



P1.85 DEVELOPMENT OF SIMULATED GOES PRODUCTS FOR GFS AND NAM

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Introduction

NCEP EMC has recently developed the capability of generating simulated satellite products for both GFS and NAM using model predicted moisture, cloud, and surface fields. This new capability will allow users to make direct comparisons between satellite observations and operational model output.

The first attempt was to simulate the four GOES imager channels, based on responses from NCEP centers and NWS field offices. The preliminary results showed reasonable agreement with observations and the products become operational in Sep. 07 for GFS and Nov. 07 for NAM.

The purpose of this presentation is to 1) describe the methodology used to derive these products, and 2) to show how these products compared against observations.

Methodology

The Joint Center for Satellite Data Assimilation (JCSDA) Community Radiative Transfer Model (CRTM) was incorporated into EMC's unified Post Processor to compute model derived brightness temperature (T_B) for specific instruments and channels. The implementation of an unified post processor enables EMC to generate simulated GOES products for GFS, NAM, WRF RUC, as well as WRF ARW. The computation algorithms and user guide for the CRTM are available online at:

<http://www.orbit.nesdis.noaa.gov/smcd/spb/CRTM>.

The JCSDA CRTM currently does not simulate T_B as well over the cloudy regions. The unified post does include all the available microphysics species when using the CRTM forward model; however, the simulated T_B will not verify as well over cloudy areas due to this limitation in the CRTM.

Two assumptions were made when using the CRTM within the unified post processor:

1) The effects of scan and sensor viewing angles were neglected. This information is contained in the radiance data which is not yet ingested by the post. The two GSI experiments performed by Treadon showed only 2~3 K differences with and without real scan and sensor angles.

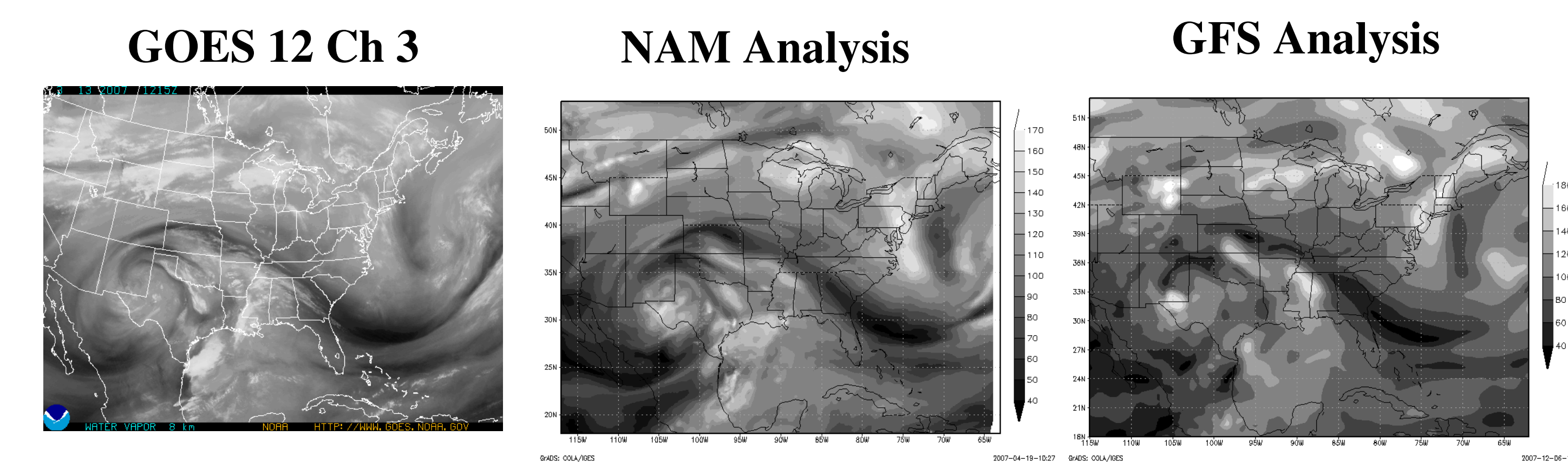
2) Each grid point is specified to be either water or land, not a combination of both.

