The GOES-10 Sounder
Part II

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Madison, WI

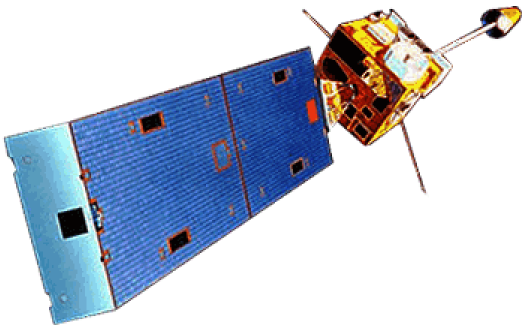
and many, many others

Cachoeira Paulista - São Paulo

26-30 November 2007

UW-Madison

Overview



- Profile retrieval input
  - radiances, first-guess
- Profile retrieval processing
- Retrieved products (DPI)
  - moisture, stability
- DPI applications
  - monitor, numerically forecast, “nearcast”
- Other retrievals
  - cloud, O_3, SO_2
- Better profiles… more promotion

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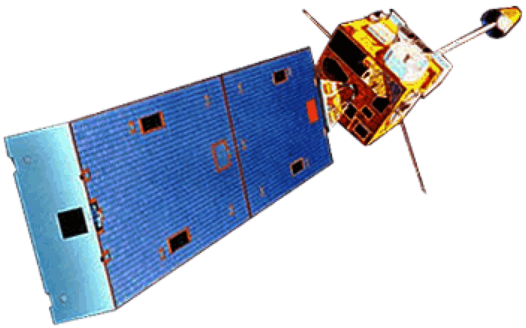

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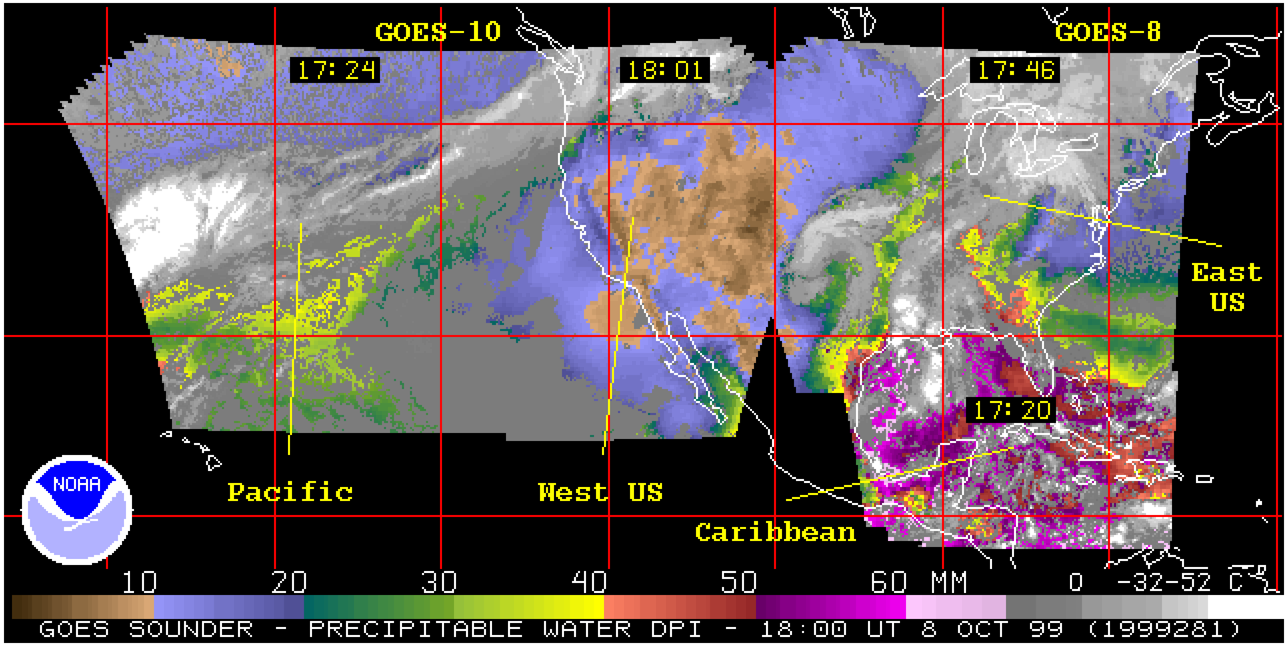
Typical real-time coverage available from the GOES Sounders

The infrared multi-spectral channels of the Sounder are used to determine atmospheric profiles in clear regions and cloud properties in cloudy regions.

A Derived Product Image (DPI) is a composite of a product (profile or cloud parameter), where possible, and satellite infrared window imagery elsewhere.



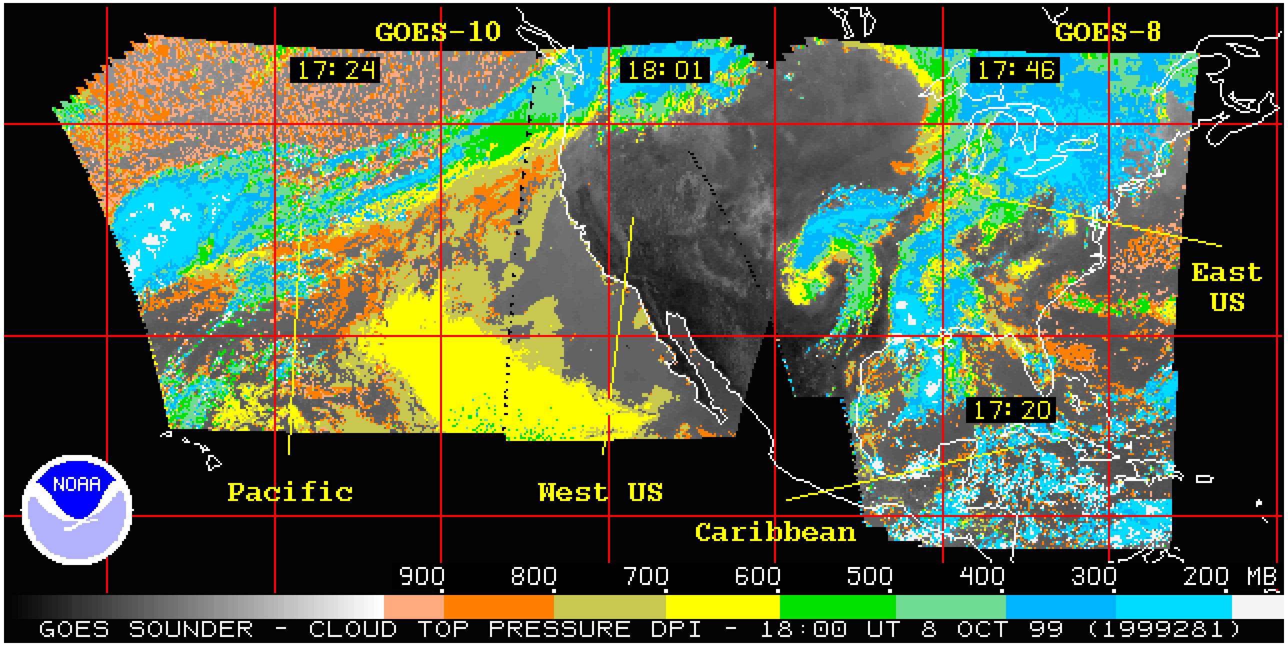
Typical real-time coverage available from the GOES Sounders

Temporal and spatial characteristics

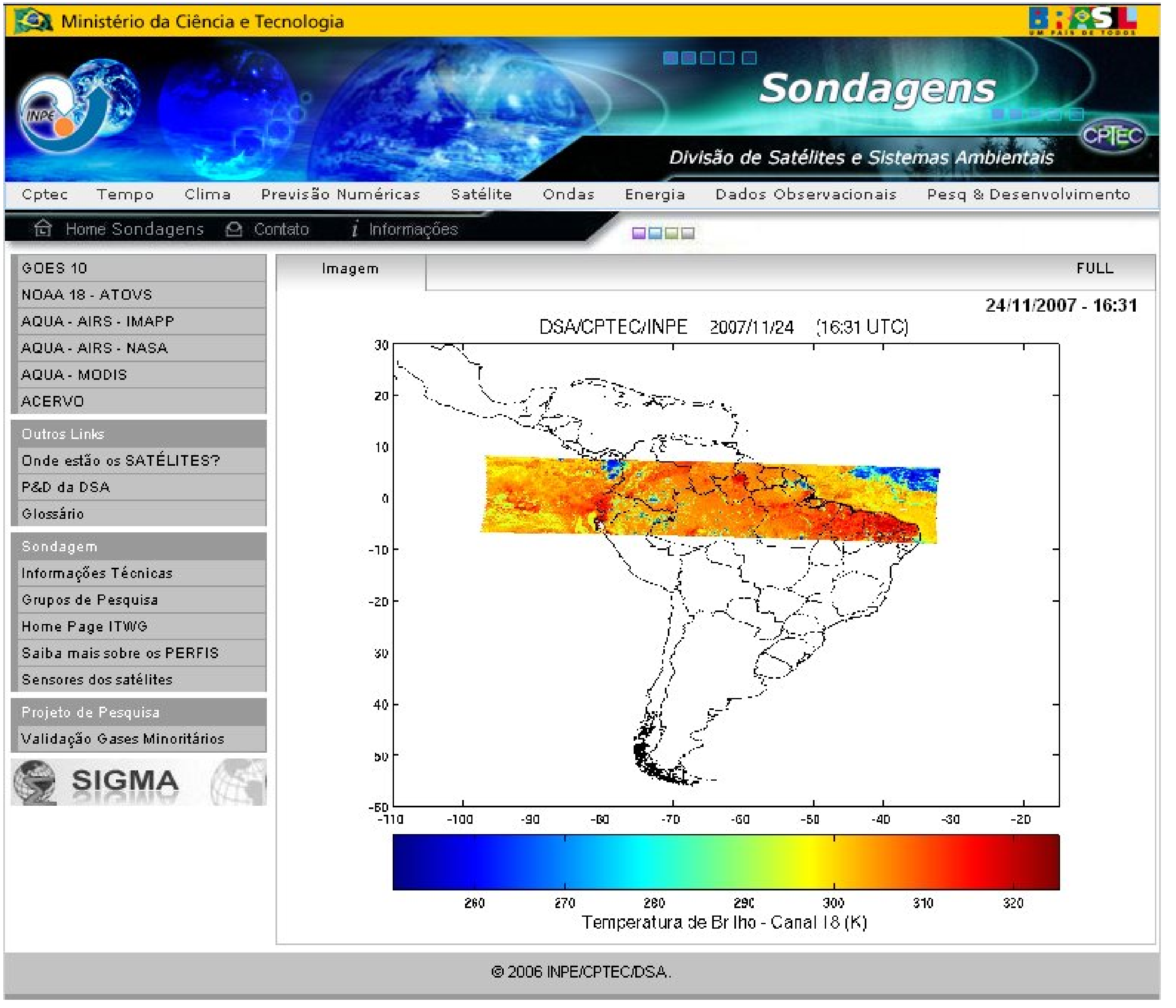
• hourly duty cycle

• US and environs domain with nominal 10 km horizontal resolution

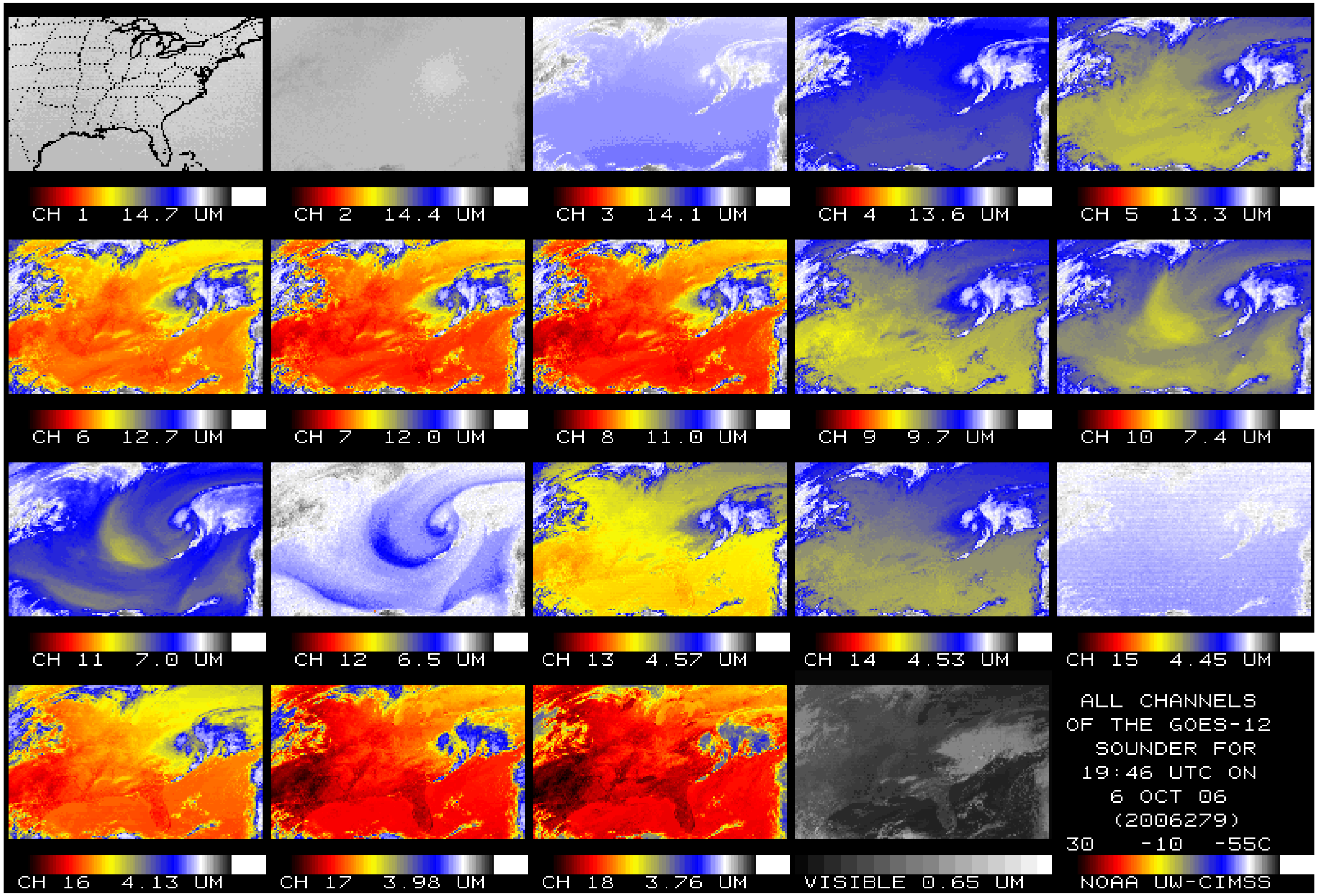
• limited vertical resolution (from 18 infrared channels)



Expanding GOES Sounder coverage – GOES-10 over South and Central America



The nineteen (19) spectral bands of the GOES Sounder



{20 UT 06 Oct 2006}

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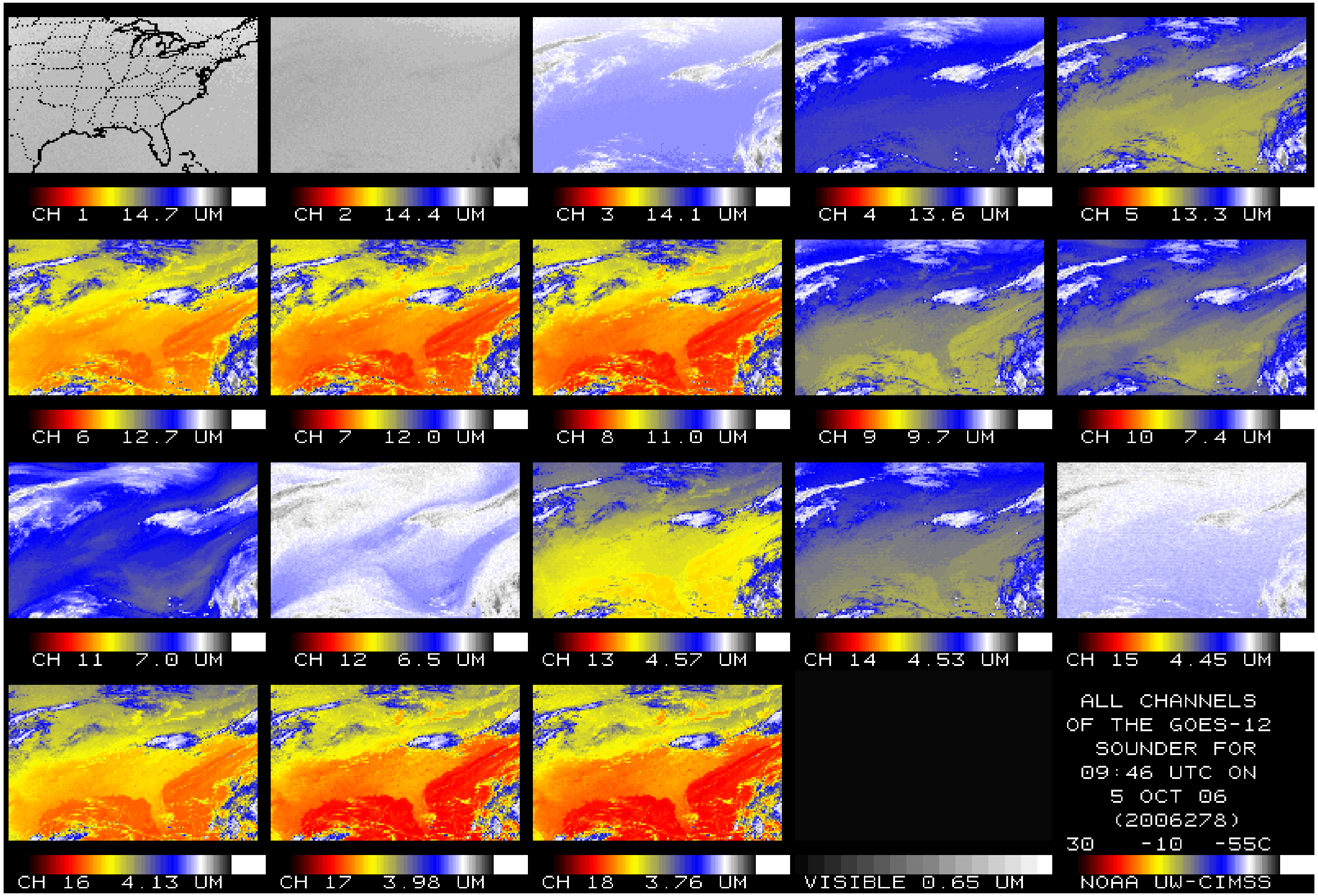
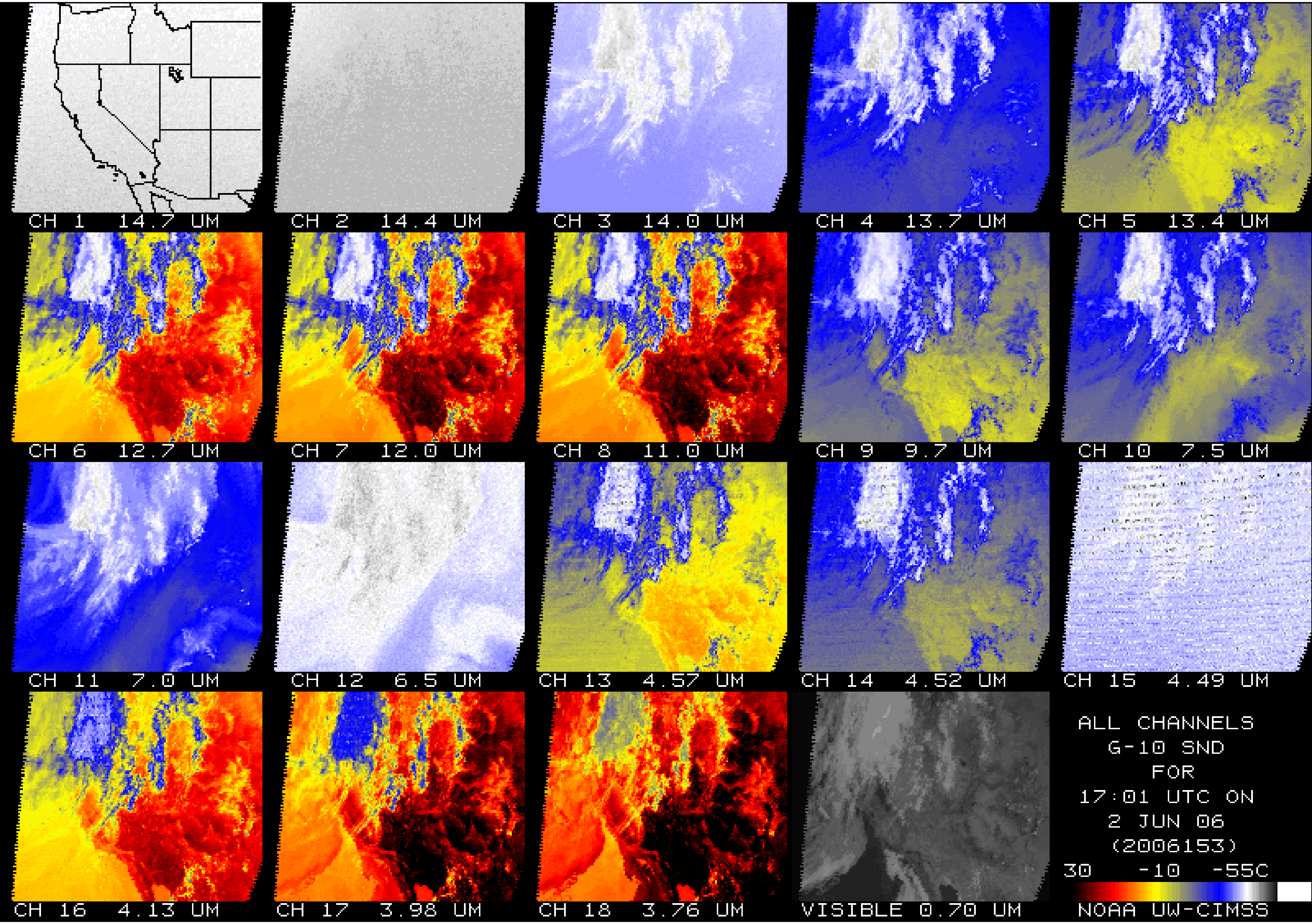
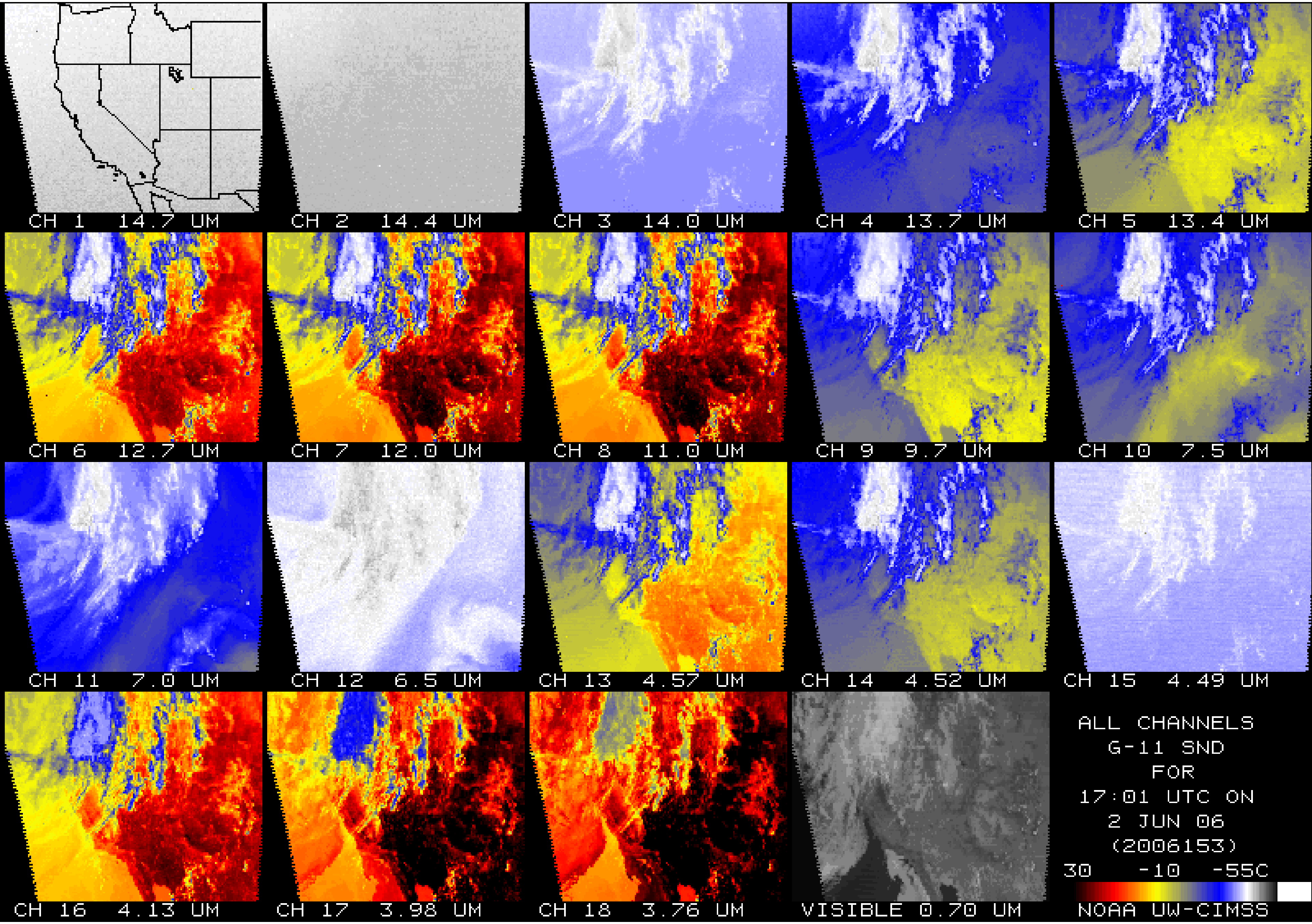


