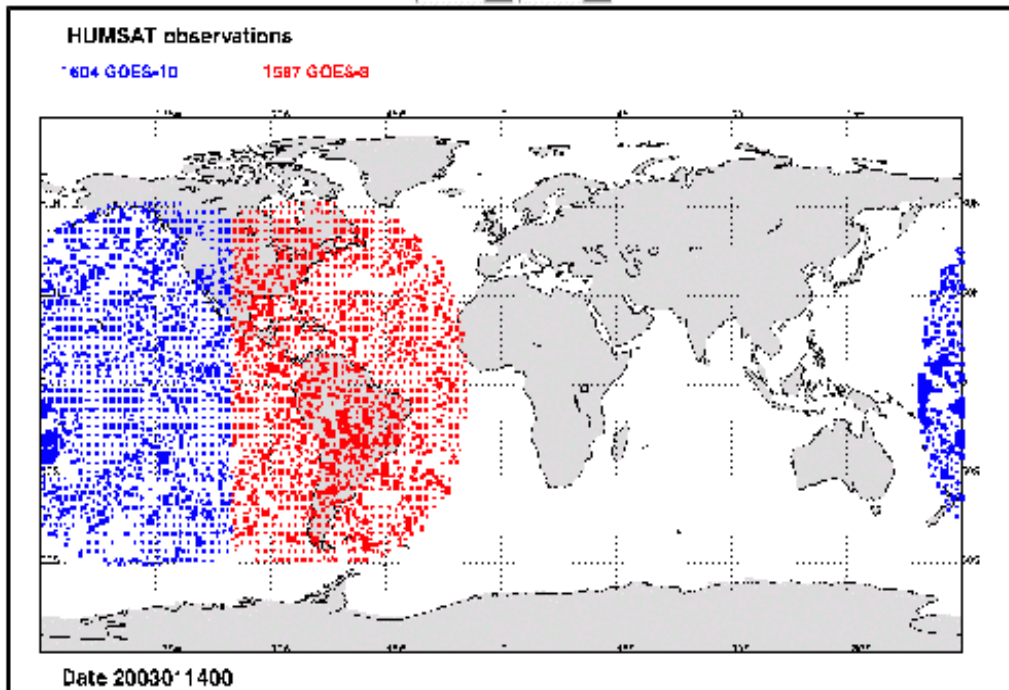
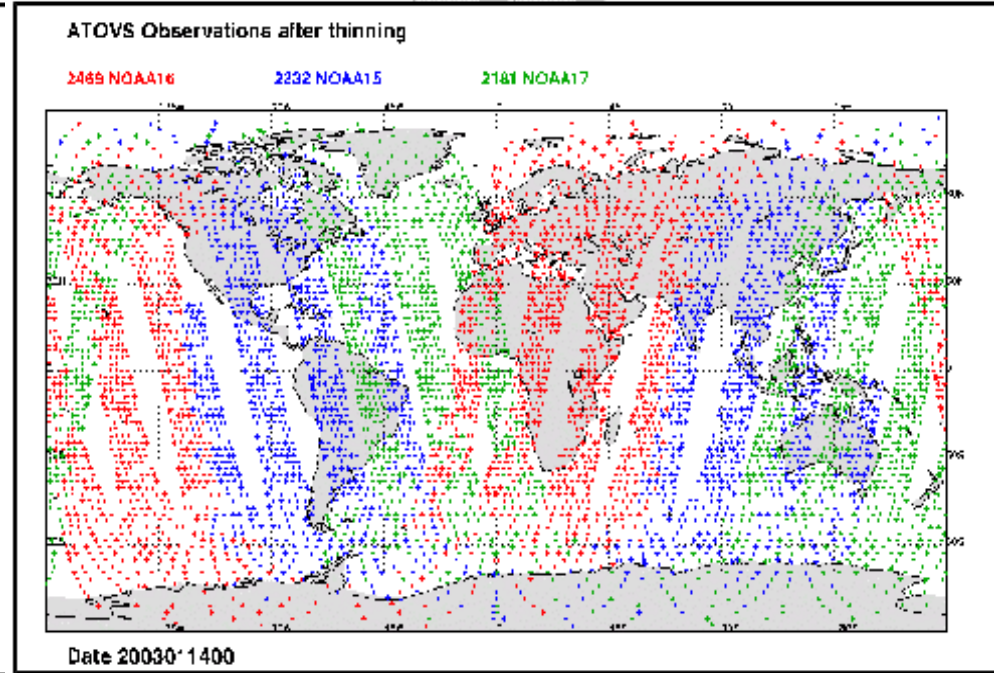
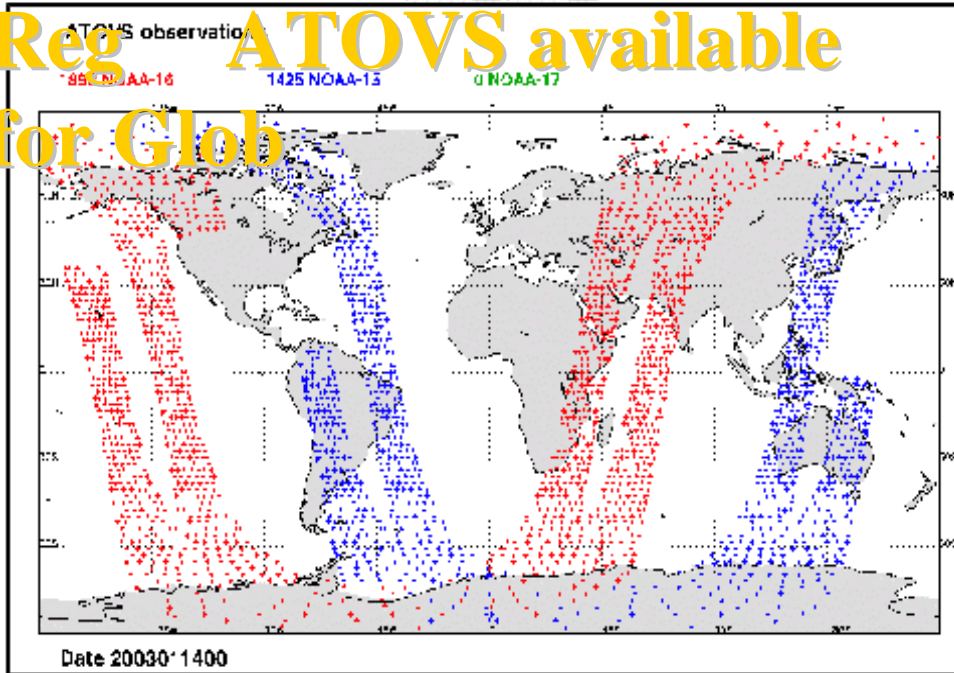
2181 NOAA17



Date 2003011400

ATOVS available for

Reg ATOVS available for Glob



GOES available for Reg

Global System

- Now:
 - Uniform resolution of 100 km (400 X 200 X 28)
 - 3D-Var at T108 on model levels, 6-hr cycle, use of raw radiances from AMSUA, AMSUB and GOES
- 2004:
 - Resolution to 35 km (800 X 600 X 80)
 - Top at 0.1 hPa (instead of 10 hPa) with additional AMSUA and AMSUB channels
 - 4D-Var assimilation, 6-hr time window with 3 outer loops at full model resolution and inner loops at T108 (cpu equivalent of a 5-day forecast of full resolution model)
 - new datasets: profilers, MODIS winds, QuikScat, GOES-12
- 2005:
 - assimilation of AIRS, MSG, MTSAT
 - revised 4D-Var statistics
- 2006-07:
 - Additional datasets: IASI, GIFTS, COSMIC...
 - very large increase in volume of assimilated data