Qualitative Validation of simulated GOES products

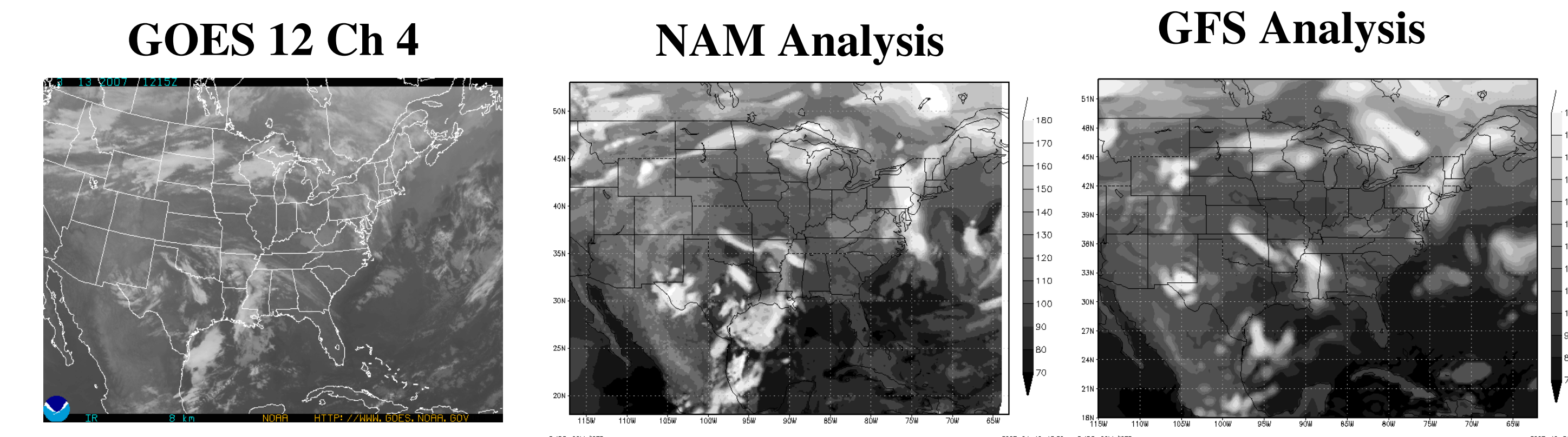
Because EMC's simulated GOES products are gridded in Grib format, it is difficult to perform objective verification of these products against GOES observations in pixel data format. Three examples have been selected to compare simulated GFS and NAM T_B against observations for water vapor and infrared (IR) channels. The three examples were chosen to represent three different weather scenarios: 1) spring, 2) tropical storm, and 3) winter storm scenarios. Note that the resolution of the GOES observations is 4 km, which is higher than the resolutions of the 12 km NAM and 35 km GFS forecasts.