{10 UT 05 Oct 2006 – 20 UT 06 Oct 2006}


CH 1 14.7 UM
CH 2 14.4 UM
CH 3 14.0 UM
CH 4 13.7 UM
CH 5 13.4 UM
CH 6 12.7 UM
CH 7 12.0 UM
CH 8 11.0 UM
CH 9 9.7 UM
CH 10 7.5 UM
CH 11 7.0 UM
CH 12 6.5 UM
CH 13 4.57 UM
CH 14 4.52 UM
CH 15 4.49 UM
CH 16 4.13 UM
CH 17 3.98 UM
CH 18 3.76 UM
VISIBLE 0.70 UM
ALL CHANNELS
G-10 SND
FOR
17:01 UTC ON
2 JUN 06
(2006153)
30 -10 -55C
NOAA UW-CIMSS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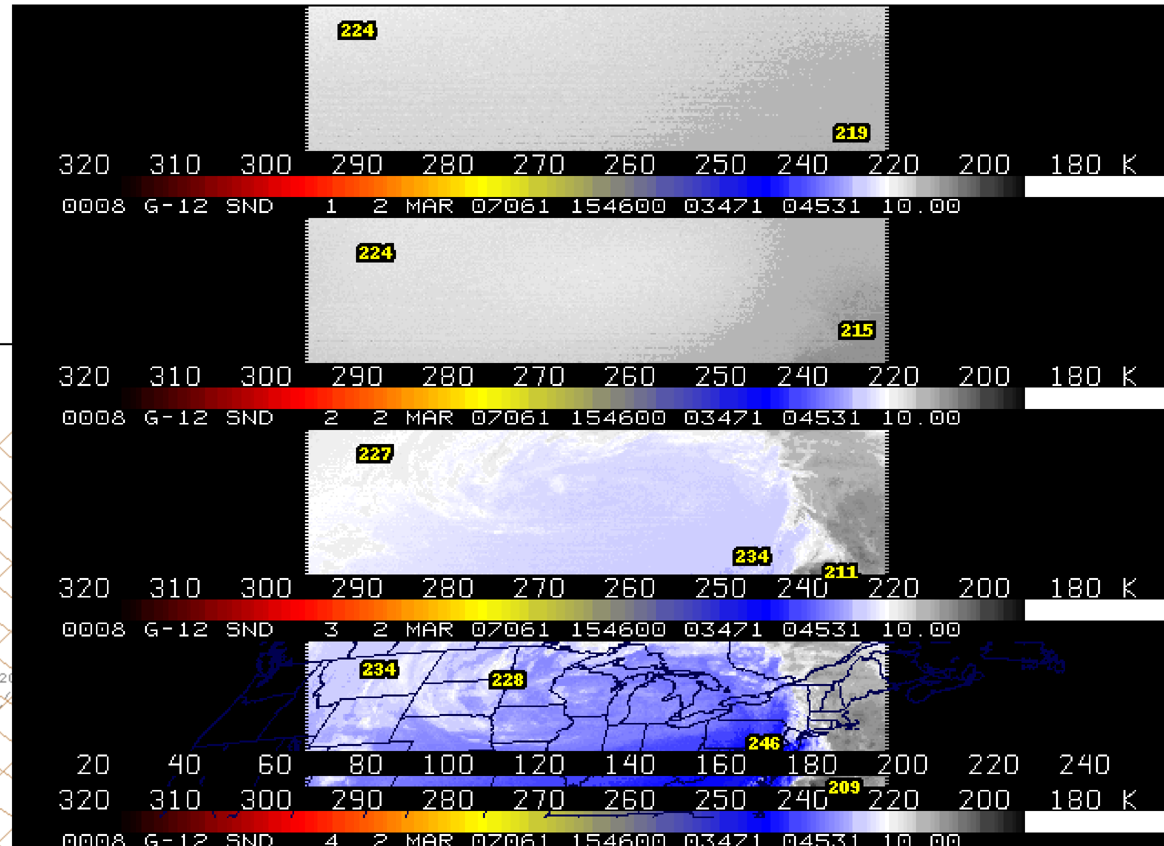
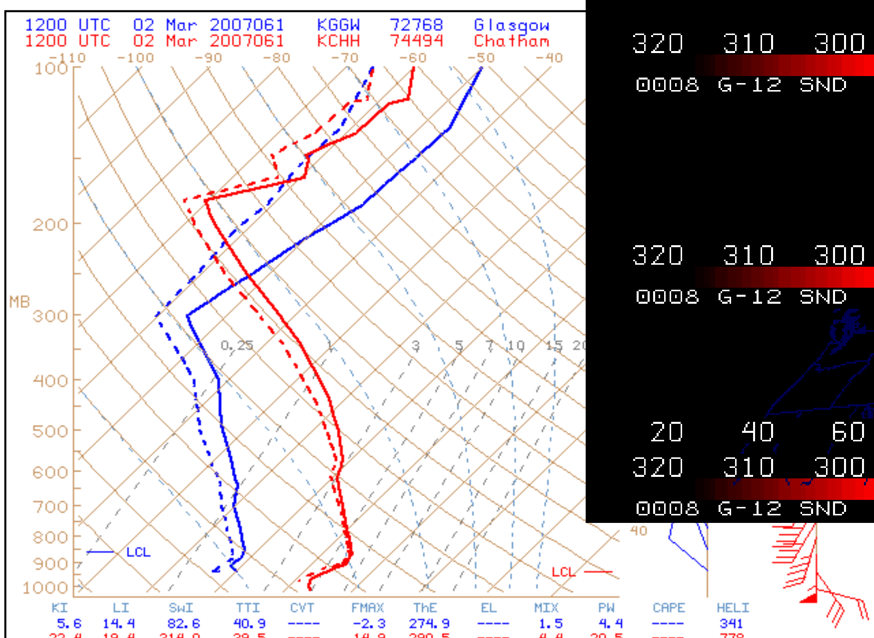
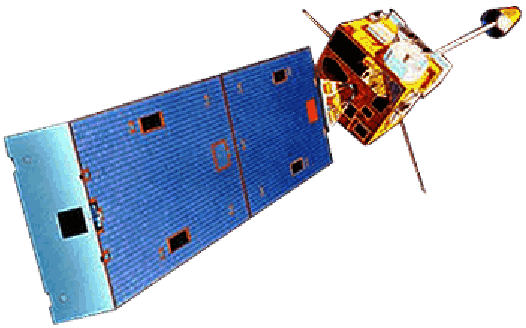
Thermal gradient reversal across tropopause observed with GOES sounding bands

GOES Sounder
Bands 1-4





Overview



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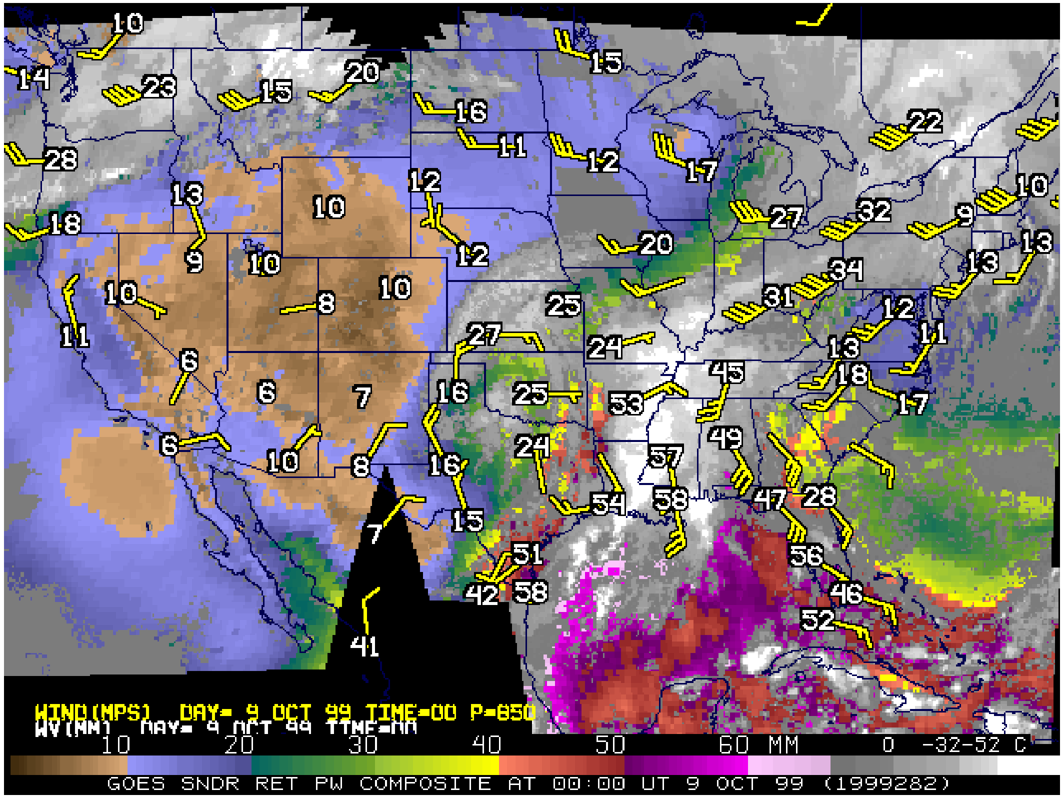
Sounding from geostationary orbit with GOES

Beneficial aspects:

- frequent observation
- modest horizontal depiction
- "regional" coverage

Limitations:

- cloud obscuration (for profiles)
- course vertical resolution (with current radiometers)
- no full disk coverage



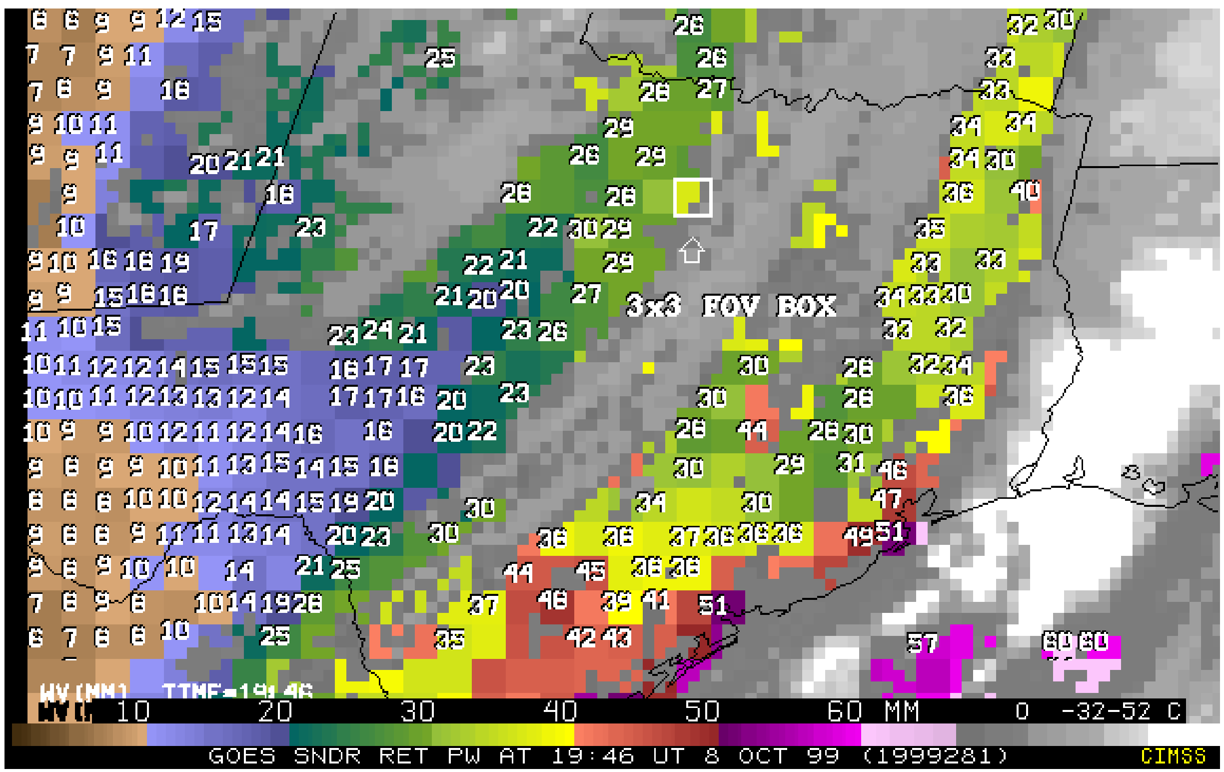
Retrieval of profiles from the GOES Sounder

circa 2000

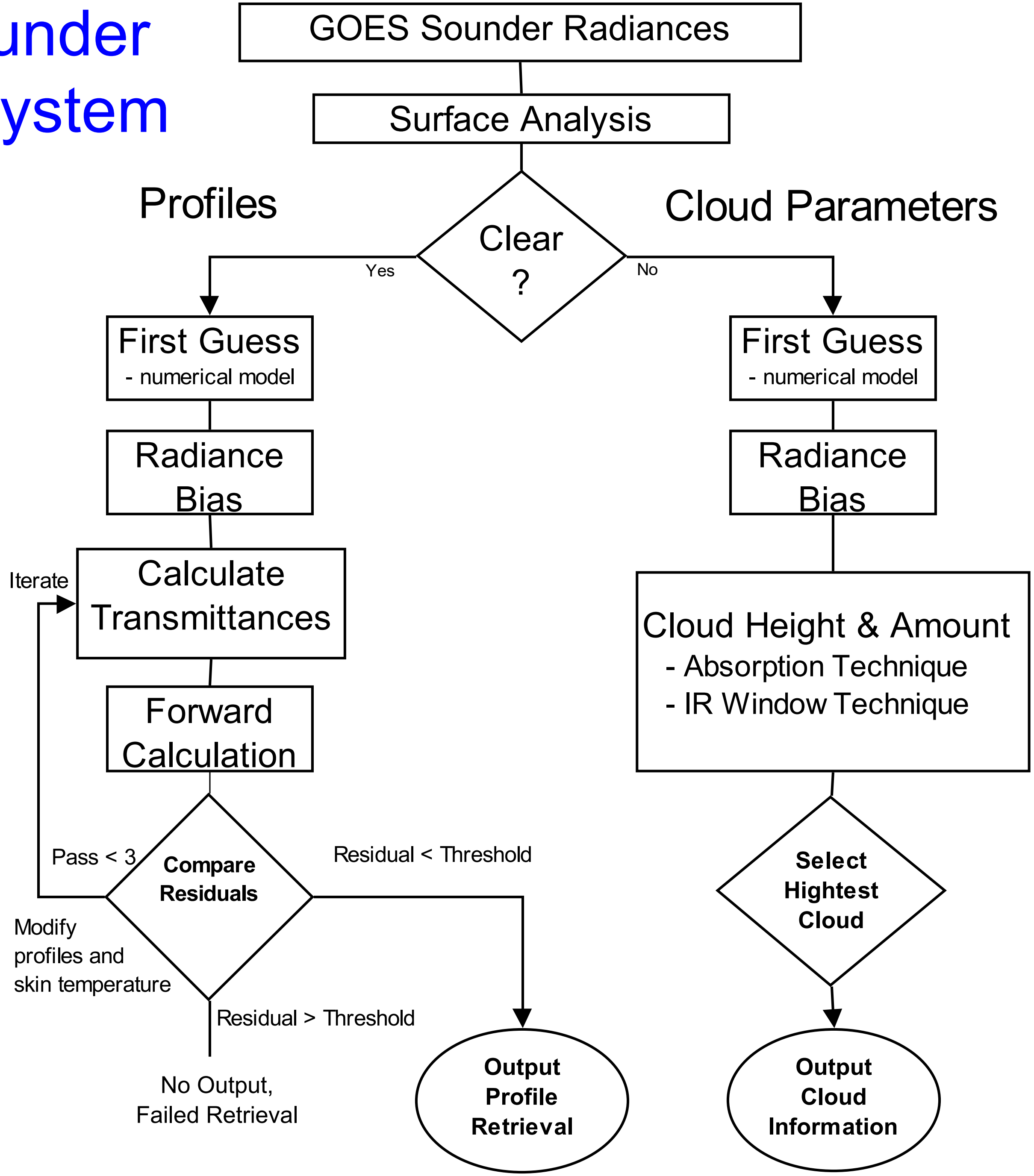
1. cloud clear and spatially average observed radiances over small areas (e.g. 3x3 FOV box); apply bias corrections

2. make first-guess profiles from numerical forecasts (eta), modified by latest surface hourly reports; calculate radiances from such profiles

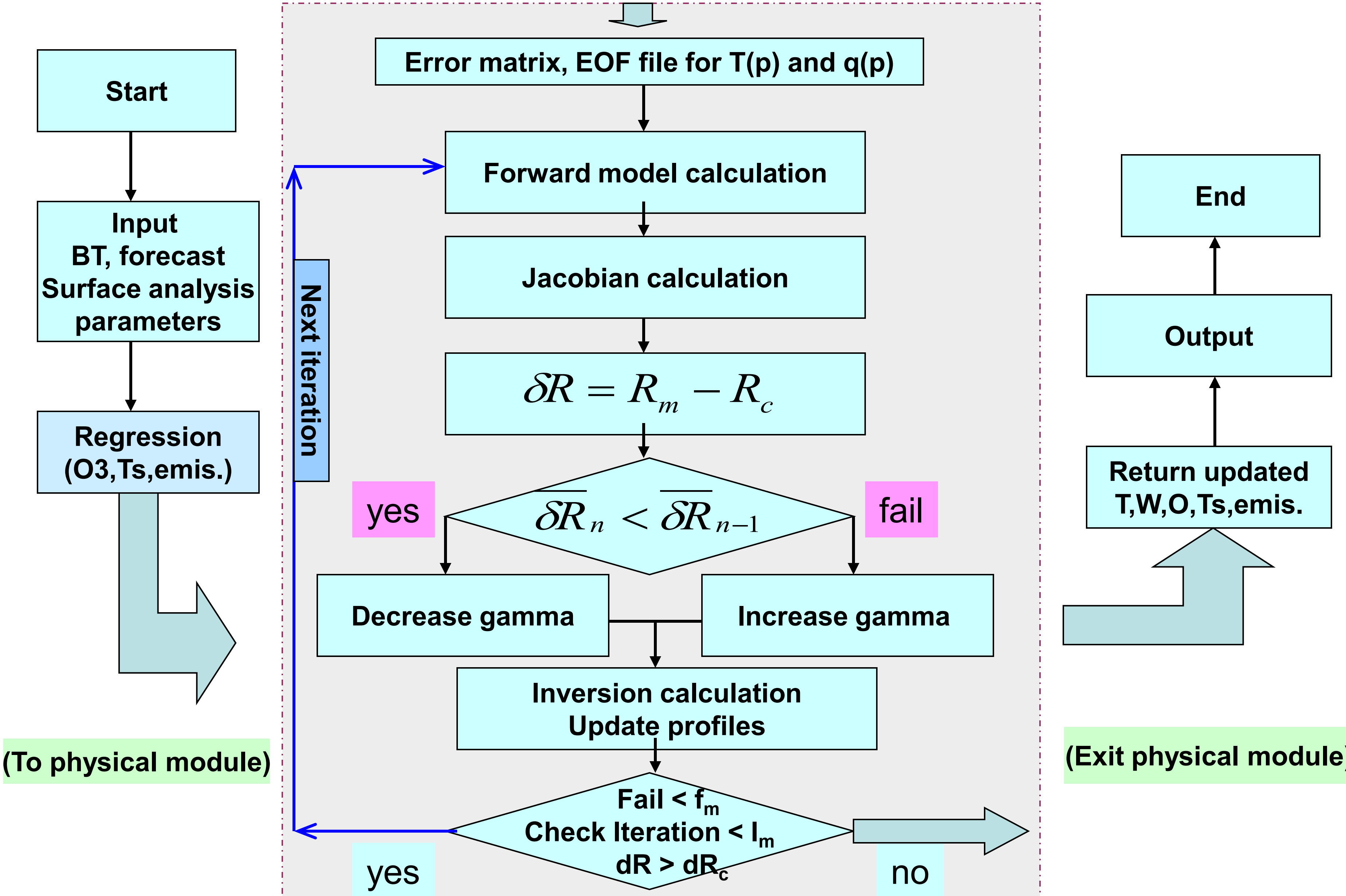
3. adjust first-guess profiles until calculated radiances match the observed radiances within some threshold



GOES Sounder Retrieval System



GOES-10 SFOV Physical module Flow Chart



Characteristics of the Radiative Transfer Equation (RTE)

* Radiance arises from deep and overlapping layers

* The radiance observations are not independent

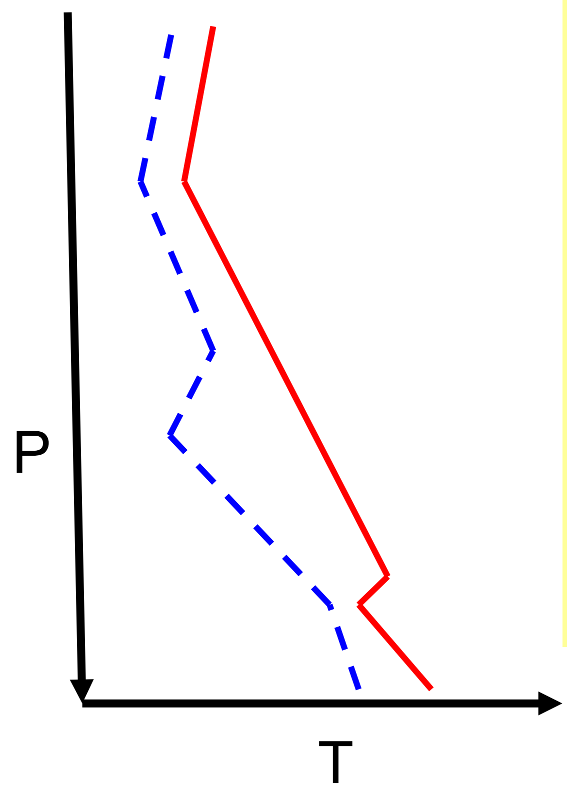
* There is no unique relation between the spectrum of the outgoing radiance and T(p) or Q(p)

* T(p) is buried in an exponent in the denominator in the integral

* Q(p) is implicit in the transmittance

* Boundary conditions are necessary for a solution; the better the first guess the better the final solution

The retrieval concept (in 25 words or less)



Perturb the **first guess profile** (surface reports, GFS forecast, and SST),

and thus, the resulting, **calculated radiances** (via RTE),

until those calculated radiances match the **observed radiances**;

when satisfied, that perturbed profile is the (final) **retrieved profile**.

Of course, many other issues (instrument noise, transmittance function accuracy, number of vertical levels, surface emissivity calculations, …, and obscuring clouds) come into play with successfully solving the matrix inversion of the perturbation form of the radiative transfer equation, simultaneously for temperature and moisture.

Statistical comparison of GOES PW retrievals

CIMSS GOES Retrieval/Radiosonde Statistics for TPW
1 April 1998 to 31 March 31 1999

- GOES-8 (00 UTC)
  - Guess RMSE: **3.6** mm
  - Retrvl RMSE **3.5** mm
  - N=3594

- GOES-10 (00 UTC)
  - Guess RMSE: **3.0** mm
  - Retrvl RMSE: **2.4** mm
  - N=616

- GOES-8 (12 UTC)
  - Guess RMSE: **3.7** mm
  - Retrvl RMSE **3.5** mm
  - N=2974

- GOES-10 (12 UTC)
  - Guess RMSE: **3.0** mm
  - Retrvl RMSE: **2.7** mm
  - N=674

The GOES Sounder does improve upon the (eta) first-guess
(…maybe not very much, but persistently in a positive sense).

