

Assimilation of GOES Cloud Top Pressure Data into the Eta Model
Ying Lin¹, Geoff DiMego¹, Brad Ferrier², Jim Jung³, Dennis Keyser¹, Eric Rogers¹
¹NCEP/EMC, ²SAIC, Camp Springs, MD, USA
³CIMSS/U.Wisc, USA
Ying.Lin@noaa.gov

The hourly, 10-km cloud-top pressure data, derived from the GOES-8 and 10 sounder radiances, provide valuable information on the model fields above the cloud tops. We have conducted experiments to assimilate these cloud top data, mainly by using them to remove spurious cloud above the observed cloud top level, while making minimal adjustments to the moisture field at the level of observed cloud top.

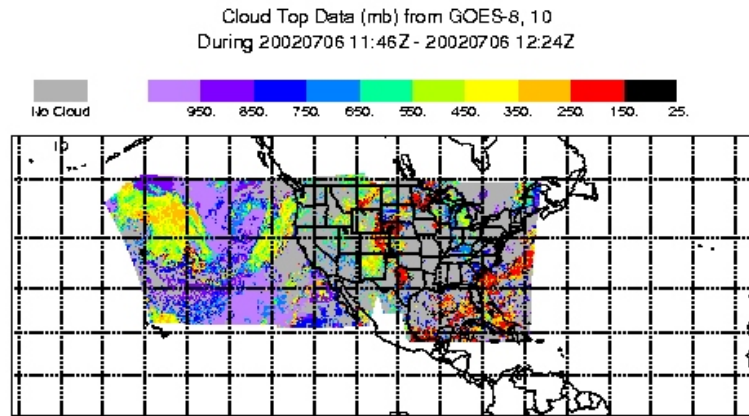


Fig. 1. An example of GOES cloud top pressure data

During the 12h pre-forecast data assimilation period, at each physics time step and for each horizontal grid point where a valid GOES cloud top observation is available, condensate (water or ice) is removed from the model above the GOES cloud top level (or removed from the entire column if the satellite data indicate that this point is cloud-free). The water vapor mixing ratio is also set to no more than grid-scale saturation (with regard to liquid water when the temperature is above -10 C, with regard to ice below -10 C). At the model level closest to the observed cloud top, if the air is subsaturated, then it is moistened at a rate that just brings it to saturation in one hour.

The cloud top assimilation has been tested on its own at 32km resolution (where the only difference between the test run and the control run is the addition of the cloud top data) and at 12km resolution, in combination with other planned upgrades for the Eta model (improved cloud physics and radiation, assimilation of radar radial winds *etc.*; - see <http://www.emc.ncep.noaa.gov/mmb/tpb.spring03/tpb.htm>). The impact on precipitation forecasts (Fig. 2) and upper air fields (Fig. 3) has been generally positive. This package of upgrades to the Eta model is scheduled to be implemented during Spring/Summer 2003.

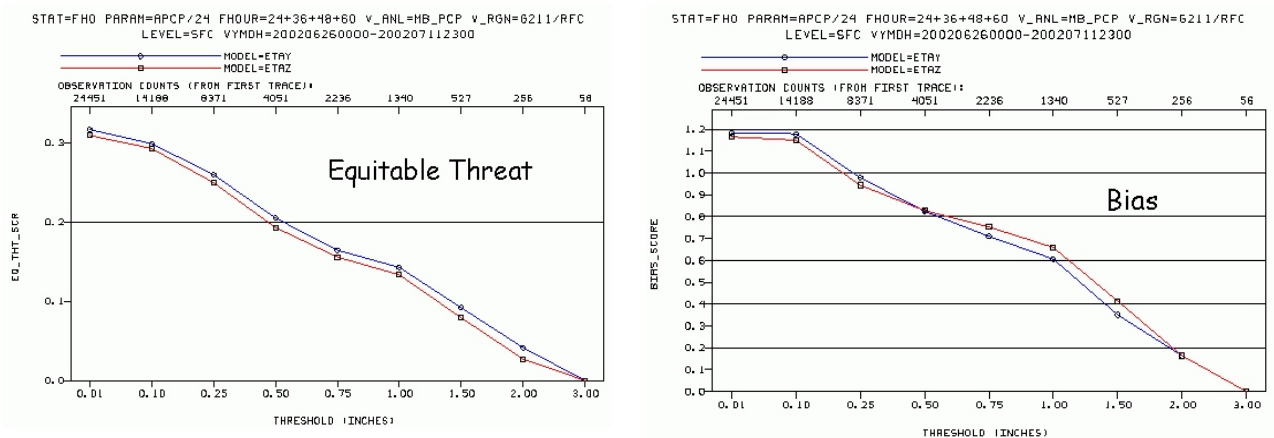


Fig.2 Equitable threat and bias scores of the 32km Eta parallel run (25 Jun - 9 Jul 2002), with cloud top assimilation (blue) and the control run (red), for 24+36+48+60h forecasts.

Upper-air Verification: RMS Error in 12h Fcsts

32km parallel, 25 Jun – 9 Jul 2002 Red: cloud top assim; Black: Control

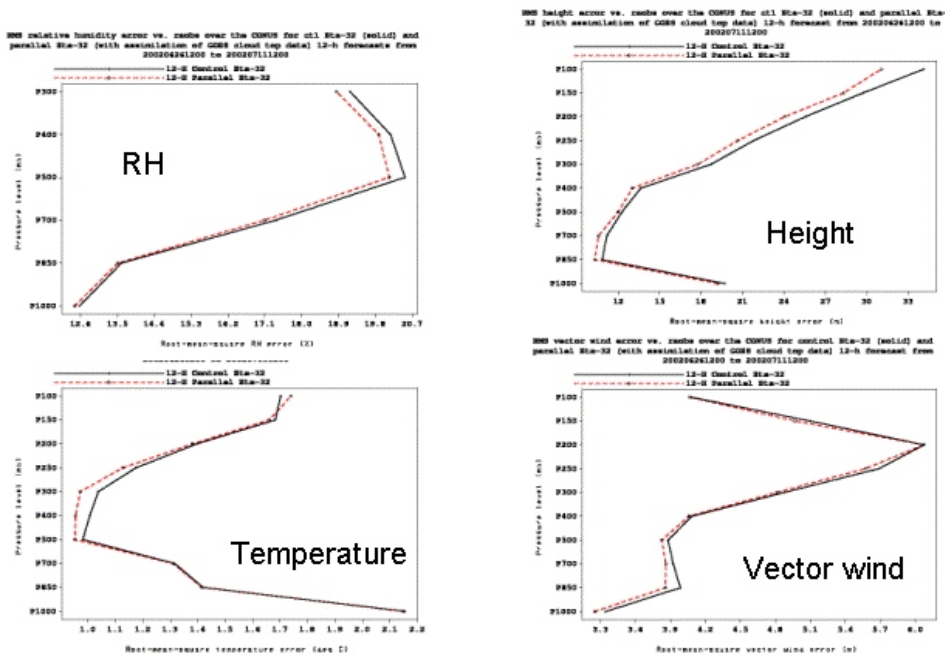


Fig.3 Upper-air verifications for the parallel run.