Case 1 – Spring case. Verified at 12 UTC March 13 2007

Water Vapor channel

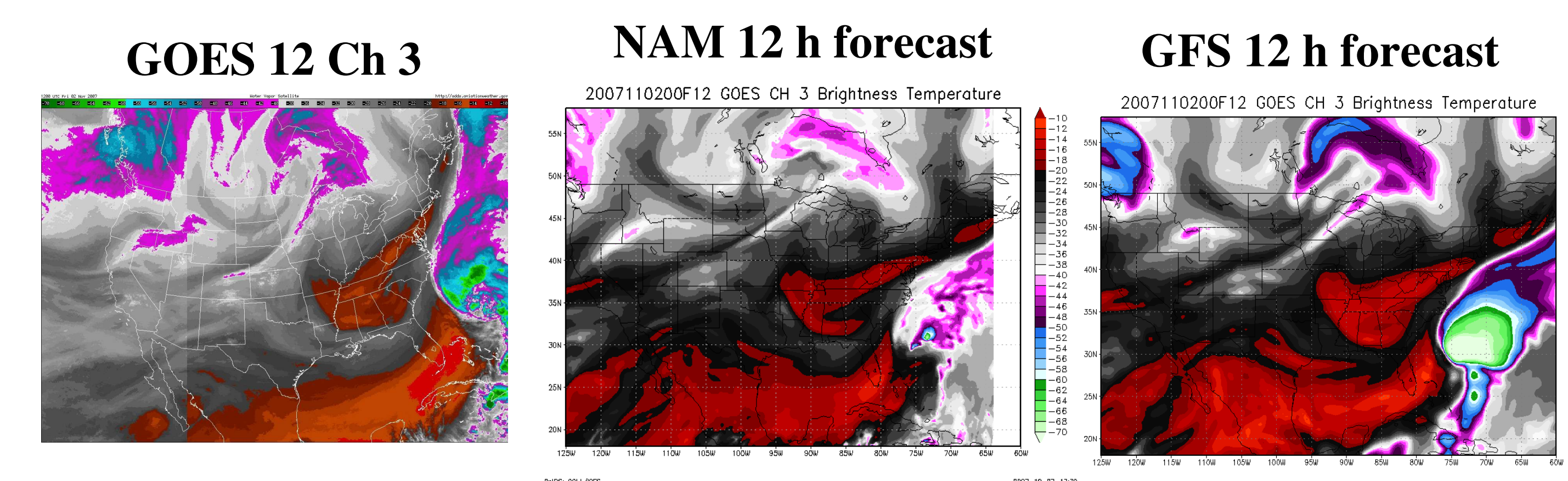


IR channel

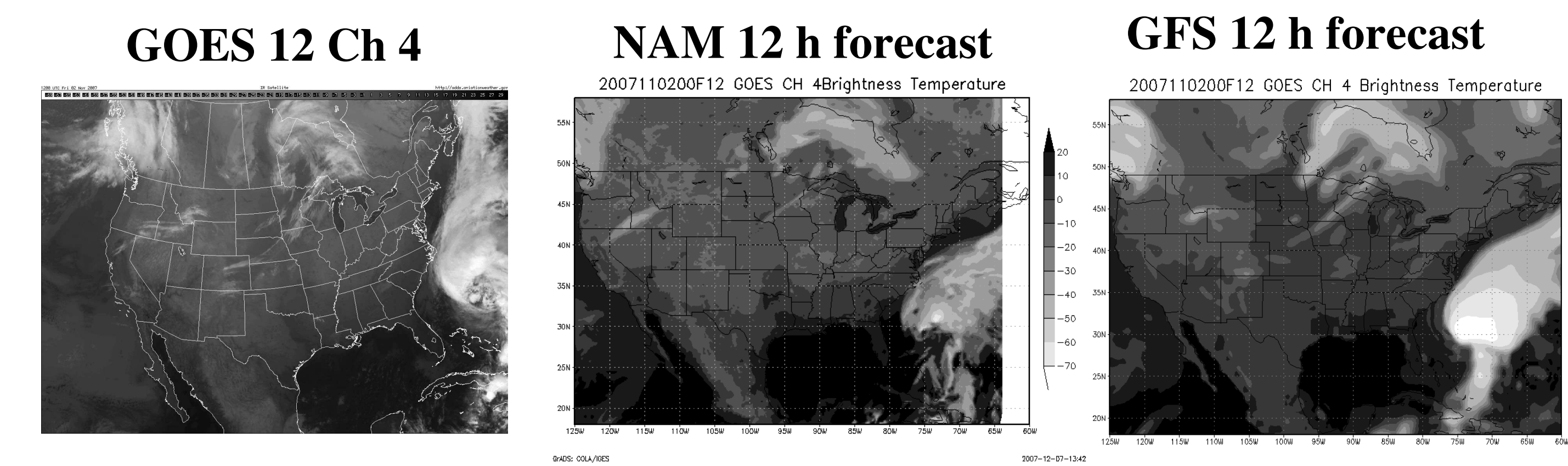


Case 2 – Tropical storm Noel. Verified at 12 UTC November 2 2007

Water Vapor channel

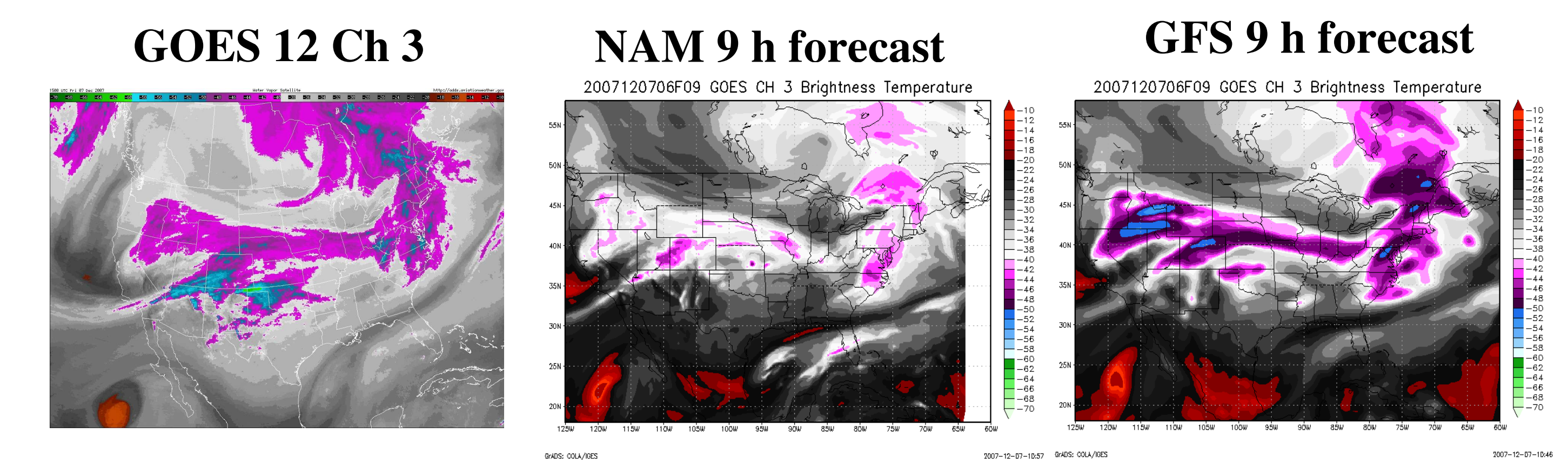


IR channel

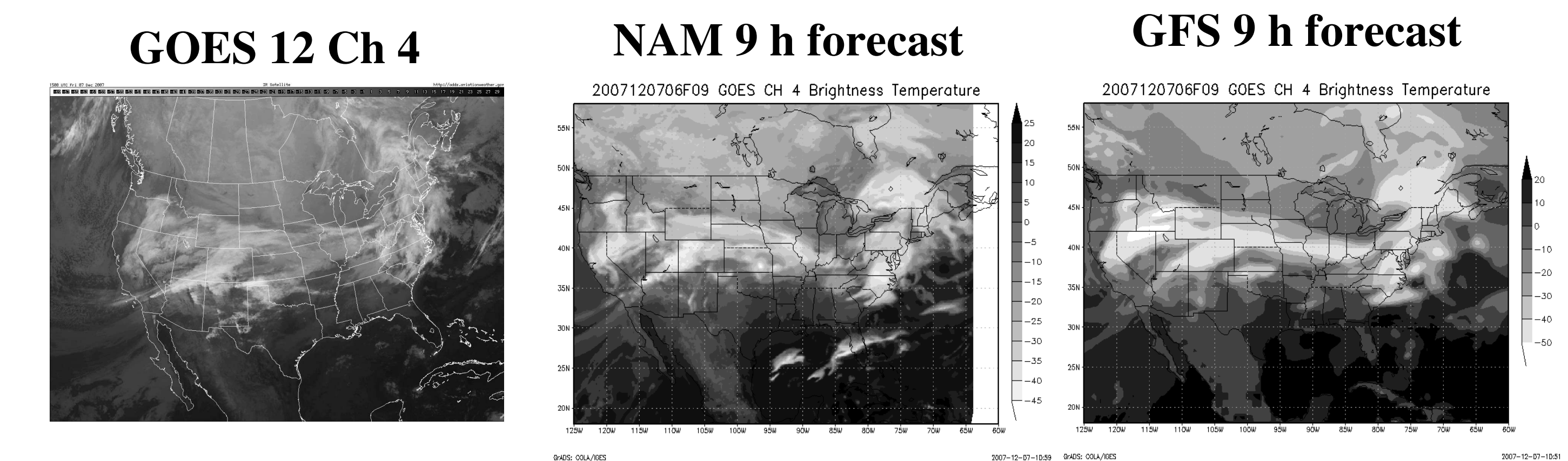


Case 3 – Winter storm case. Verified at 15 UTC December 7 2007

Water Vapor channel



IR channel



Summary

- The model-derived T_B using the CRTM compares reasonably well with the observed T_B for the water vapor channel and the IR channel based on qualitative similarities in moisture patterns and cloud patterns.
- The NAM had warm T_B biases in both the tropical storm and the winter storm cases. Further investigation will be carried out to examine whether these warm biases are attributed to models or CRTM.
- The simulated GOES products added value to forecasters by providing GOES look-a-like images with longer lead time.

Future Work

- A recent upgrade was made to the CRTM to improve the radiative-transfer computations of cloud properties. The unified post will be upgraded to use this new version soon.
- EMC's analysis group is planning to assimilate clouds in the future, which should also improve model-derived satellite products.
- With collaboration with NESDIS, EMC is looking into performing objective verification of simulated GOES products.

Acknowledgment

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