Statistical assessment of SFOV retrieved TPW

For a one year period (01 Sep 2005 – 31 Aug 2006), GOES Sounder retrieved Total Precipitable Water vapor (TPW) values (in mm), and their first guess (GFS) values, were compared with co-located (within 11 km) radiosonde observations.

GOES-**12** (wrt raobs)	RMSE for Guess	RMSE for **Retrvls**
SFOV	3.68	**3.43**
3x3 FOV	3.02	2.84
5x5 FOV	3.45	3.03
GOES-**11** (wrt raobs)	RMSE for Guess	RMSE for **Retrvls**
SFOV	4.13	**3.91**
3x3 FOV	3.44	3.48
5x5 FOV	3.98	3.99
GOES-**10** (wrt raobs)	RMSE for Guess	RMSE for **Retrvls**
SFOV	2.84	**2.69**
3x3 FOV	2.38	2.44
5x5 FOV	3.35	2.64

{Computations generously provided by J. P. Nelson (CIMSS) and A.S. Allegrino (OPDB).}

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Scale the RMSE values by the average TPW

GOES-**12** (wrt raobs)	RMSE for Guess	RMSE for **Retrvls**
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3.43/21.79=**15%**

3.91/18.24=**21%**

2.69/11.01=**24%**

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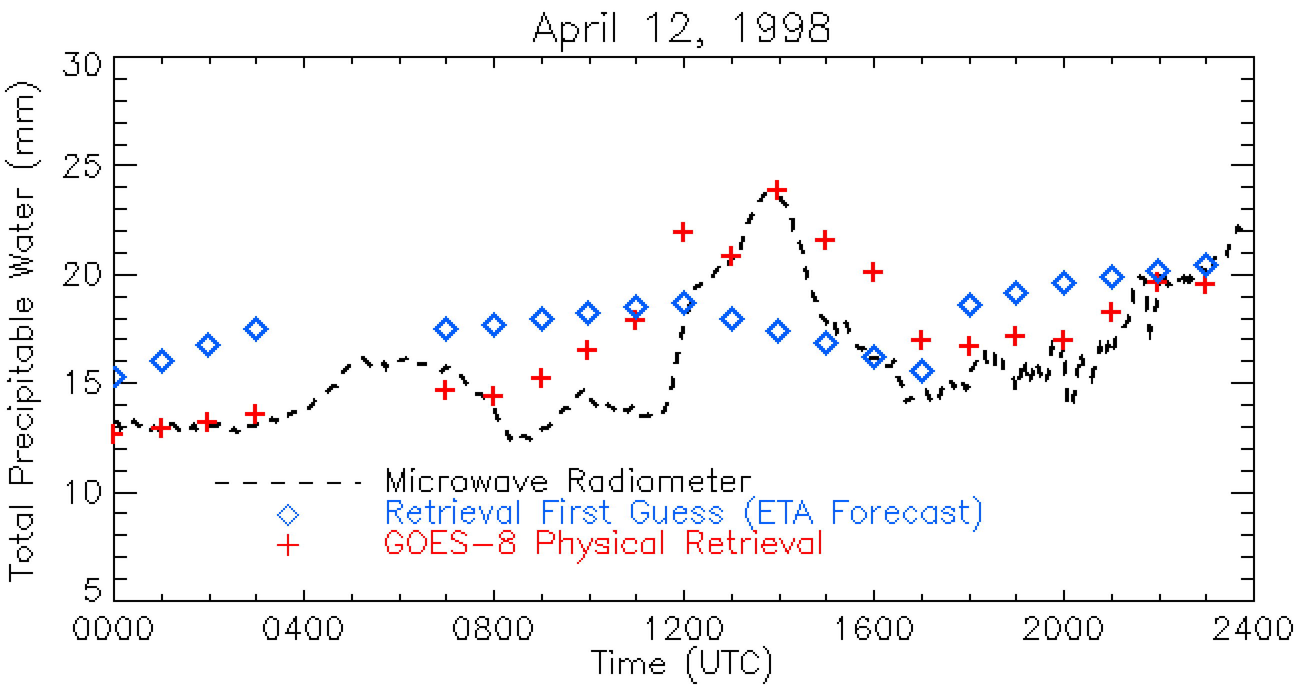
Comparison of GOES PW with microwave retrievals

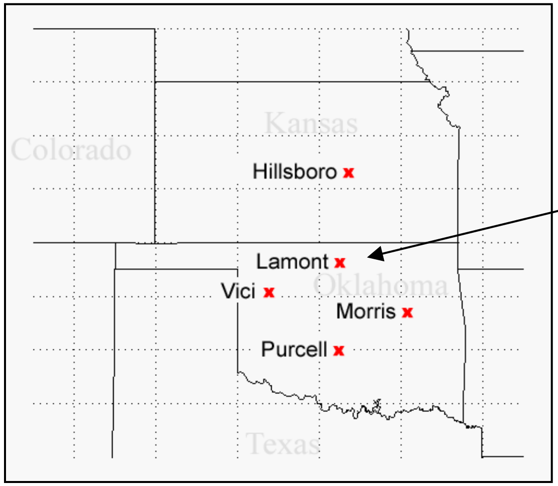


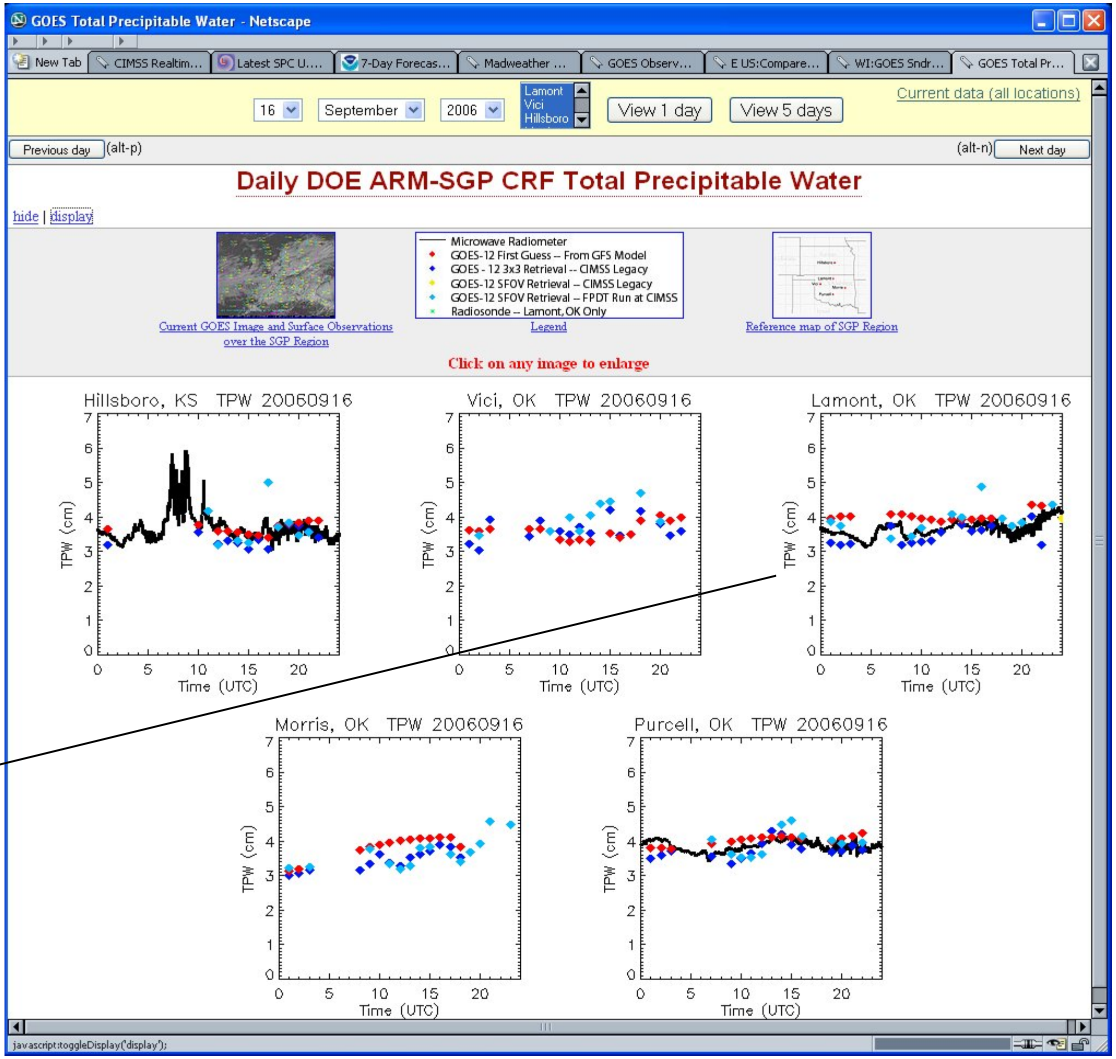
(from W. Feltz)

Co-located total precipitable water (PW) values retrieved from the GOES Sounder compare well with integrated moisture measured by a microwave radiometer at the CART site (Lamont, OK). Note “flat” first-guess trace. GOES retrievals show ability to capture the trend and range of total moisture.

Comparing GOES retrieval trends with other observations at the ARM-SGP site (1)

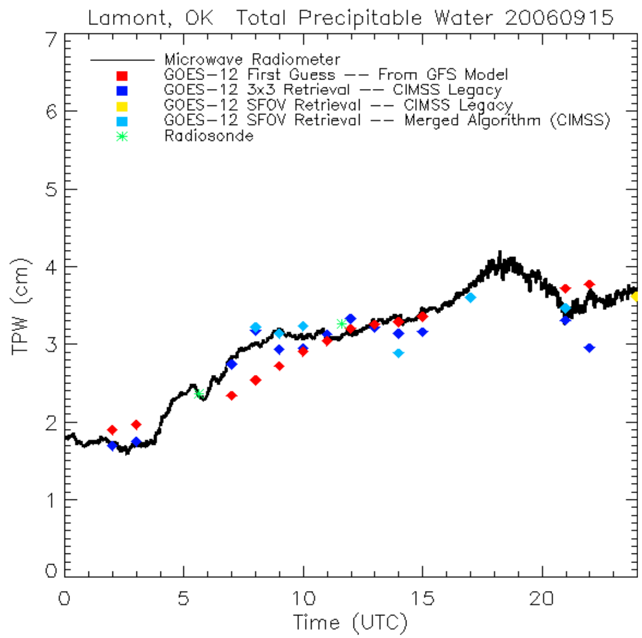
Ground-based microwave radiometers at the DOE Atmospheric Radiation Measurement – Southern Great Plains site provide quality independent comparison for total column integrated water (aka TPW).

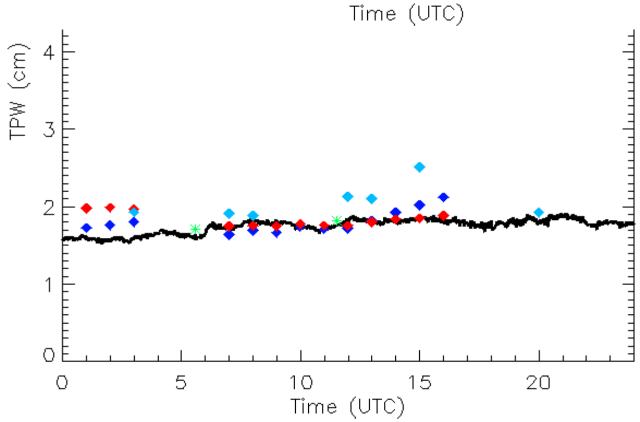


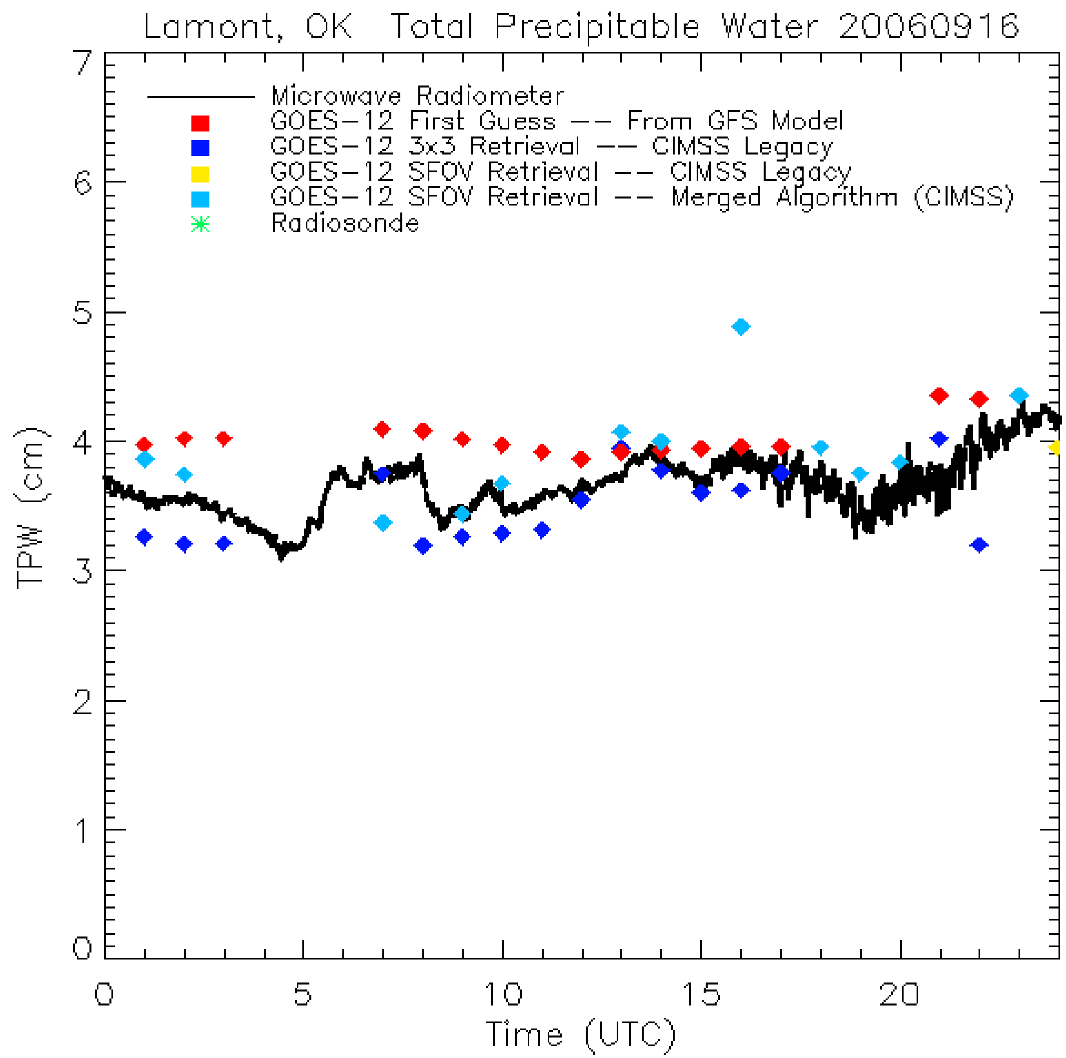


{16 Sep 2006}

Comparing GOES retrieval trends with other observations at the ARM-SGP site (2)

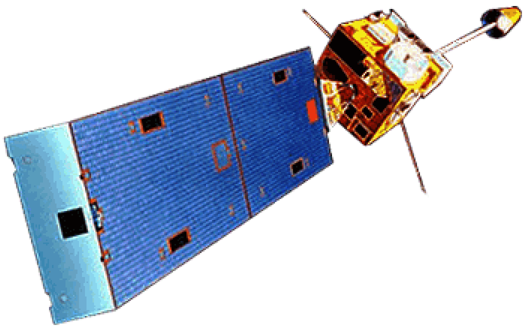






{14-16 Sep 2006}

Overview



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Rationale for considering use of DPI

The excellent quality of Sounder radiance data is evidenced clearly by the consistent and fluid evolution of the 19-panel Sounder imagery animation showing unaltered equivalent blackbody temperatures.

However, to provide more quantitative information for parameters more directly applicable to weather forecasting purposes (PW, LI…), the construct of the DPI is employed.

The inherent image character of the DPI lends itself to:

• display approaching full resolution of the data (single FOV)

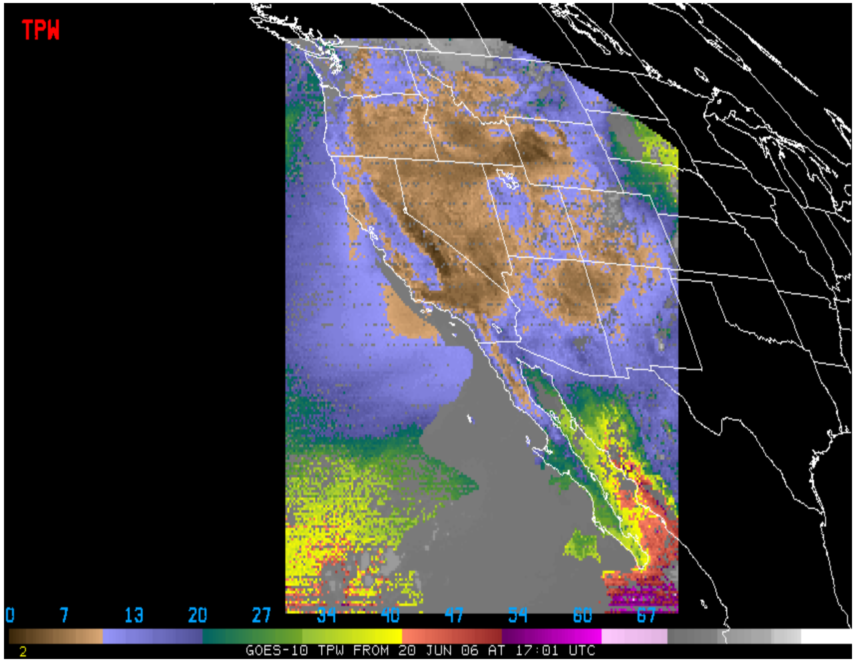
• ready animation (with image display software)

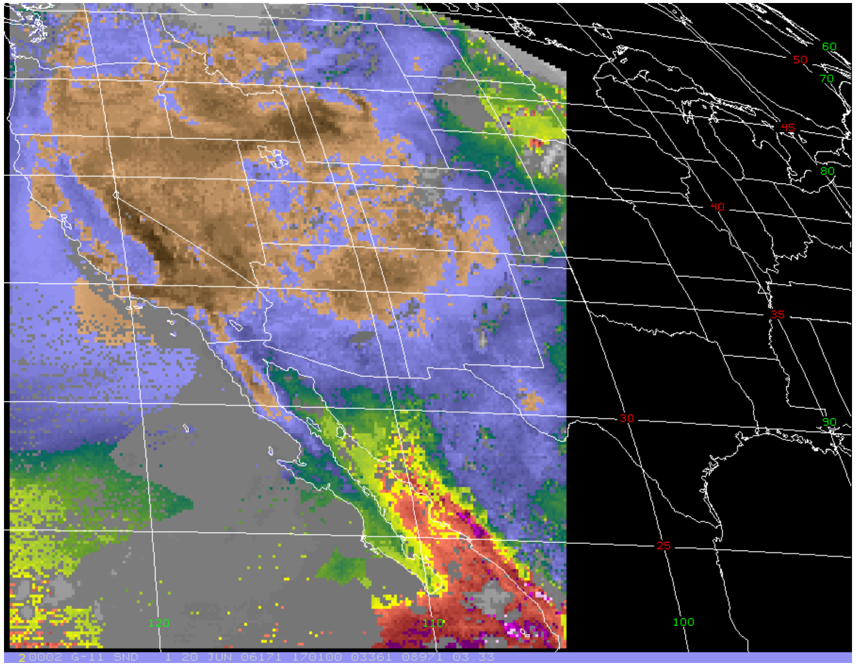
• synergistic blending of "active" weather, seen in the cloud evolution, and "precursor" conditions, seen in the product evolution

(3 May 1999 animations at http://cimss.ssec.wisc.edu/aspt/products/prod.html)

TPW

GOES10 | GOES11

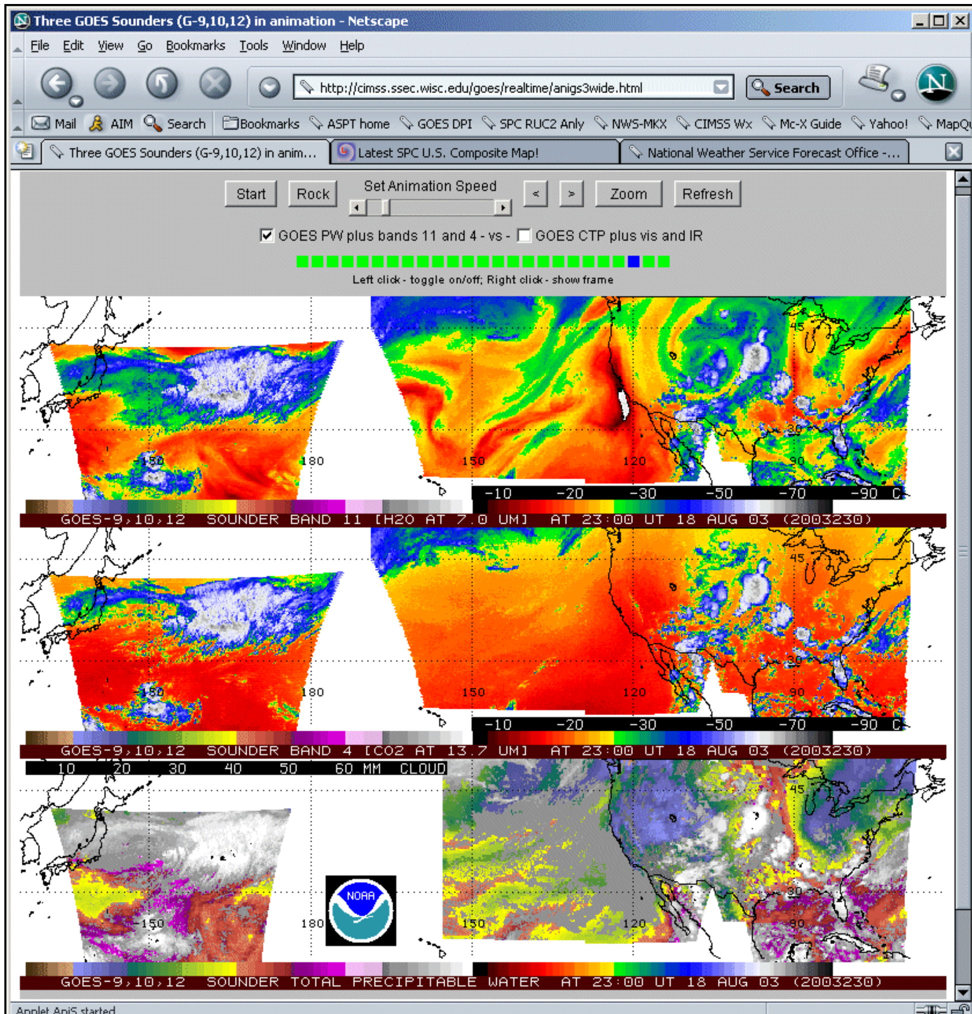


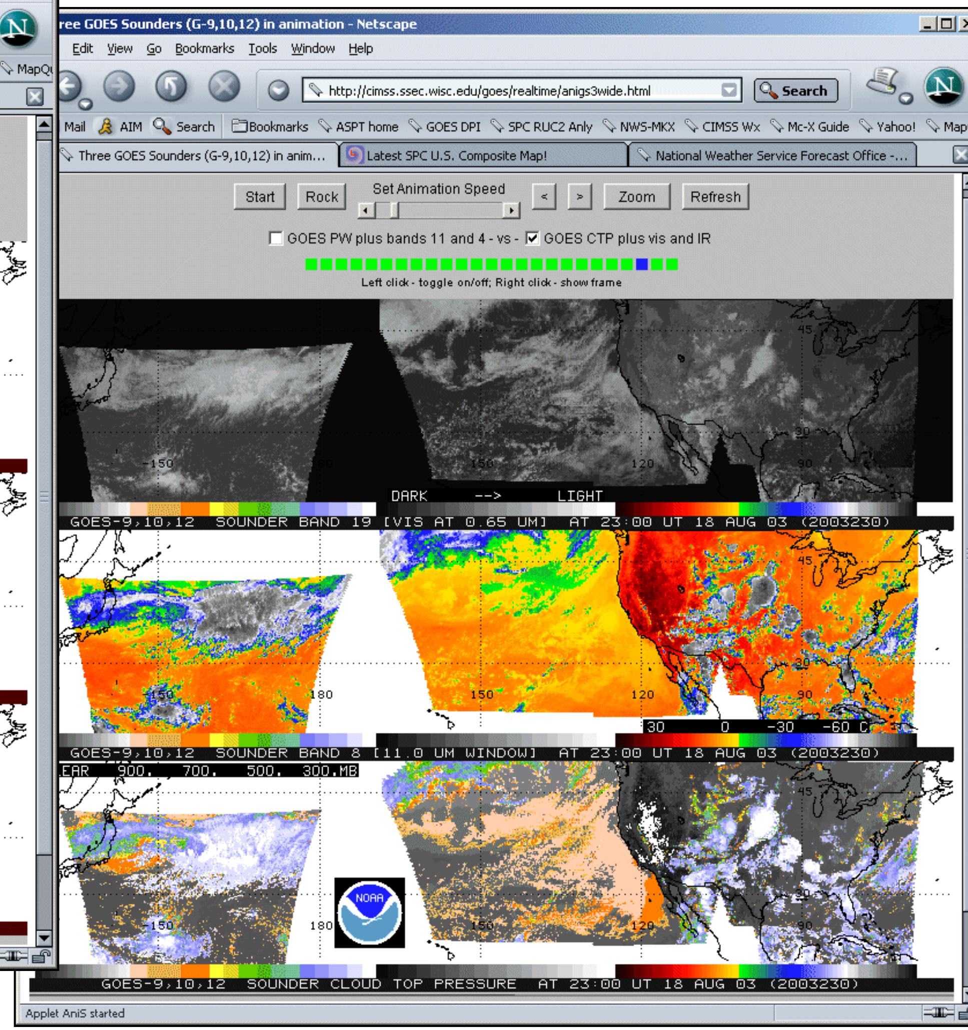


Three GOES wide Sounder coverage across the northern mid-latitudes from Japan to Maine

For GOES-**9** (far Pacific), GOES-**10** (West US), and GOES-**12** (East US), DPI and imagery include (on left) TPW, band 4 (CO2), and band 11 (H2O) and (on right) CTP, band 11 window, and band 19 visible.

2003



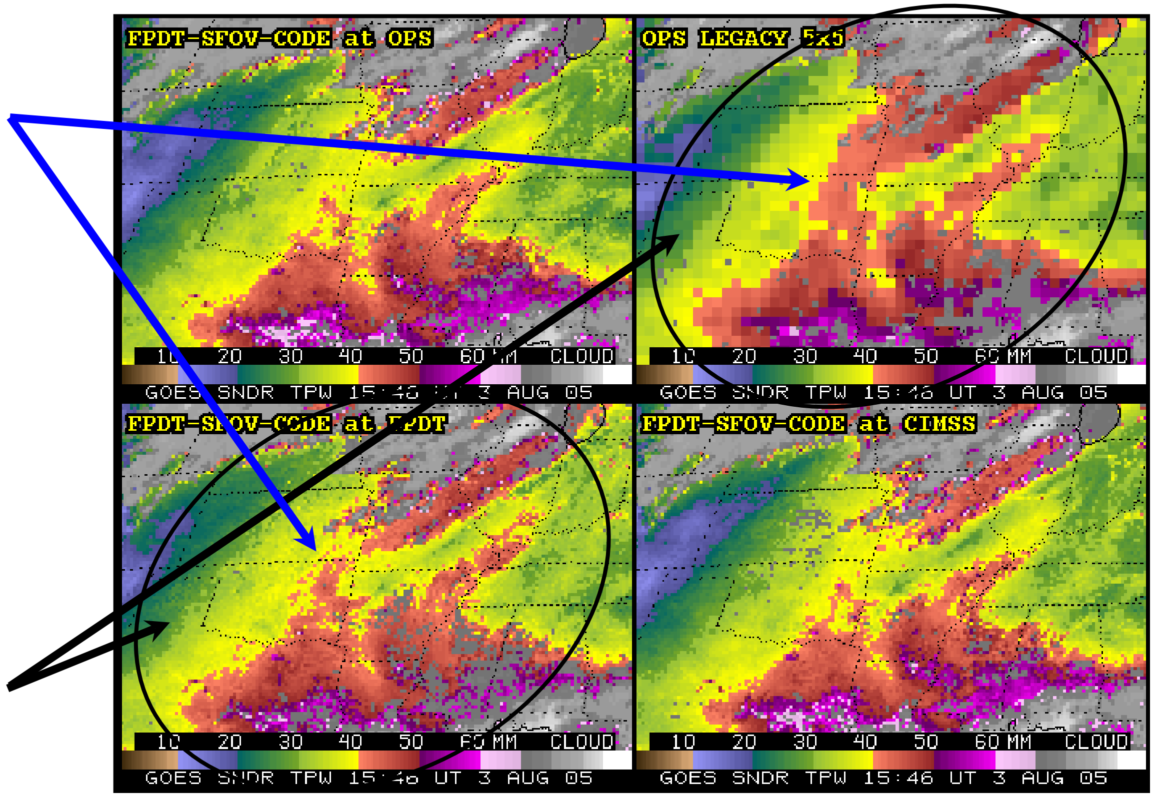


Improvement with new SFOV DPI algorithm:
1. Better horizontal resolution

Increased horizontal resolution simply provides more detail as well as more naturally smooth looking imagery.

Clear isolated individual FOVs are found with the SFOV technique, but not with the previous 5x5 FOV processing. (Note NW MO.)

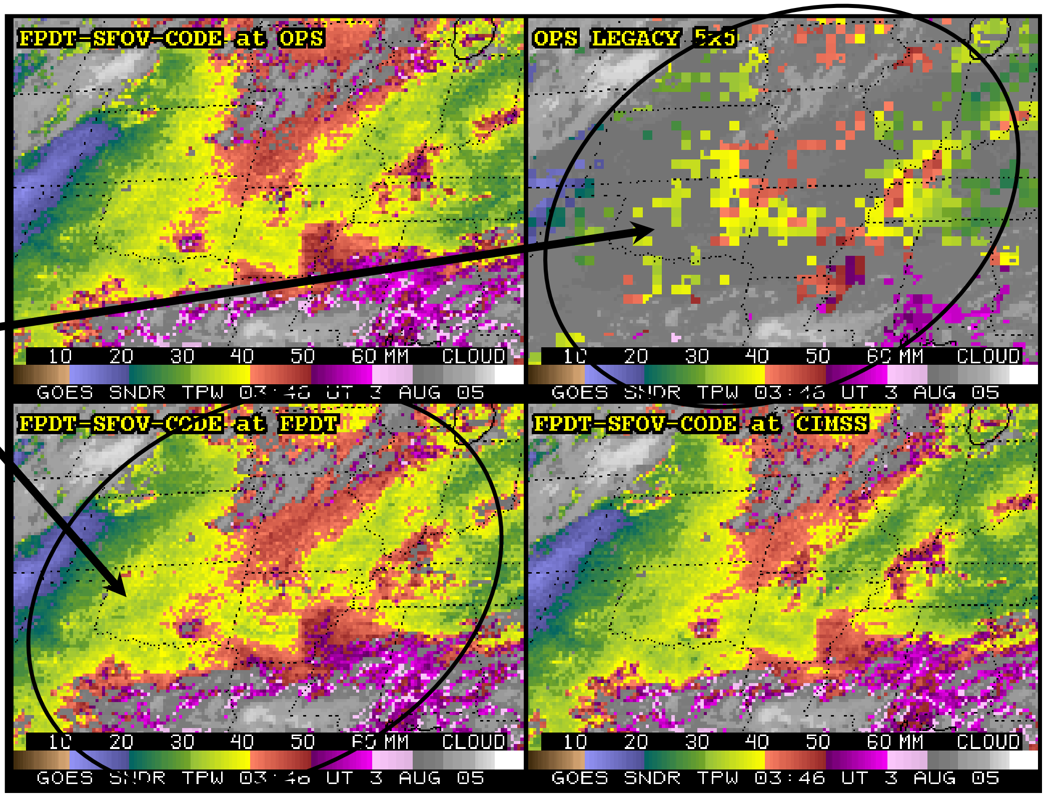
Finer scales of gradient information are also gained.



Example of GOES Sounder TPW DPI at 1546 UT on 03 Aug 2005.

Improvement with new SFOV DPI algorithm: 2. More complete coverage overnight

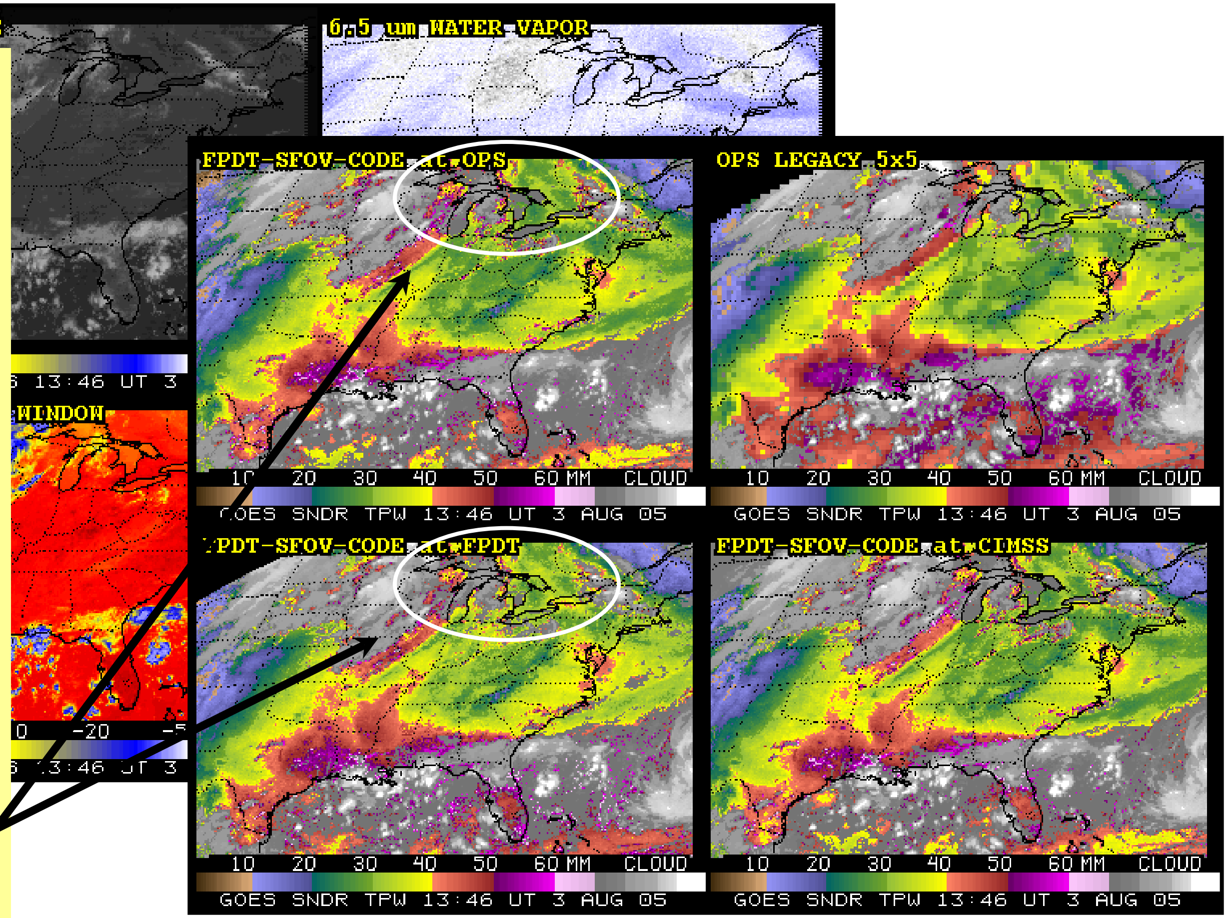
Dramatic increase was achieved in profile parameter coverage overnight with new SFOV DPI, compared to previous 5x5 FOV DPI available on AWIPS. Ability to successfully retrieval profiles in clear air situations no longer impaired by previous algorithm deficiencies and threshold settings.



Example of GOES Sounder TPW DPI at 0346 UT on 03 Aug 2005.

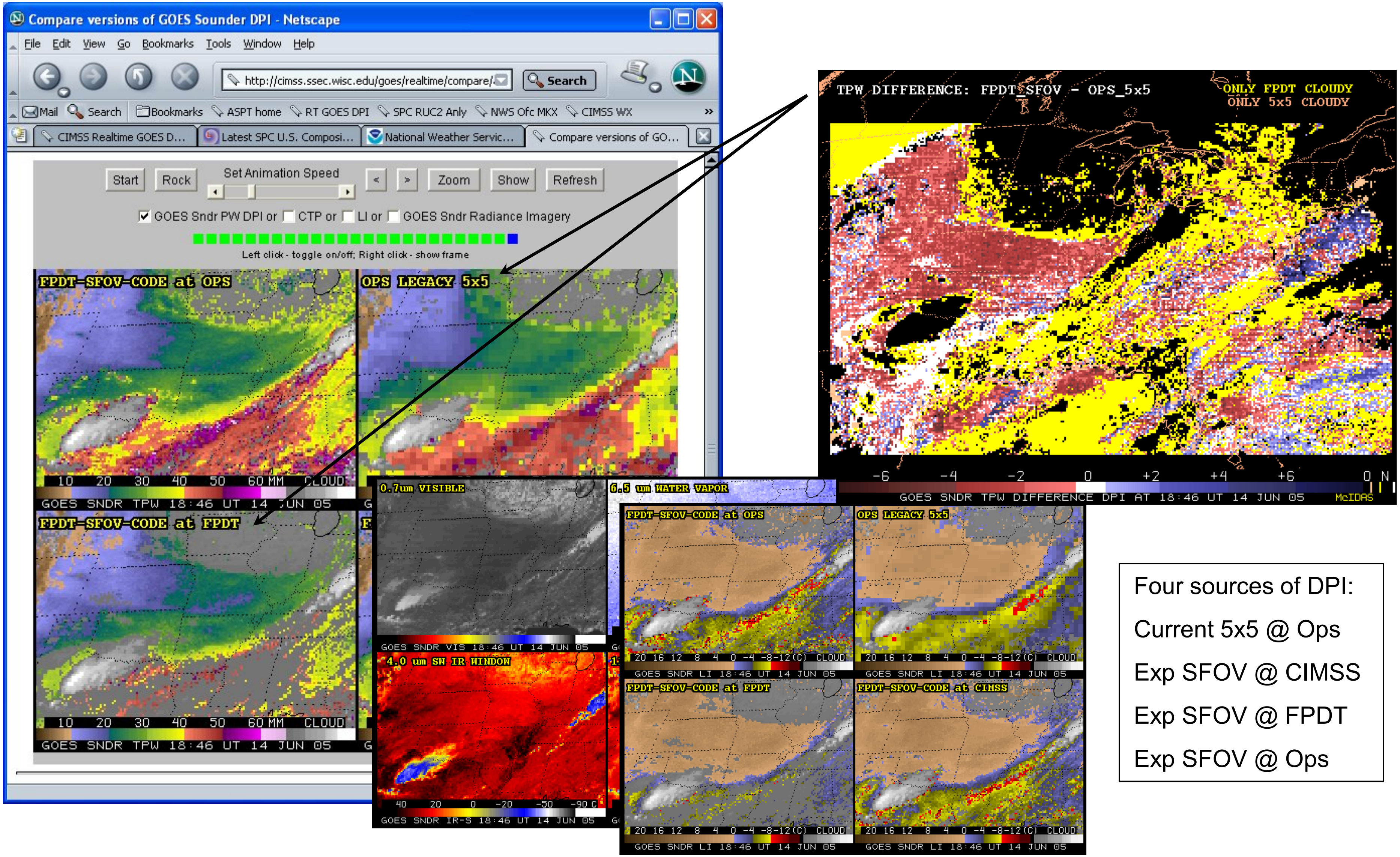
Improvement with new SFOV DPI algorithm:
3. Finely tuned cloud screening

A fine balance was achieved in the cloud screening for the profile retrievals, which is to avoid cloud contamination around extensive and cold cloud features as well as the larger instances of small scale diurnal cumulus developments, while not preventing retrievals in any clear air locations. Note how the final SFOV algorithm was tuned not to exclude clear profiles over the Great Lakes.



Example of GOES Sounder TPW DPI at 1346 UT on 03 Aug 2005.

Monitoring and comparing real-time GOES Sounder Single Field-of-View (SFOV) Derived Product Imagery (DPI) for ultimate use by the National Weather Service (NWS)



Four sources of DPI:

Current 5x5 @ Ops

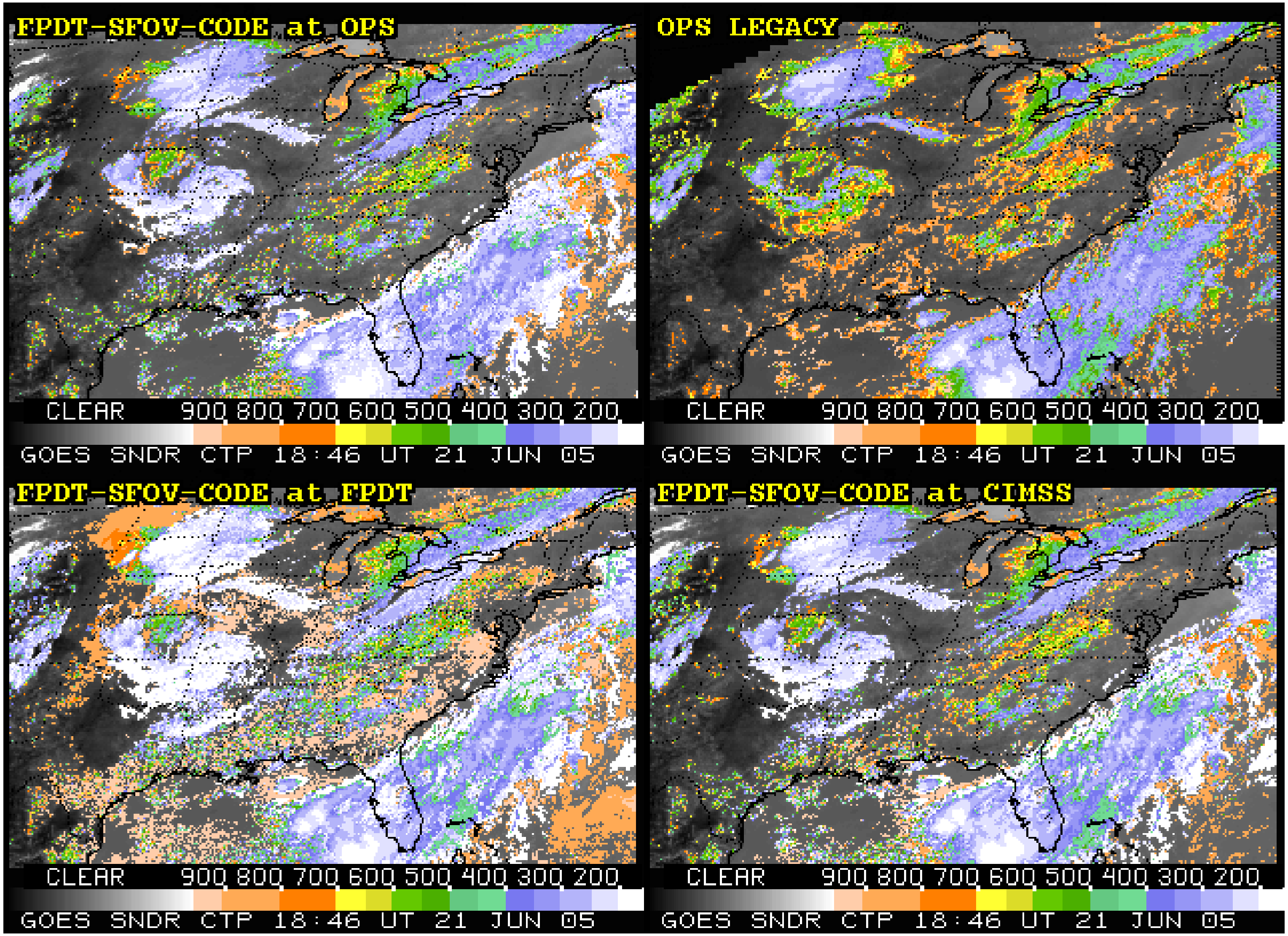
Exp SFOV @ CIMSS

Exp SFOV @ FPDT

Exp SFOV @ Ops

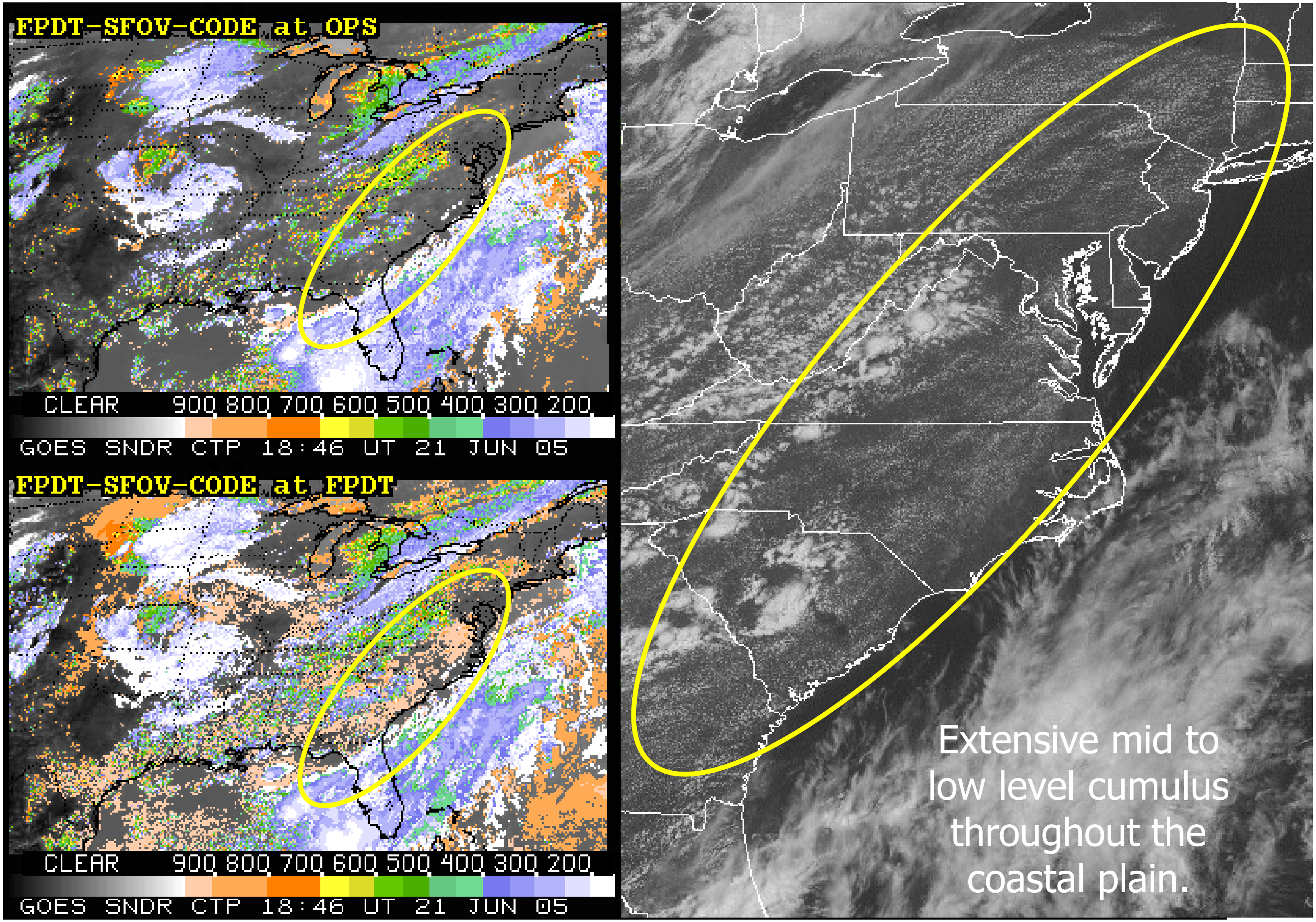
2005

Case from June 21st, 2005 18:46Z



(Courtesy: J. Daniels et al.)

Note differences along East Coast



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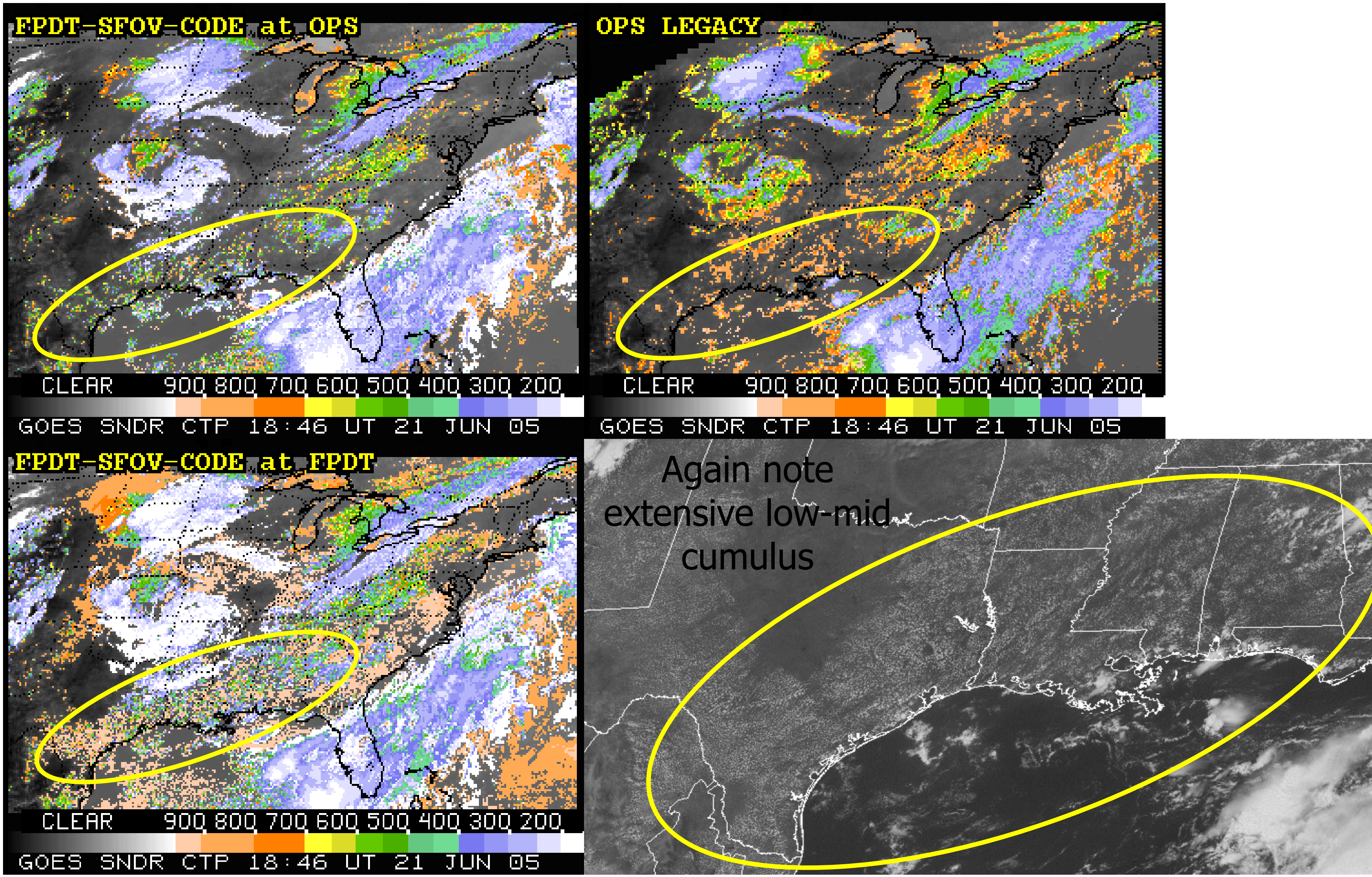
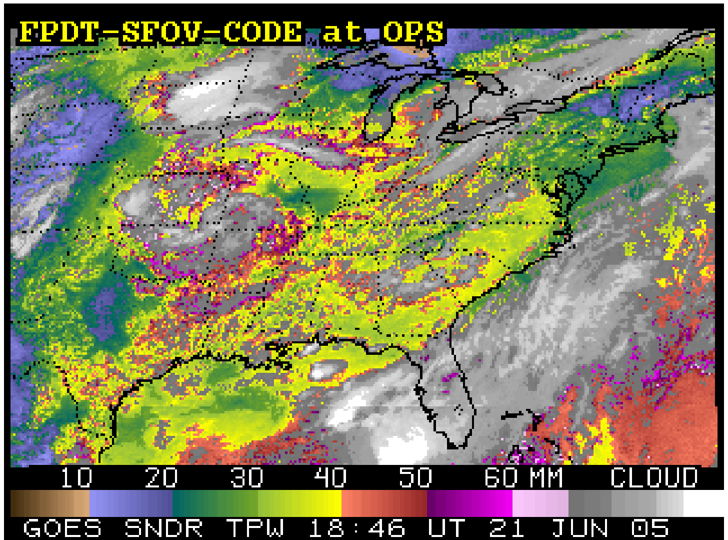
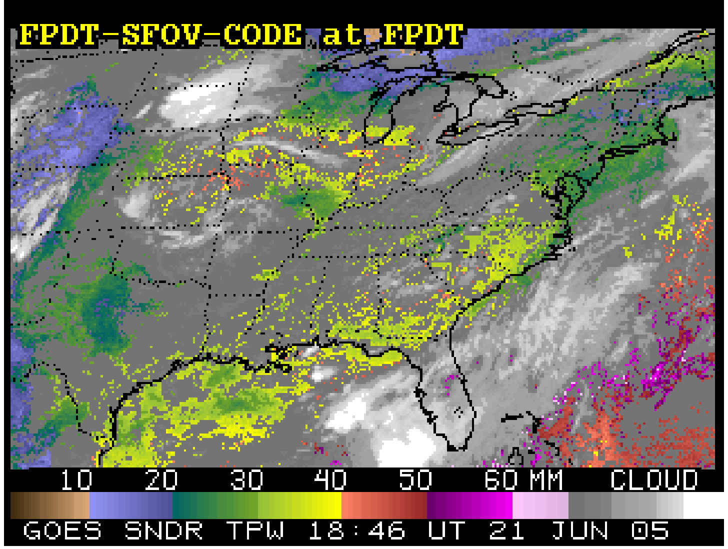


(Courtesy: J. Daniels et al.)

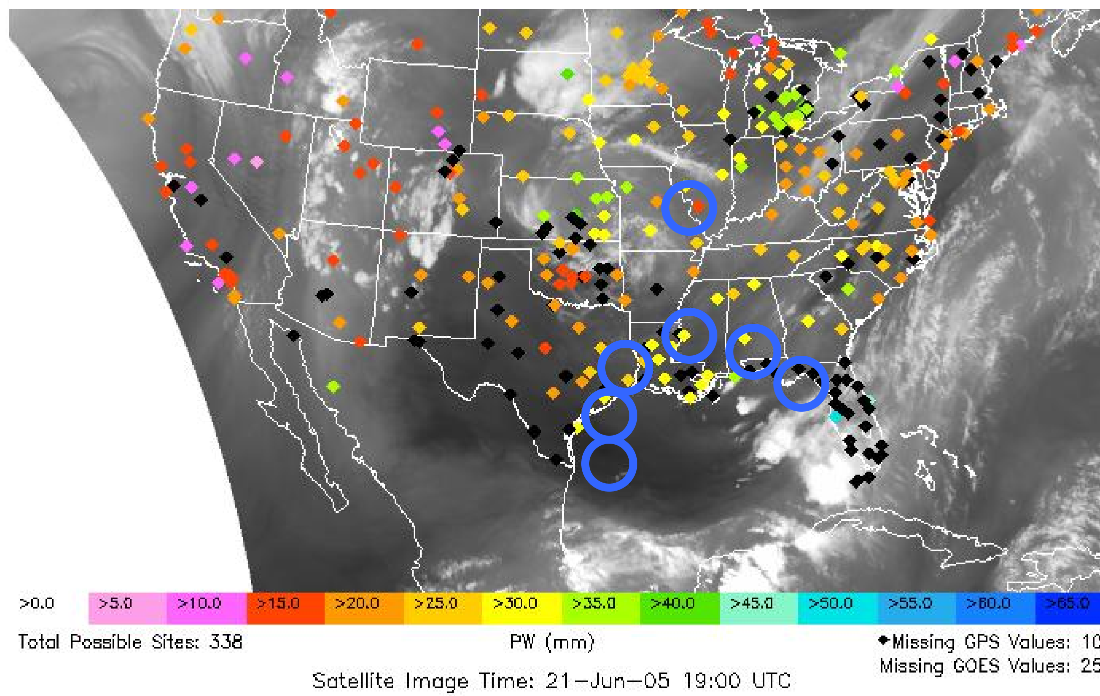
But is the “cloudier” data “o.k.”?





GOES Water Vapor

The sampling of circled GPS TPW values are all roughly between 25mm and 35mm. All selected spots are where the “looser” cloud mask produced a DPI product, but the “tighter” mask did not. At virtually all spots, the “looser” mask DPI had TPW values of 40-60mm.

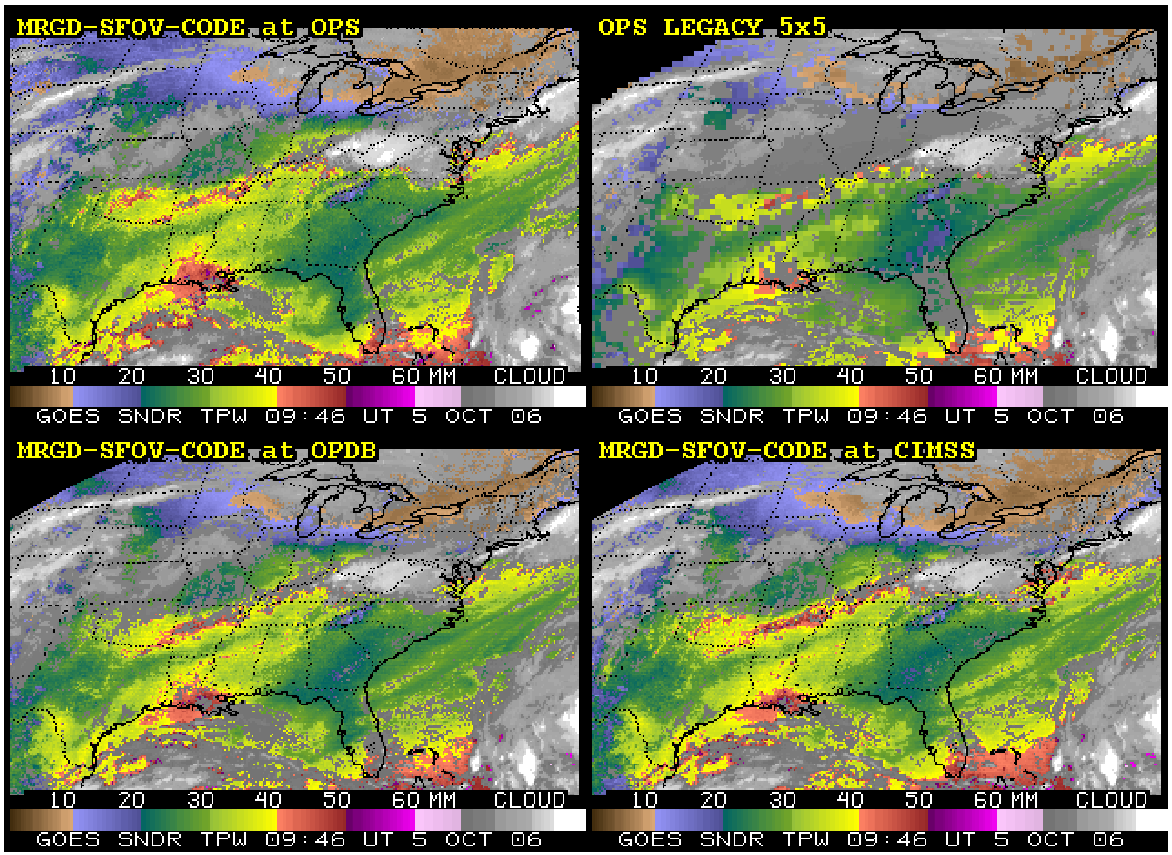


(Courtesy: J. Daniels et al.)

Continuing to monitor modifications being made to retrieval processing methods

New OPS SFOV

Old OPS 5x5

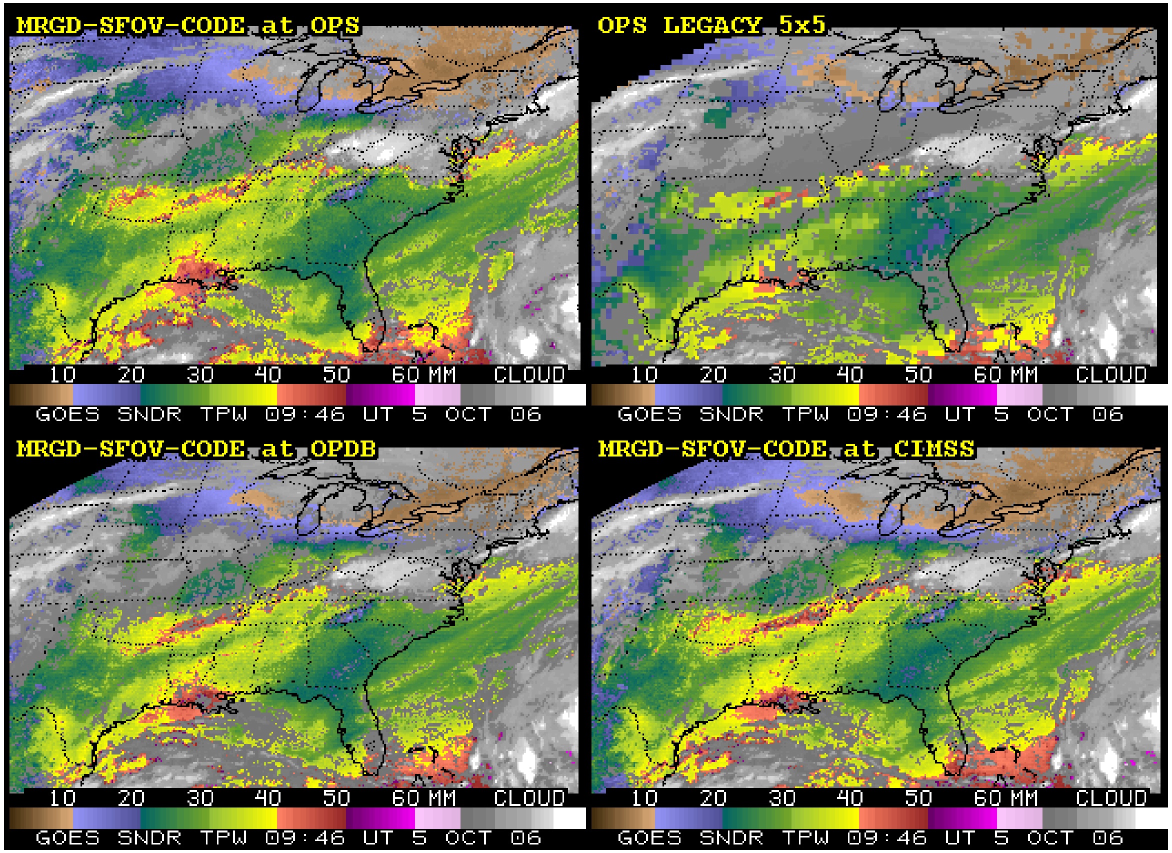


SFOV @ OPDB

SFOV @ CIMSS

GOES Sounder TPW DPI – 10 UT 05 Oct 2006

Continuing to monitor modifications being made to retrieval processing methods

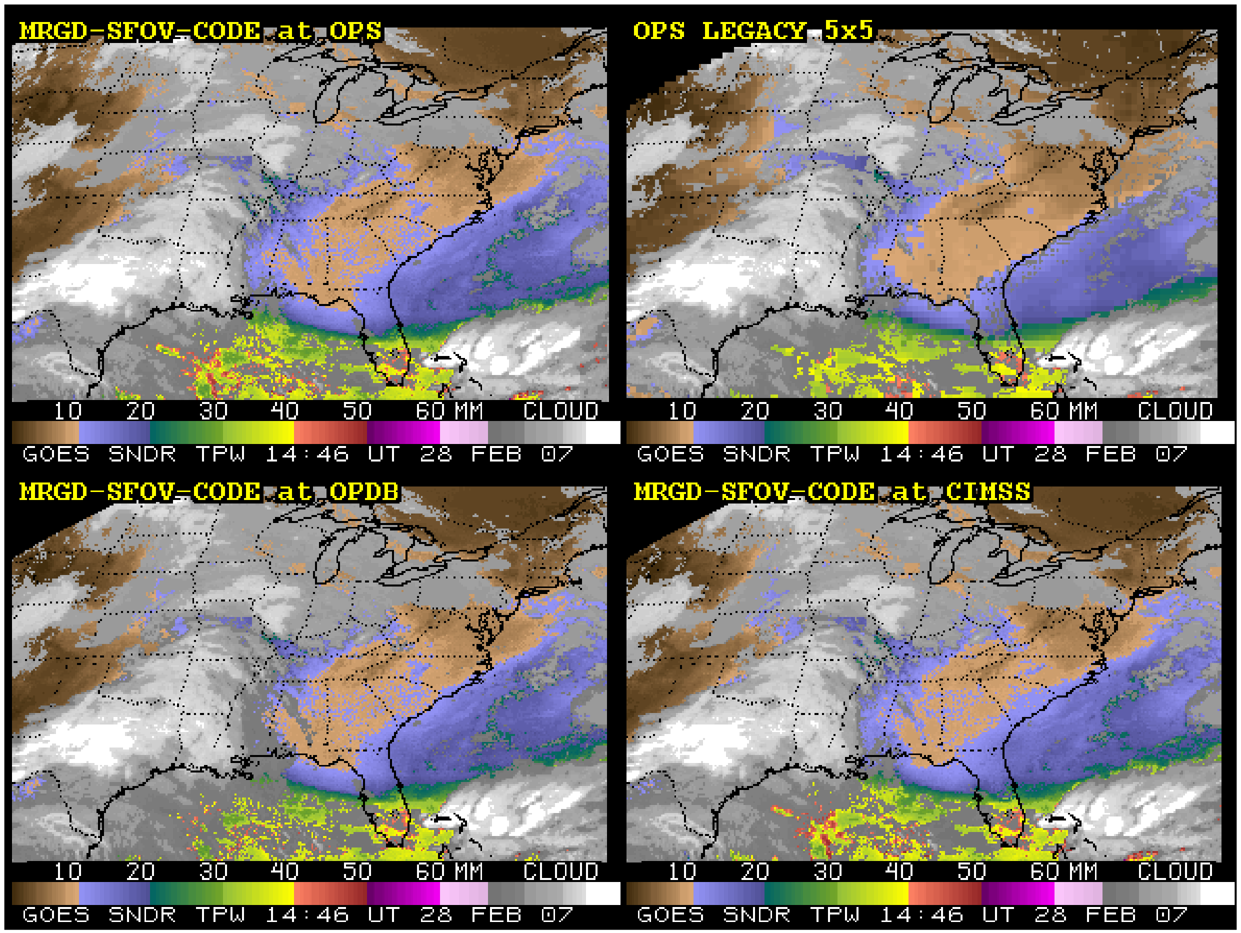


{10 UT 05 Oct 2006 – 20 UT 06 Oct 2006}

Continuing to monitor modifications being made to retrieval processing methods

New OPS SFOV

Old OPS 5x5

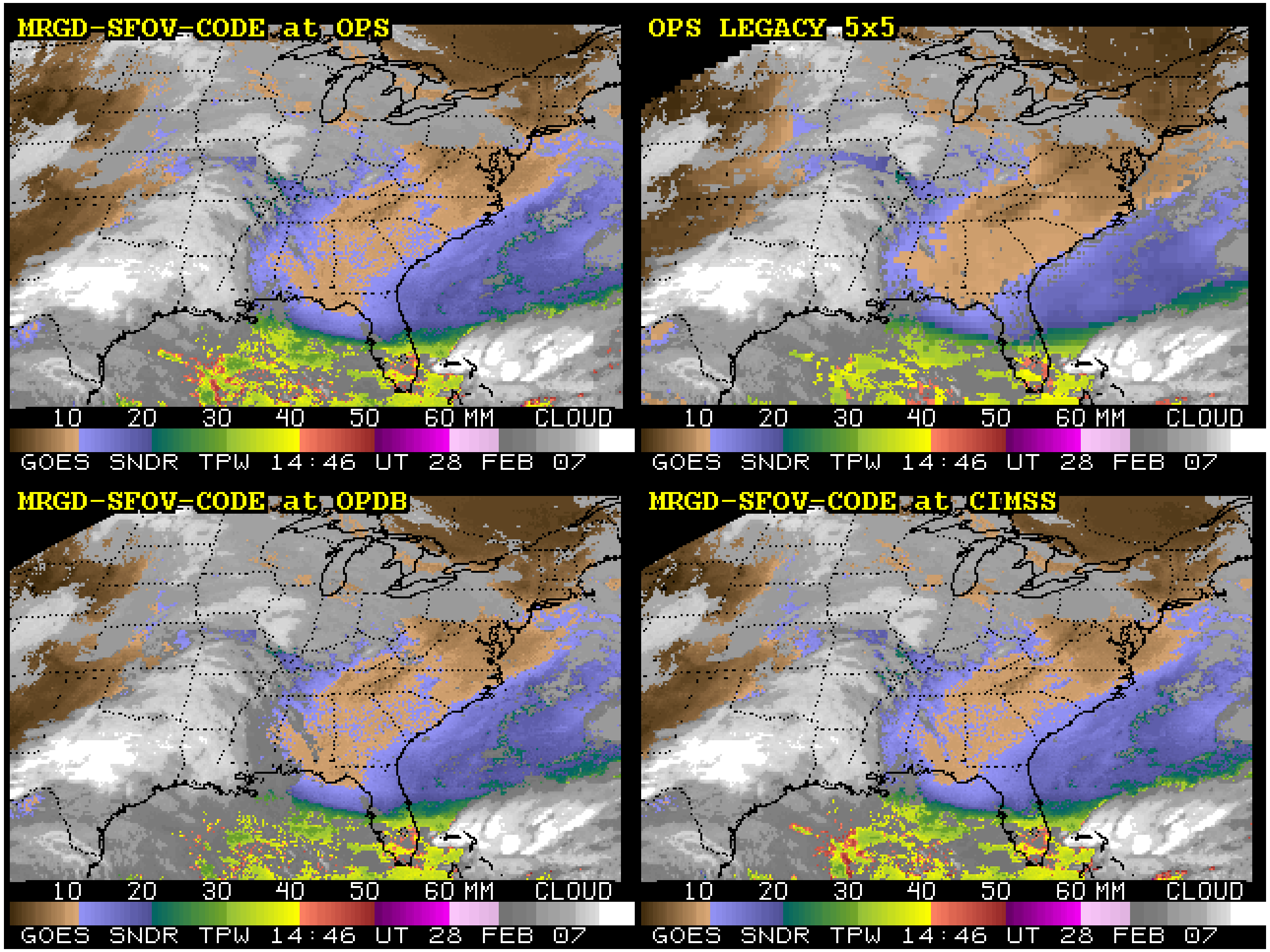


SFOV @ OPDB

SFOV @ CIMSS

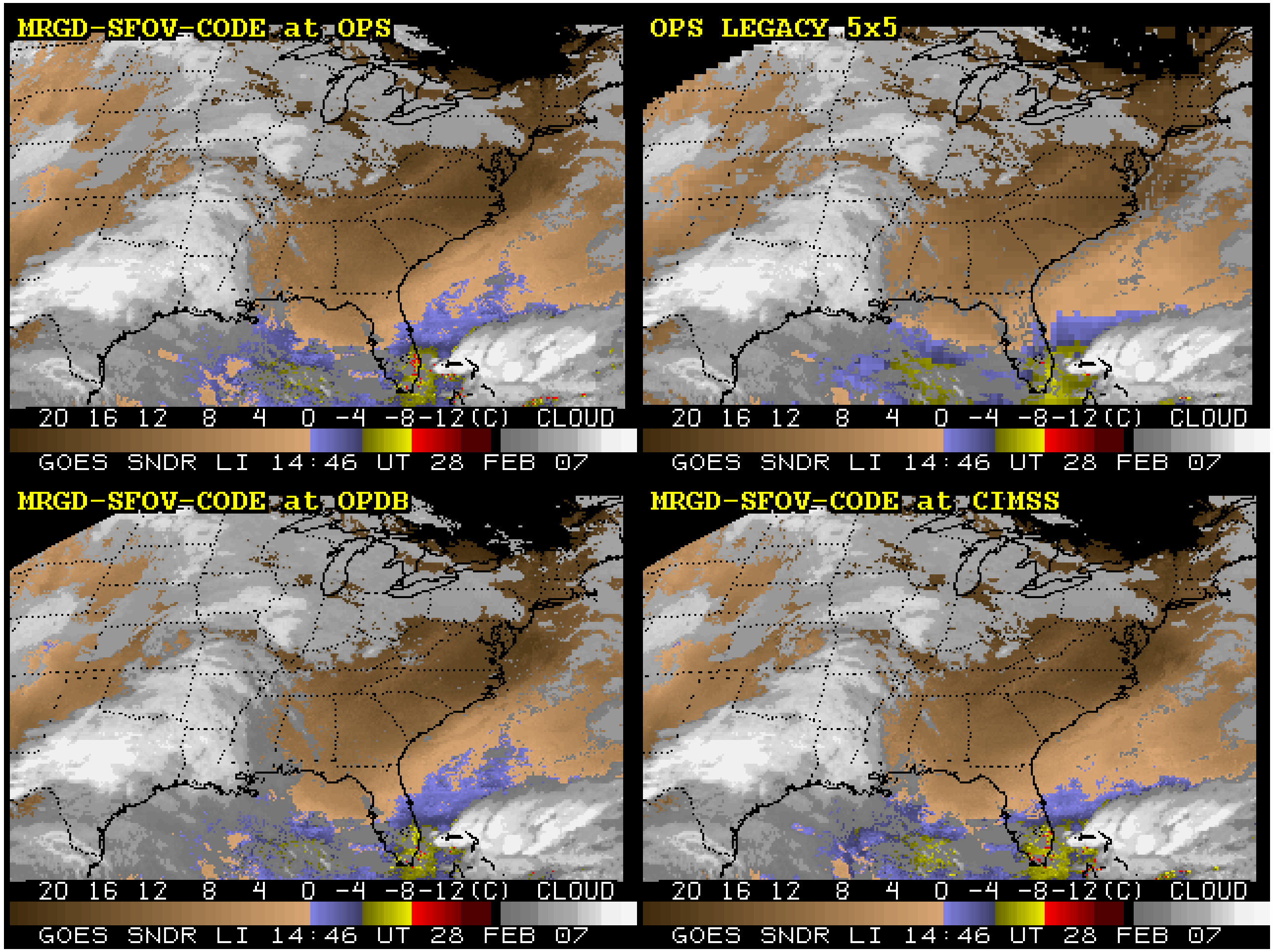
GOES Sounder TPW DPI – 15 UT 28 Feb 2007

Continuing to monitor modifications being made to retrieval processing methods



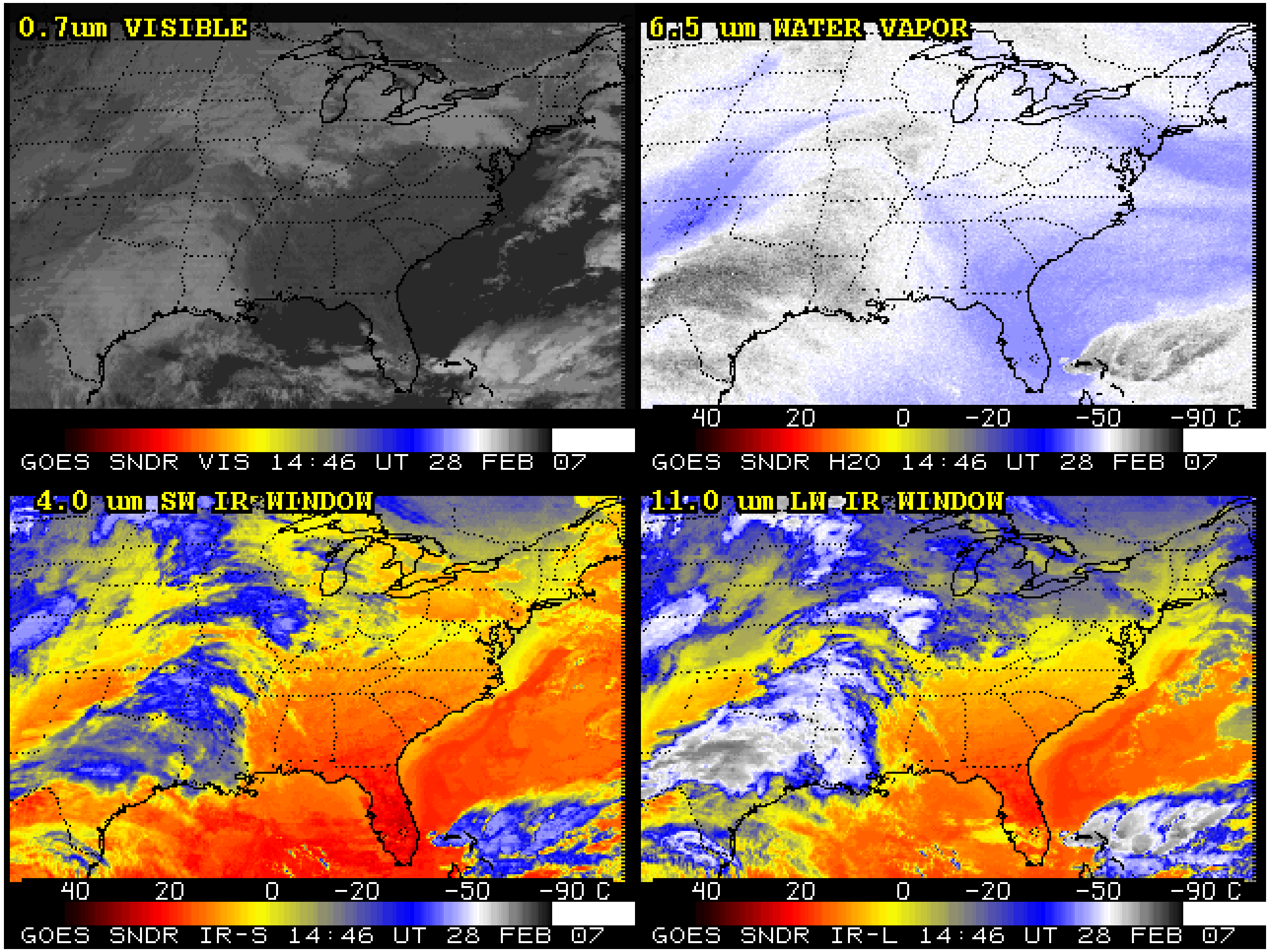
{GOES Sounder Total Precipitable Water -- 15 UT 28 Feb 2007 – 21 UT 01 Mar 2007}

Continuing to monitor modifications being made to retrieval processing methods



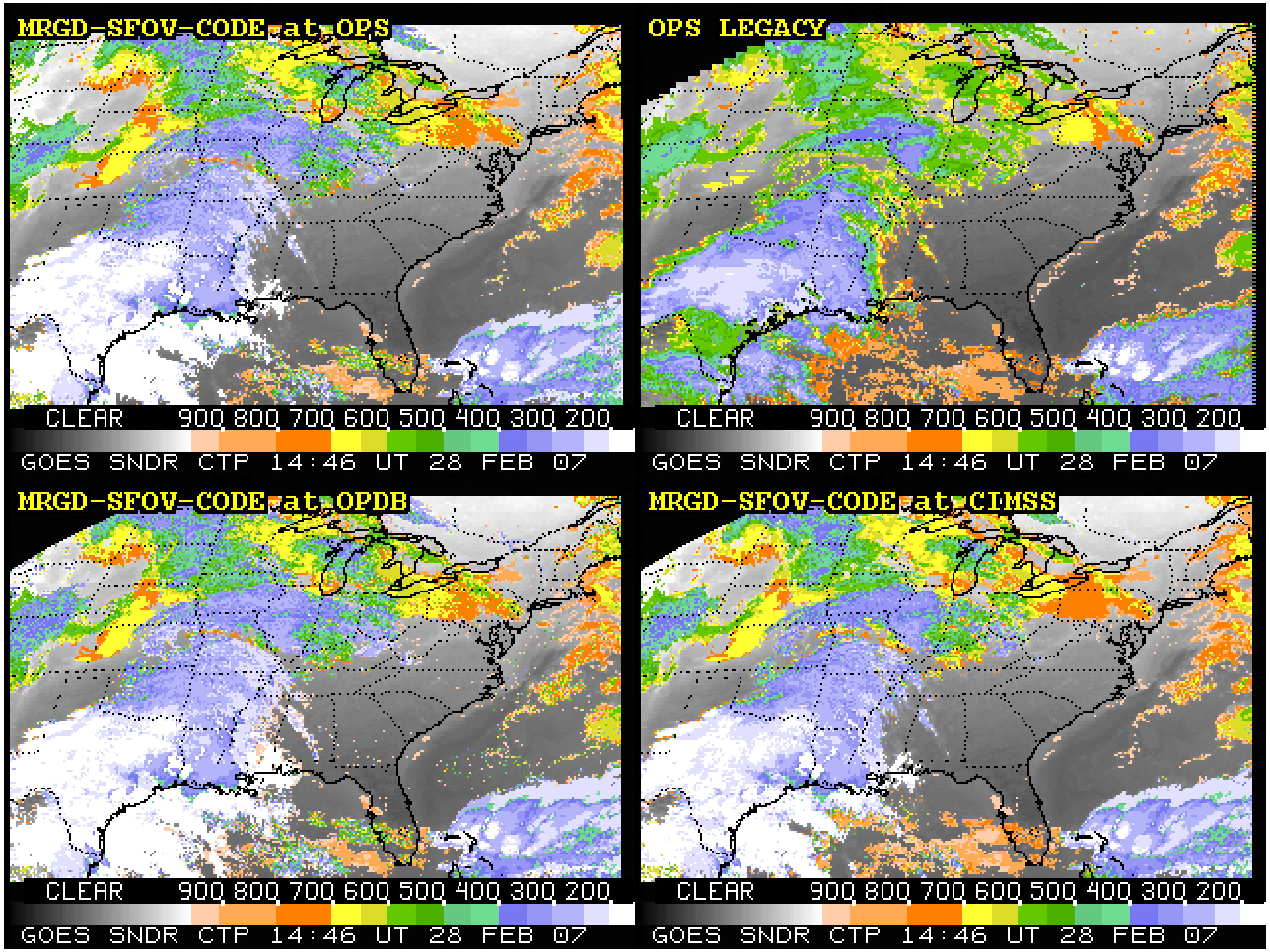
{GOES Sounder Lifted Index (Stability) -- 15 UT 28 Feb 2007 – 21 UT 01 Mar 2007}

Viewing "raw" Sounder imagery in the course of monitoring modifications being made to retrieval processing methods



{GOES Sounder Band Radiance Imagery -- 15 UT 28 Feb 2007 – 21 UT 01 Mar 2007}

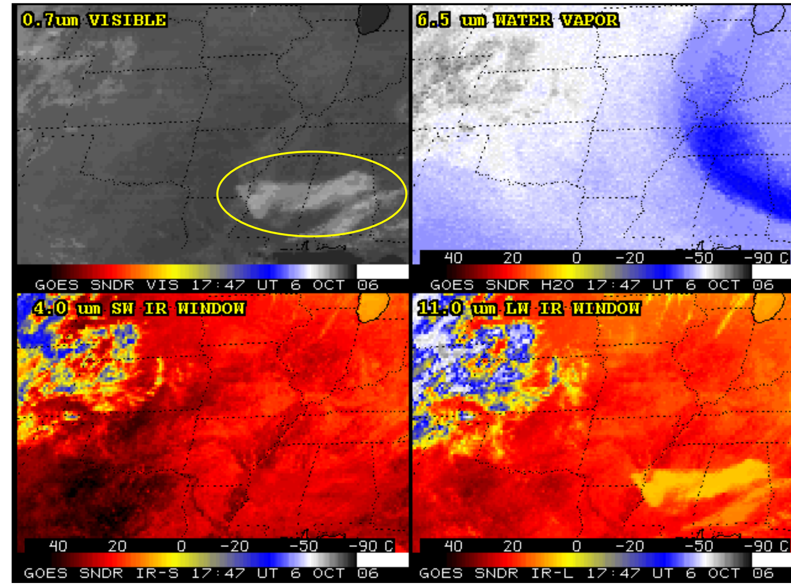
Continuing to monitor modifications being made to retrieval processing methods



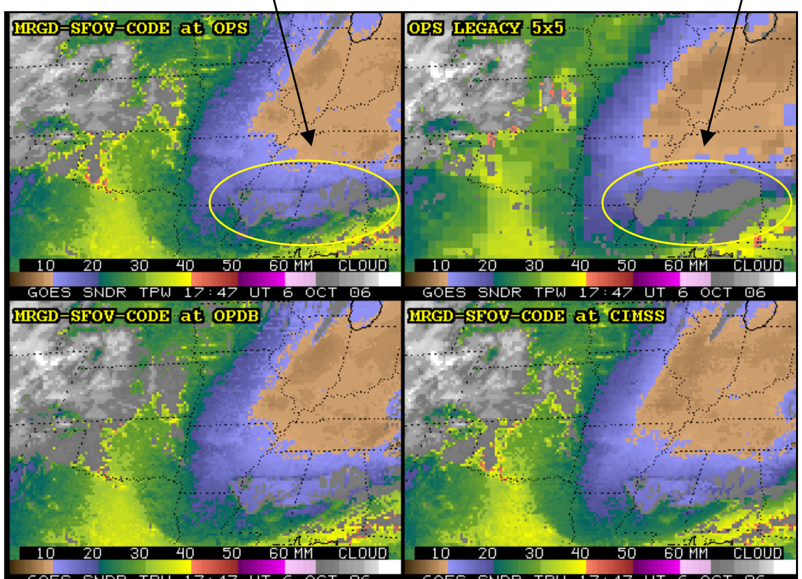
{GOES Sounder Cloud Top Pressure -- 15 UT 28 Feb 2007 – 21 UT 01 Mar 2007}

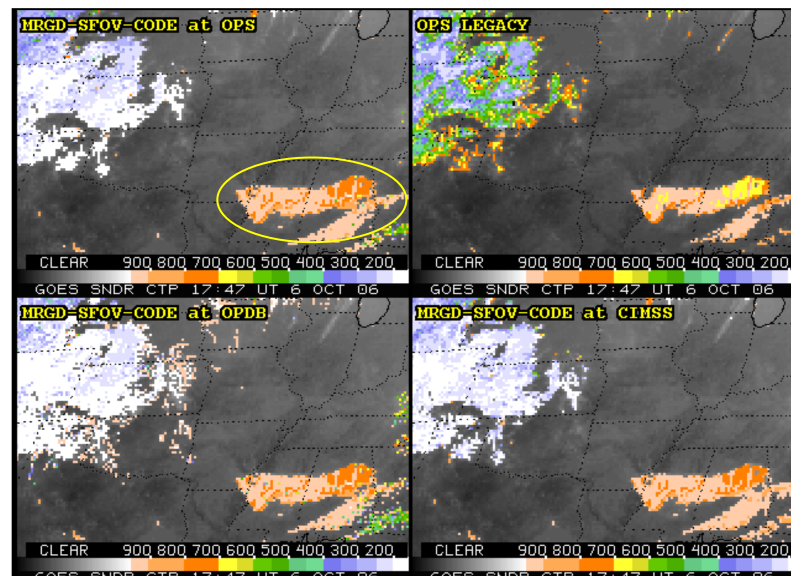
Continuing to look closely at the SFOV DPI

Cloud determination (screening or depicting) remains troublesome at times.



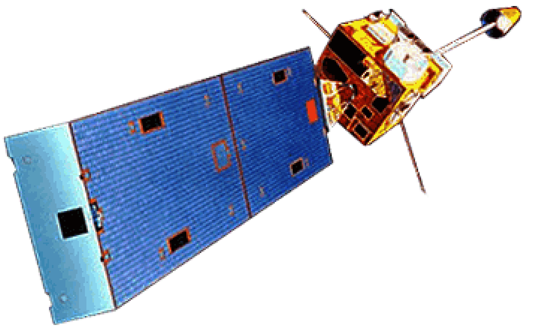
Although all cloud top pressure (CTP) DPI captured the low cloud across MS and AL, the "old" 5x5 TPW DPI screened that cloud better than the new SFOV TPW DPI processing!





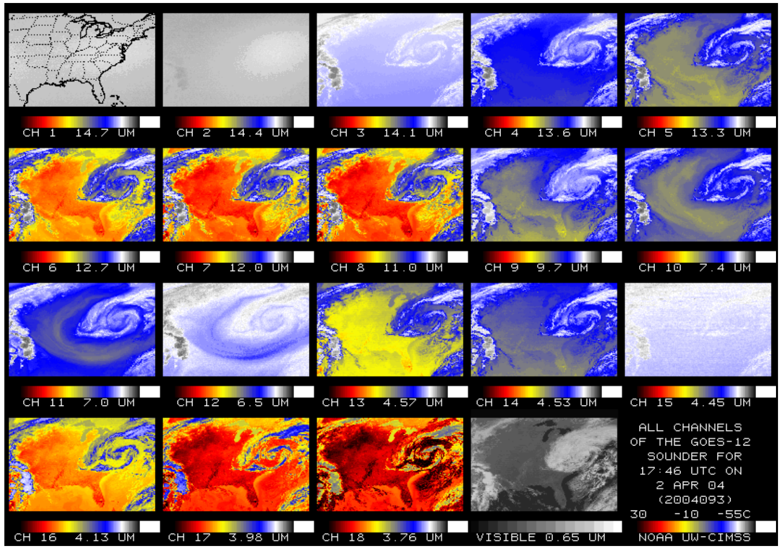
{18 UT 06 Oct 2006}

Overview

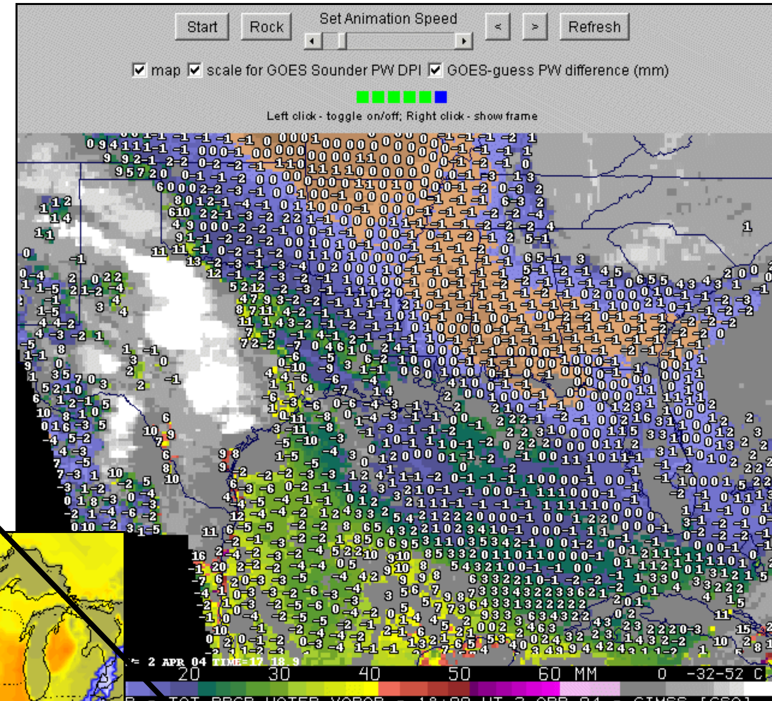


- Profile retrieval input
  - radiances, first-guess
- Profile retrieval processing
- Retrieved products (DPI)
  - moisture, stability
- DPI applications
  - monitor, numerically forecast, “nearcast”
- Other retrievals
  - cloud, O_3, SO_2
- Better profiles… more promotion

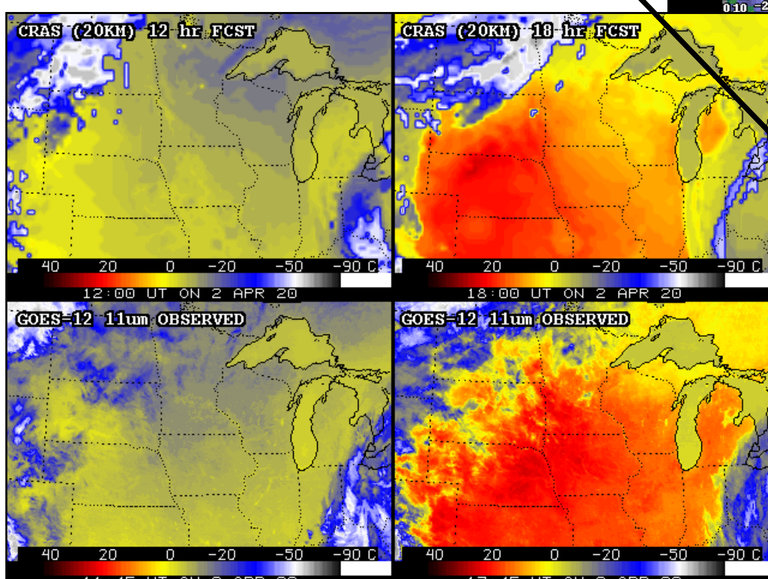
Fundamental CIMSS research: striving to make quality real-time GOES Sounder radiance **observations** into practical ***useful information*** for weather forecasting



Atmospheric continuity and evolution are clearly evident in multi-spectral **animation**.



Where will clouds be? Comparison between **observed** imagery (bottom) and **forecast** imagery (top) builds confidence in how well the CRAS model is assimilating retrieved GOES Sounder cloud and moisture information.



Where will forecast (GFS) moisture need to be modified, monitoring trends, to provide a better forecast for convection (as across Texas)? **Differences** between retrieved GOES Sounder **TPW** and the GFS forecast values are plotted over the GOES TPW Derived Product Imagery (DPI).

[1800 UT 2 Apr 2004]

Aspects of satellite applications: general to specific

Imagery (monitor [qualitative/quantitative], interpret)

Winds (measure motions)

Soundings (derive vertical profiles or quantities) [or imagery of]

Assimilation of above data into numerical models

Storm/cloud detection, synoptic interpretation, indicators of turbulence or instability, multi-spectral combinations ("true color" images; detection of fog, fire, smoke, volcanic ash, aerosols, snow, ice…)

Diagnostic wind fields (steering of tropical storms; synoptic dynamics)

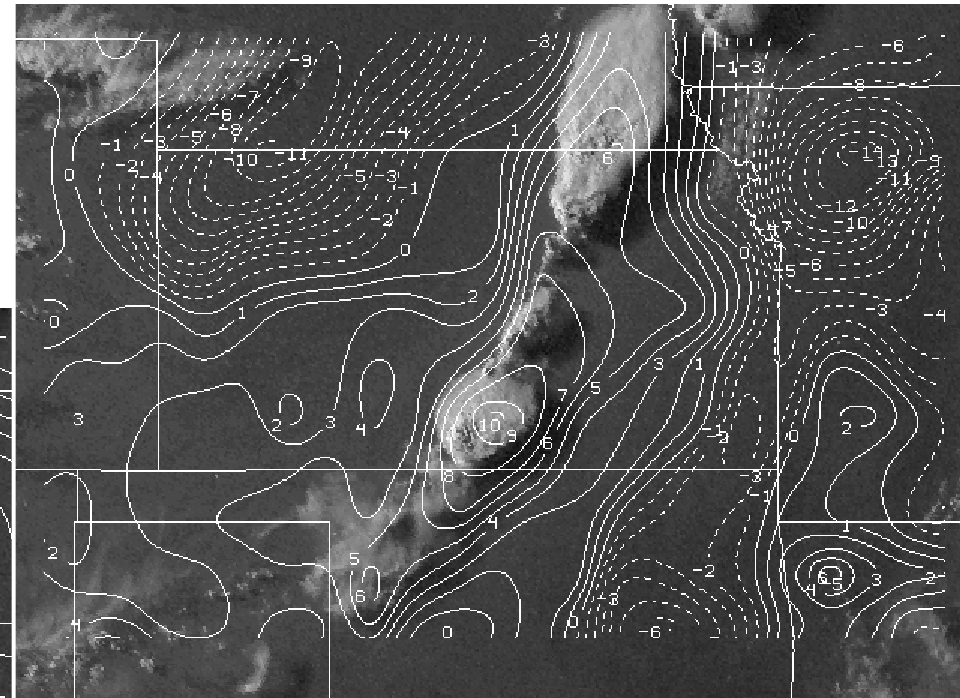
Fields of total precipitable water, atmospheric stability

Current Sounder Operational Uses

GOES Sounder Product	*Operational Use within the NWS*
Clear-sky Radiances	**Assimilation into** NCEP operational regional & global NWP models over water
Layer & Total Precipitable Water	**Assimilation into** NCEP operational regional & global NWP models; **display and animation within** NWS AWIPS for use by forecasters at NWS WFOs & National Centers in forecasting precipitation and severe weather
Cloud-top retrievals (pressure, temperature, cloud amount)	**Assimilation into** NCEP operational regional NWP models; **display and animation within** NWS AWIPS for use by forecasters at NWS WFOs; **supplement to** NWS/ASOS cloud measurements for generation of total cloud cover product at NWS/ASOS sites
Surface skin temperature	**Image display and animation within** NWS AWIPS for use by forecasters at NWS WFOs
Profiles of temperature & moisture	**Display (SKEW-Ts) within** NWS AWIPS for use by forecasters at NWS WFOs in forecasting precipitation and severe weather
Atmospheric stability indices	**Image display and animation within** NWS AWIPS for use by forecasters at NWS WFOs in forecasting precipitation and severe weather
Water Vapor Winds	**Image display and animation within** NWS AWIPS for use by forecasters at NWS WFOs

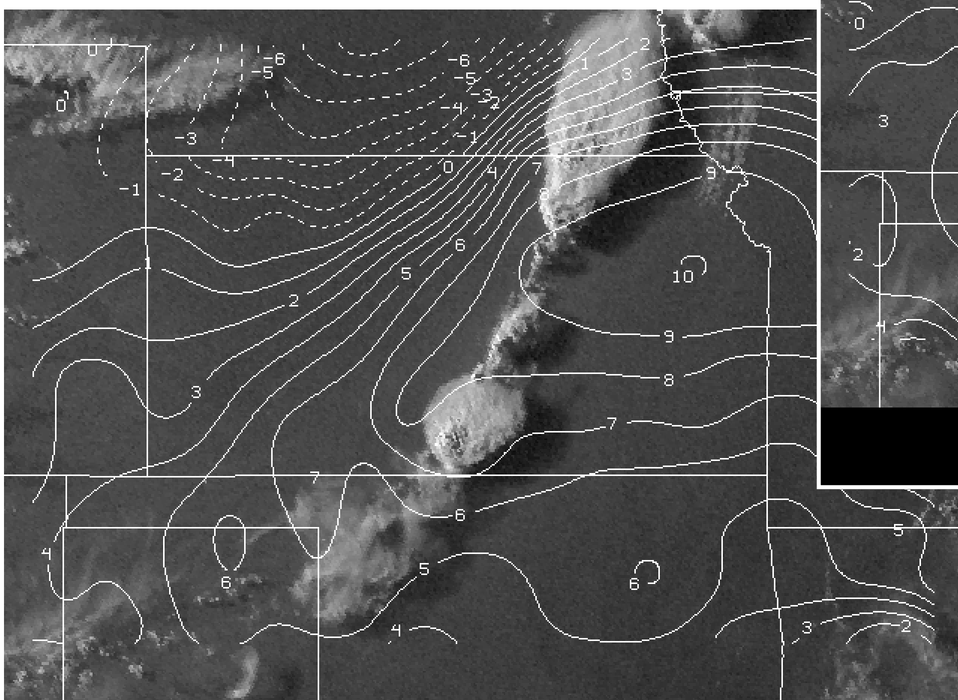
Temporal trends in GOES Sounder parameters

Change in total
precipitable water
from 1800 to 2200 UT
on 13 Jul 1997



GOES TPW (MM) TENDENCY 18Z - 22Z 7/13/97

Figure 15. GOES soundings change in TPW (mm), from 18Z-22Z, July 13, 1997, displayed over 00Z, 7/14/97 visible image.



ETA TPW (MM) TENDENCY 18Z - 22Z 7/13/97

Figure 14. ETA forecast change in TPW (mm), from 18Z-22Z, July 13, 1997, displayed over 00Z, 7/14/97 visible image.

GOES Sounder

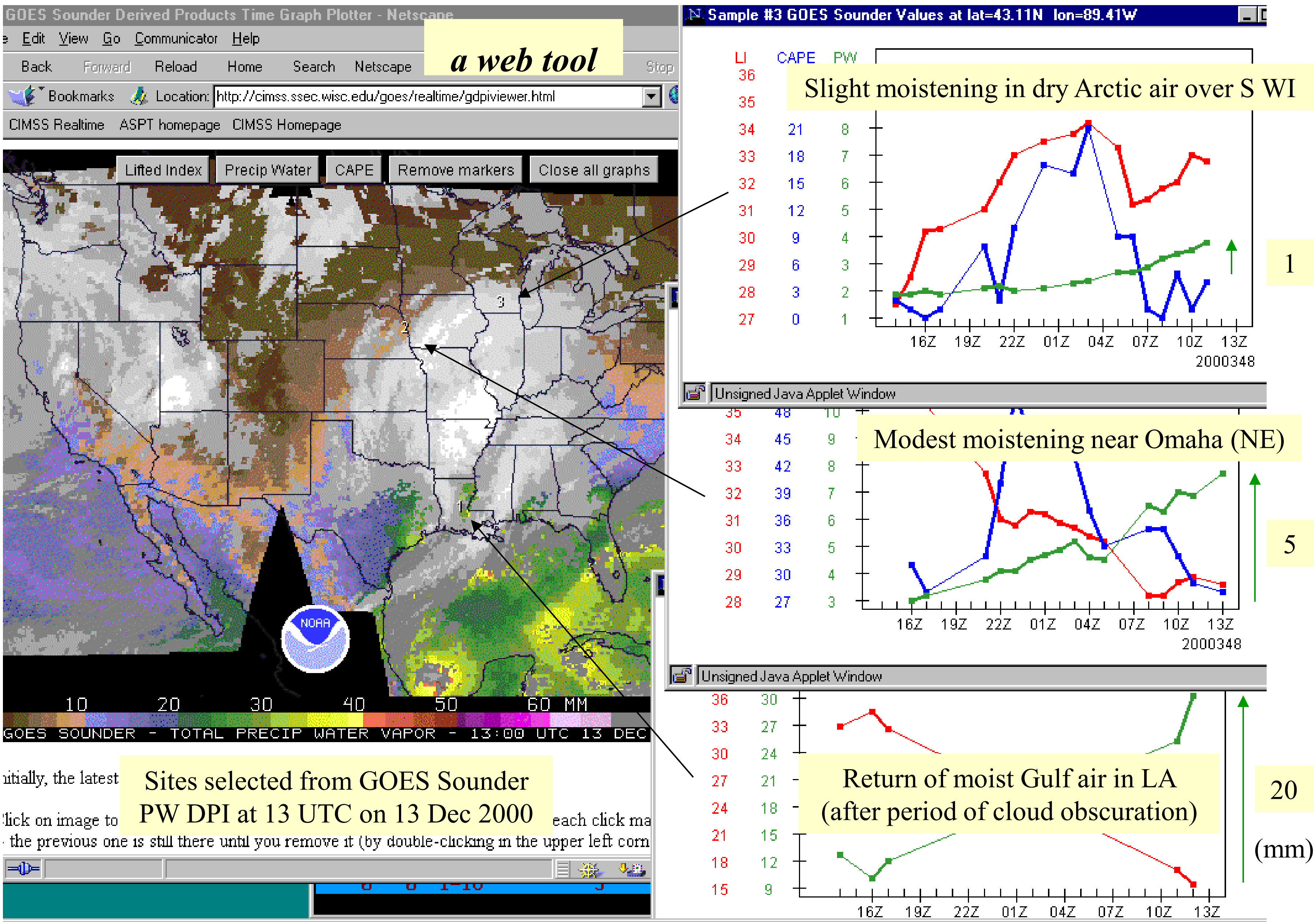
vs

ETA forecast

00 UT image

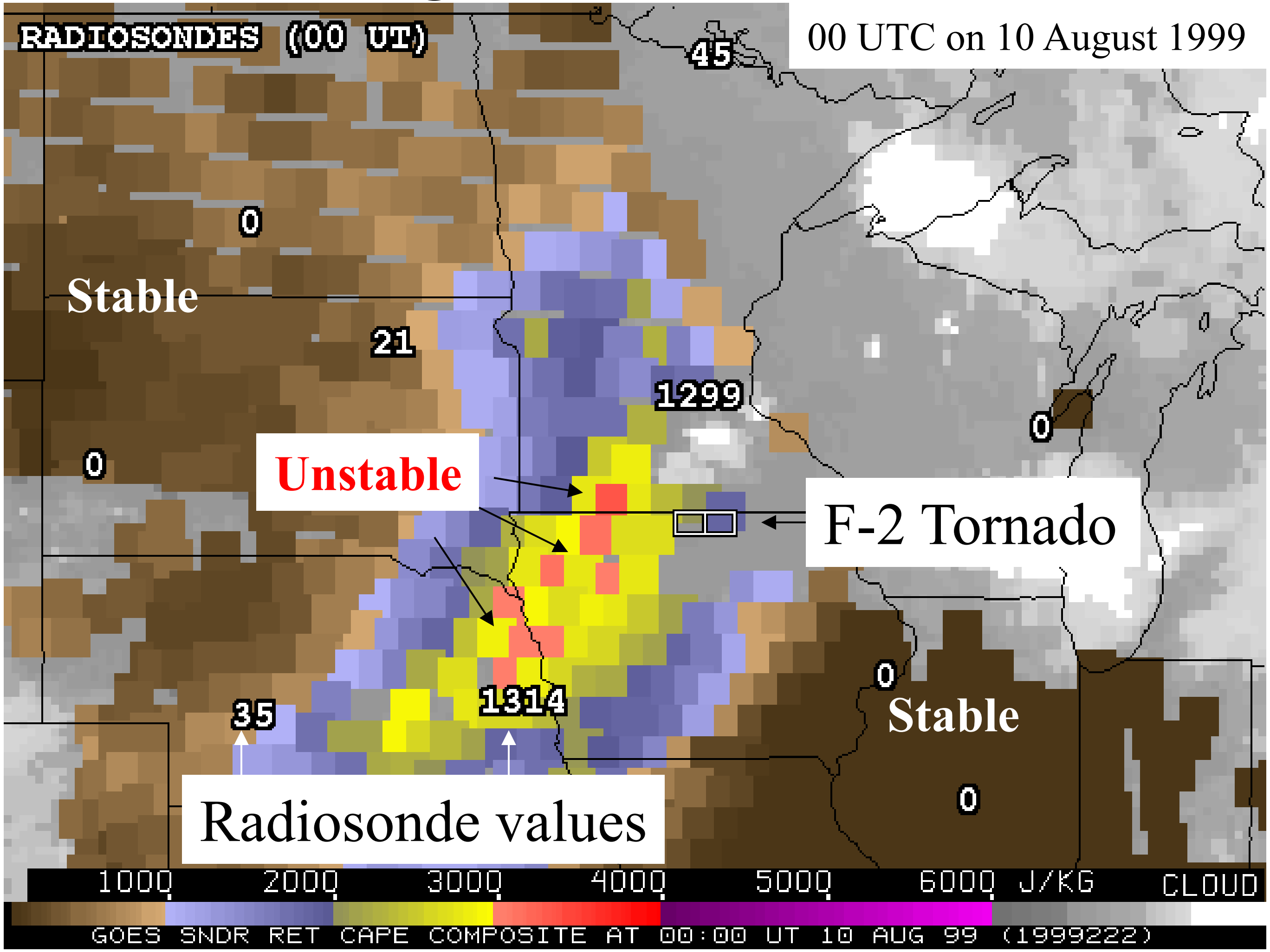
(Courtesy: J. Daniels et al.)

Example of PW trends in GOES DPI (time series plots) from 13 December 2000



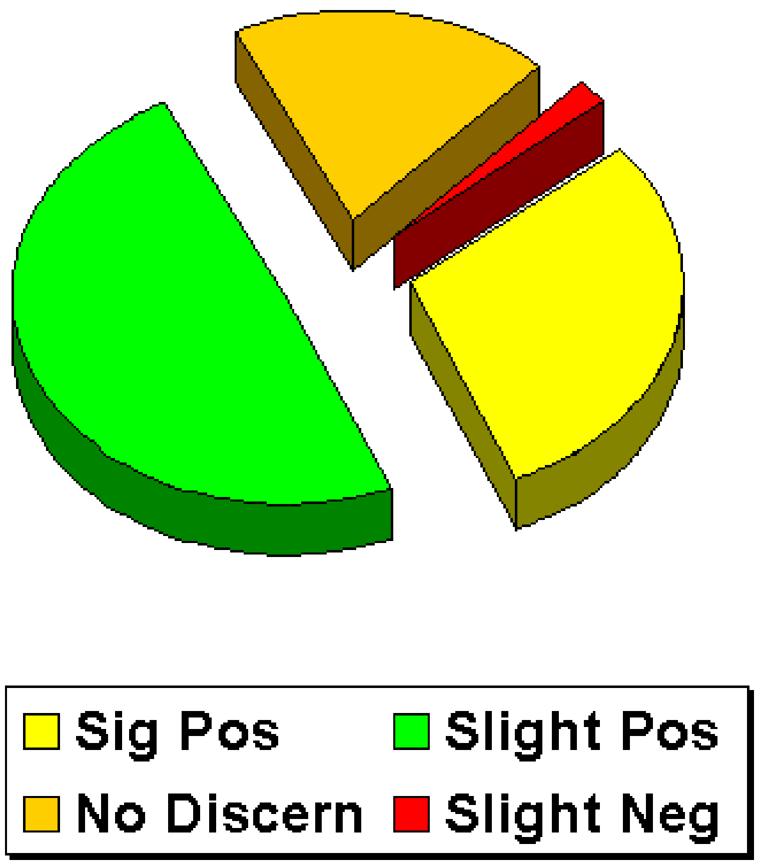
A Derived Product Image of CAPE from the GOES-8 Sounder

NOAA
NESDIS
ORA
ARAD
ASPT



Geostationary Operational Environmental Satellite (GOES)-8 Sounder Convective Available Potential Energy (CAPE) values. The axis of CAPE values greater than 2500 J/kg extended from eastern Nebraska into southern Minnesota. CAPE values calculated from the 00 UTC radiosondes were too sparse to capture this feature. The two counties outlined in northern Iowa show the location of an F-2 tornado that occurred just over two hours later. A NWS forecaster used Sounder data to help correctly forecast this event.

Atmospheric Instability

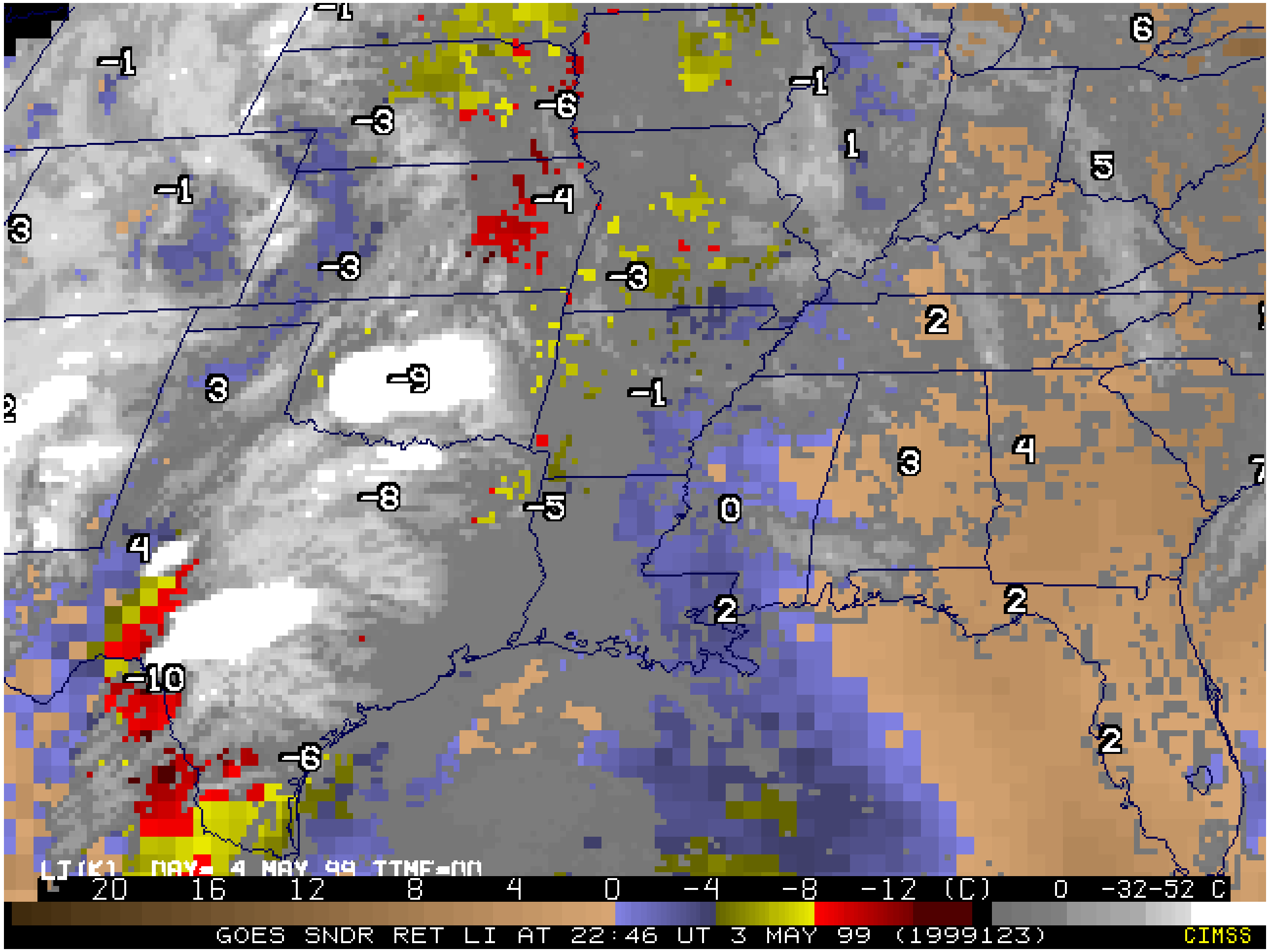


NWS Forecaster responses (Summer of 1999) to: "Rate the usefulness of LI, CAPE & CINH (changes in time/axes/gradients in the hourly product) for location/timing of thunderstorms."

There were 248 valid weather cases.

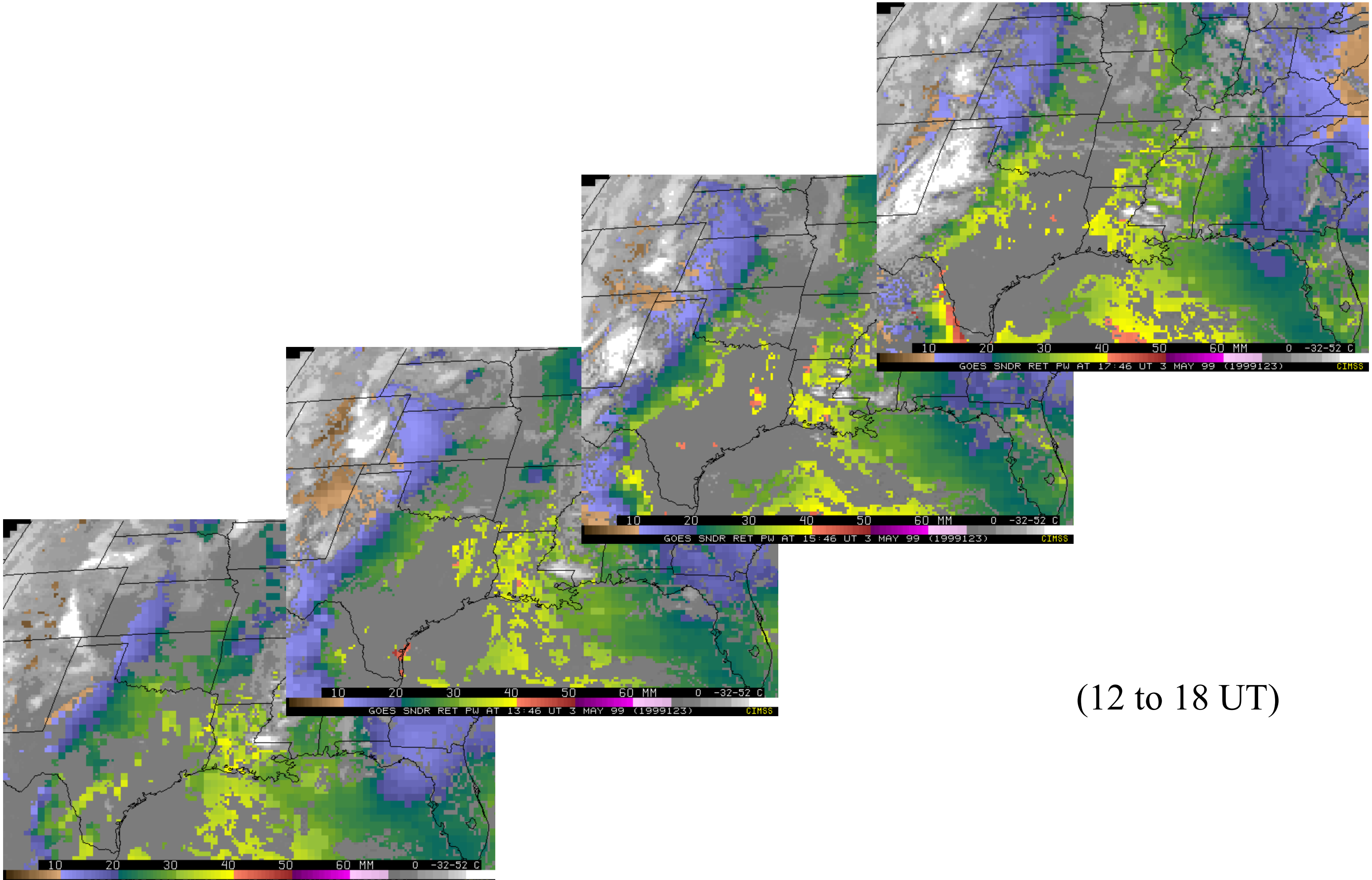
- Significant Positive Impact (30%)
- Slight Positive Impact (49%)
- No Discernible Impact (19%)
- Slight Negative Impact (2%)
- Significant Negative Impact (0)

GOES DPI on 3 May 1999 over south central US



Strong tornadoes had developed in southwest Oklahoma by the late afternoon (before 22 UT). How had things looked beforehand from the GOES Sounder ?

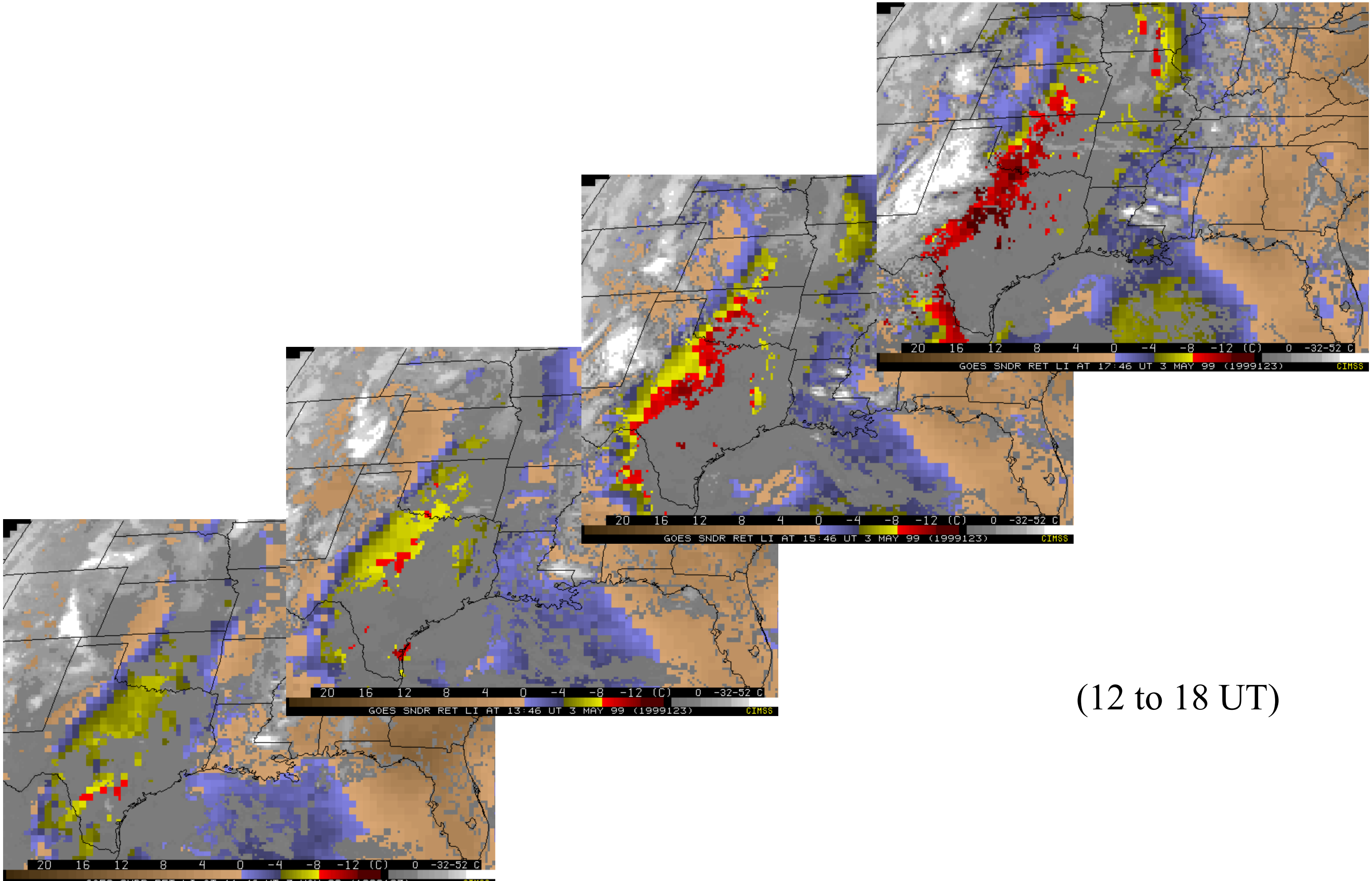
Evolution of moisture as seen in GOES PW DPI



(12 to 18 UT)

Java animation: anigpw3m.html

Evolution of stability as seen in GOES LI DPI

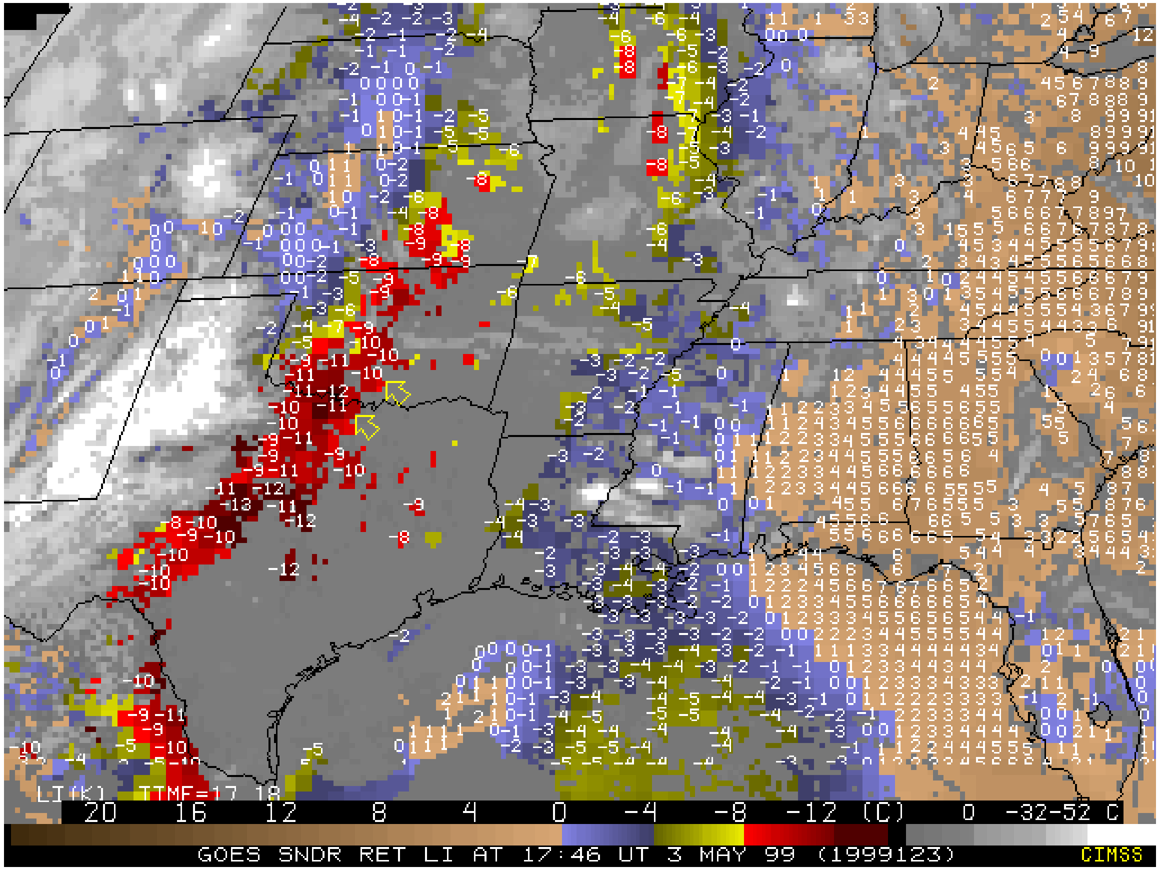


(12 to 18 UT)

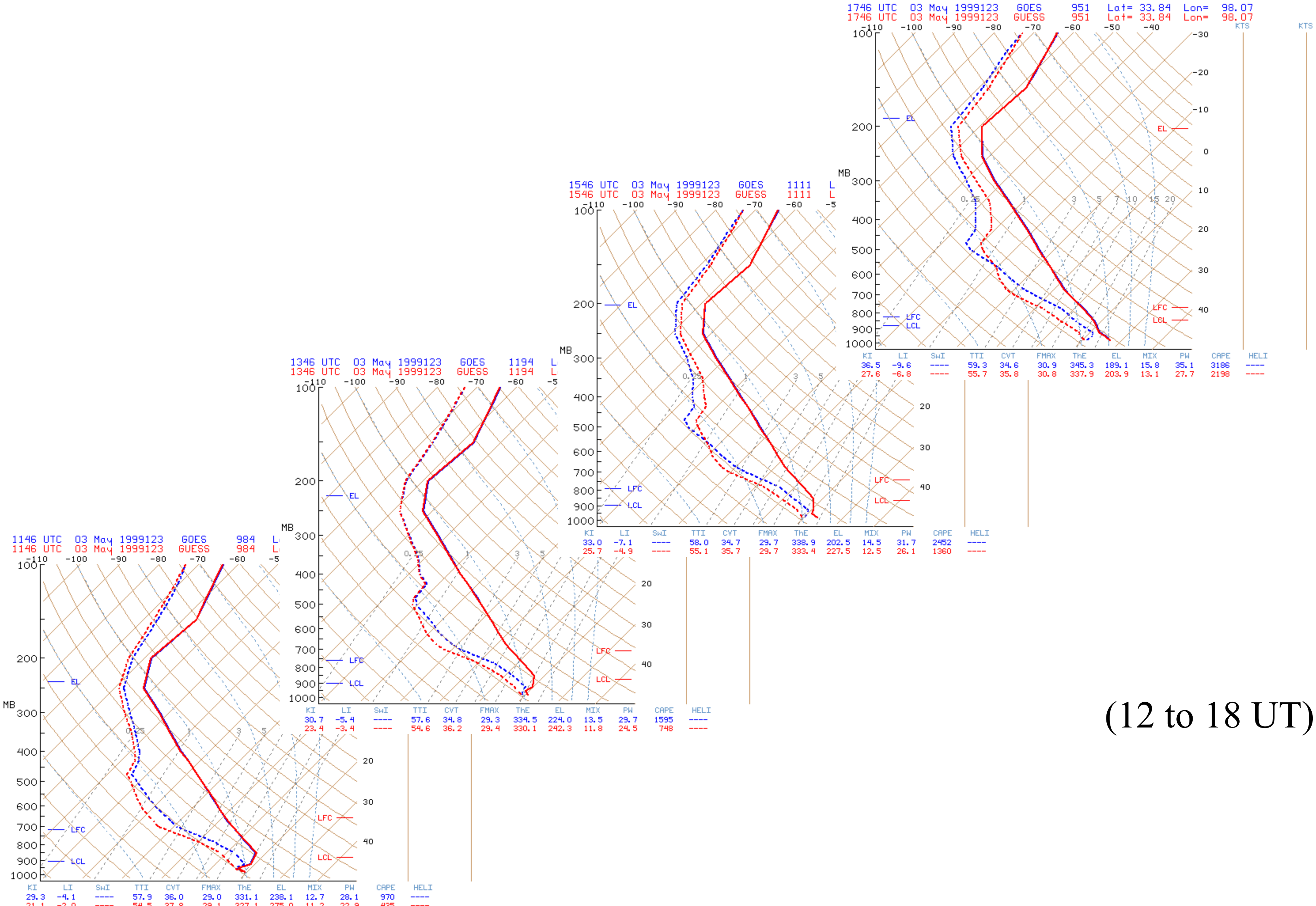
Java animation: anigli3m.html

Vertical profile comparisons (GOES versus first-guess)

Clearing persisted over the N central TX and S central OK region until 20 UT on 03 May 1999. Comparisons of GOES and first-guess profiles, in Skew-T/log-P format, show little change in temperature but markedly more moist GOES profiles in general, with drier GOES profiles aloft over the later hours.



Evolution of profiles retrieved from the GOES Sounder



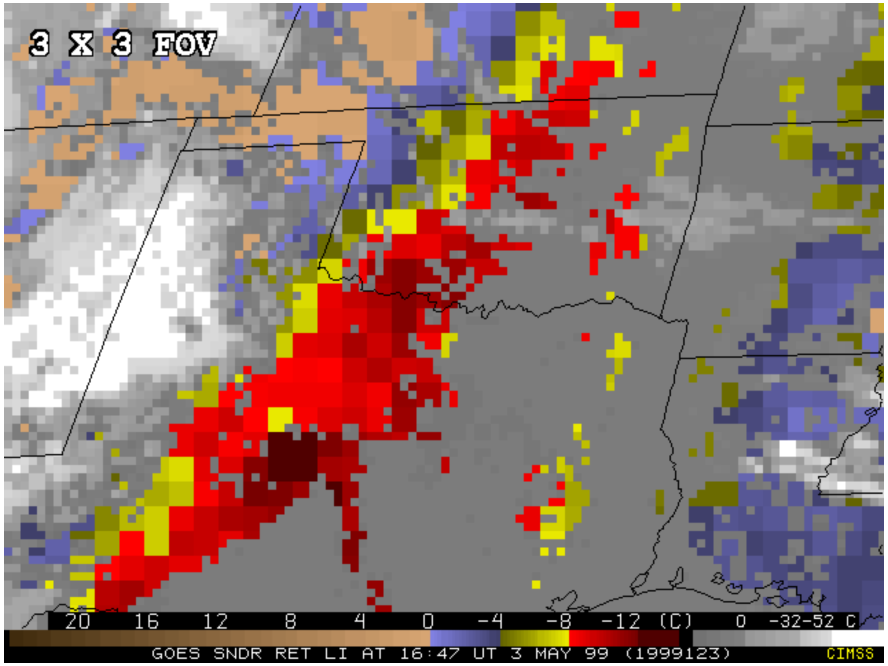
(12 to 18 UT)

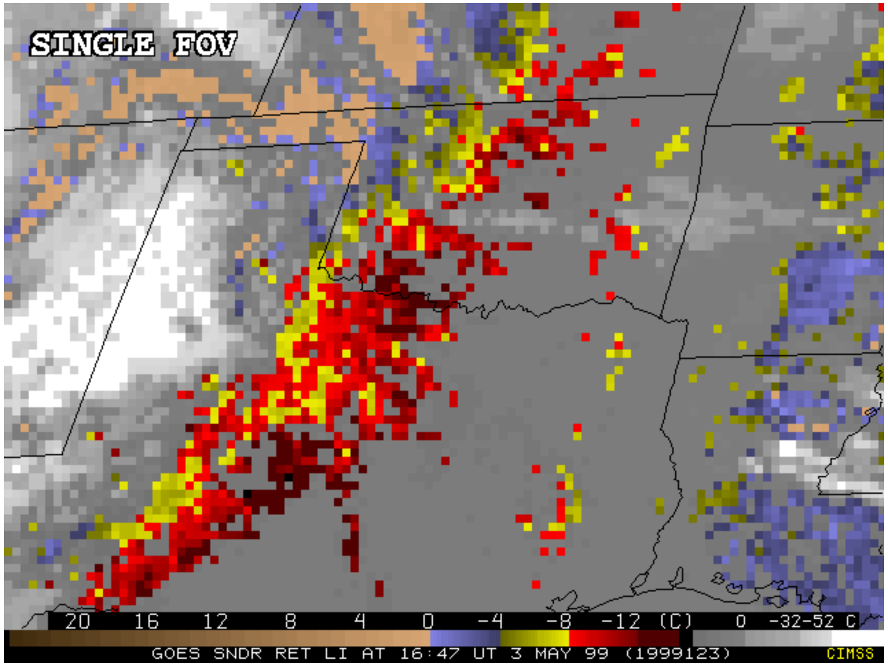
Java animation: anisks3m.html

Single FOV full resolution DPI from the Sounder

Complete radiative transfer calculations are done for 3x3 FOV box areas, using cloud-cleared, spatially averaged radiance observations. The matrix inversion solution coefficients can then be re-applied to the radiances for any individual clear FOV, effectively producing single FOV retrievals.

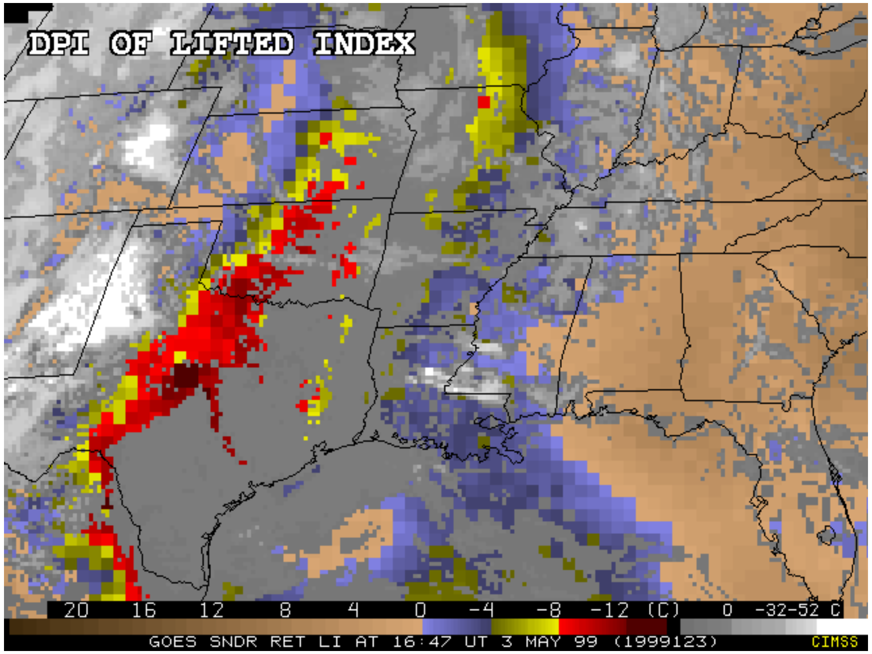
Computational loading and consideration of noise levels at the single FOV scale have slowed implementation.

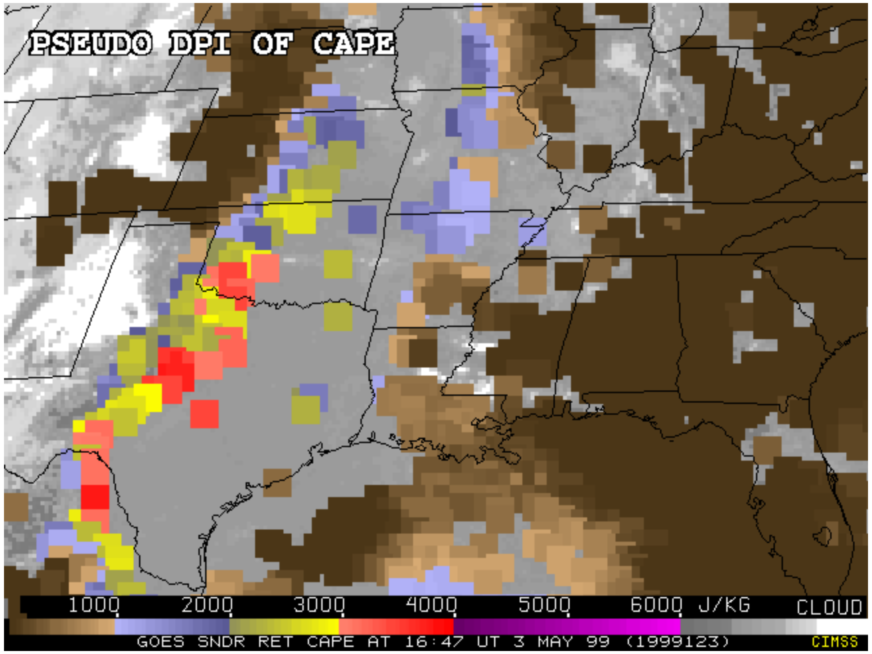




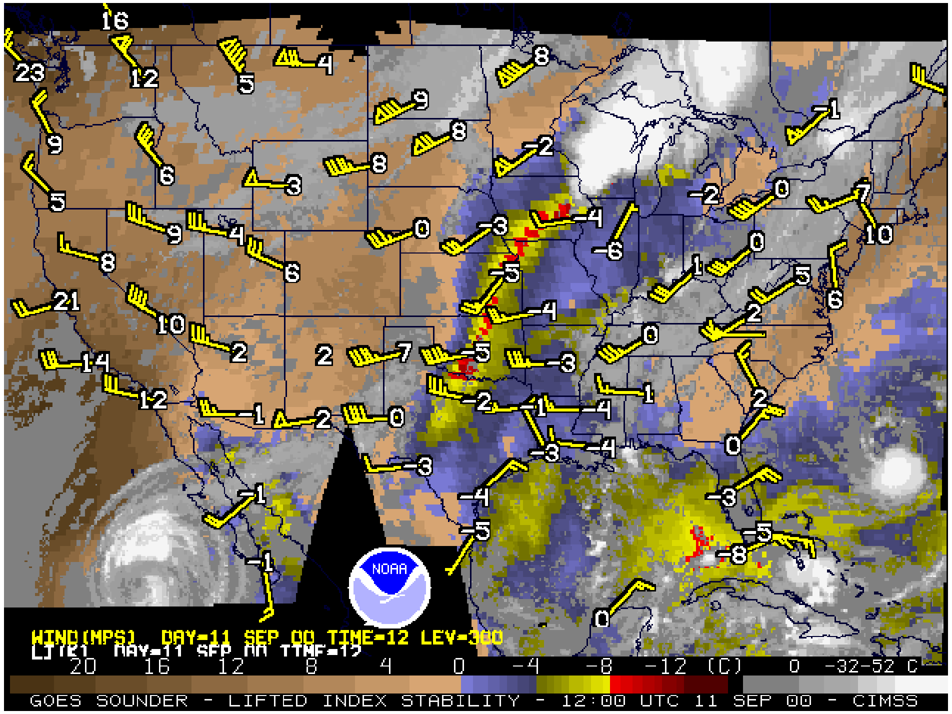
Expanding the suite of products generated as DPI

Any parameter (500 mb temperature…) or derived quantity (CAPE…) from an atmospheric profile can be displayed as a DPI. Limited vertical resolution has traditionally driven the initial products to be more bulk type, integrated parameters (PW, LI). However, a "pseudo" DPI can be created from a retrieval file, where the given retrieval value is projected over a small radius while clouds are still blended as before.

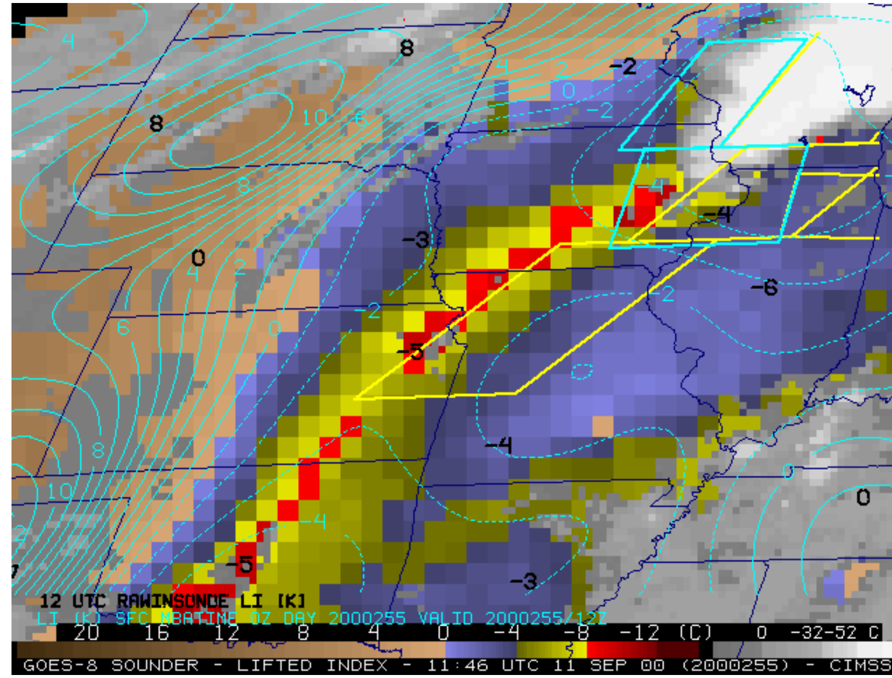




12 UTC Sounder LI



Zoomed in view:



With Eta forecast and watch boxes

EXCESSIVE RAINFALL POTENTIAL OUTLOOK

HYDROMETEOROLOGICAL PREDICTION CENTER...NWS...CAMP SPRINGS MD

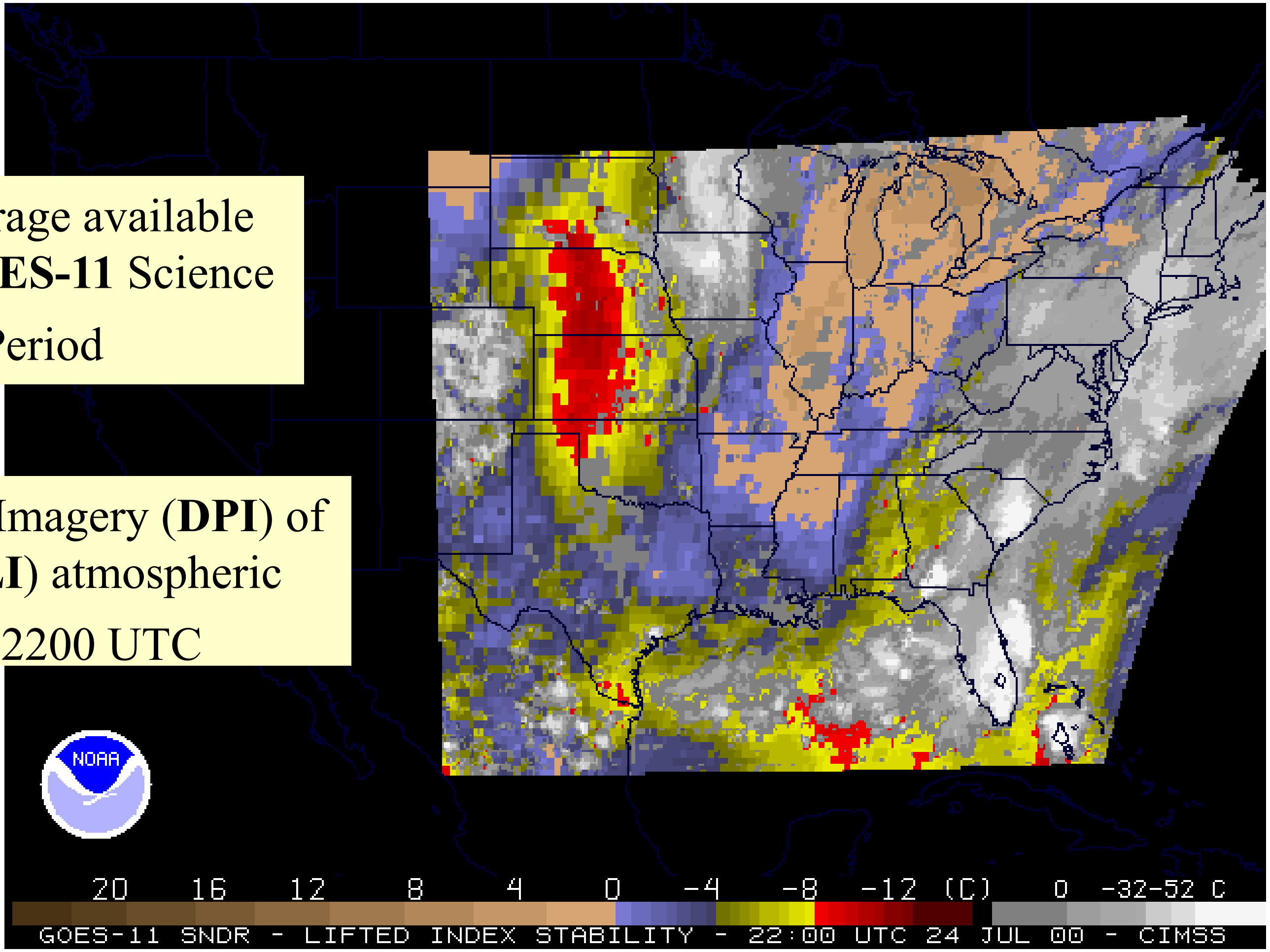
GOES SOUNDER DATA SHOWS THAT PWS SOUTH OF THE OUTFLOW BOUNDARY ARE IN THE 1.60 TO 1.70 INCH RANGE. THE SOUNDER DATA ALSO INDICATES THAT THE AIRMASS TO THE WEST ACROSS IL IS CONTINUING TO DESTABILIZE. ALL THE ABOVE ARGUE FOR THE POTENTIAL FOR ISOLD 3 TO 5 INCH RAINFALL BEFORE THE SYSTEM STARTS SHIFTING EWD.

Janesville, WI received 4 inches of rain; Sullivan, WI had 3 inches.

Application of GOES Sounder Products for the severe weather situation of 24-25 July 2000 over the north central US

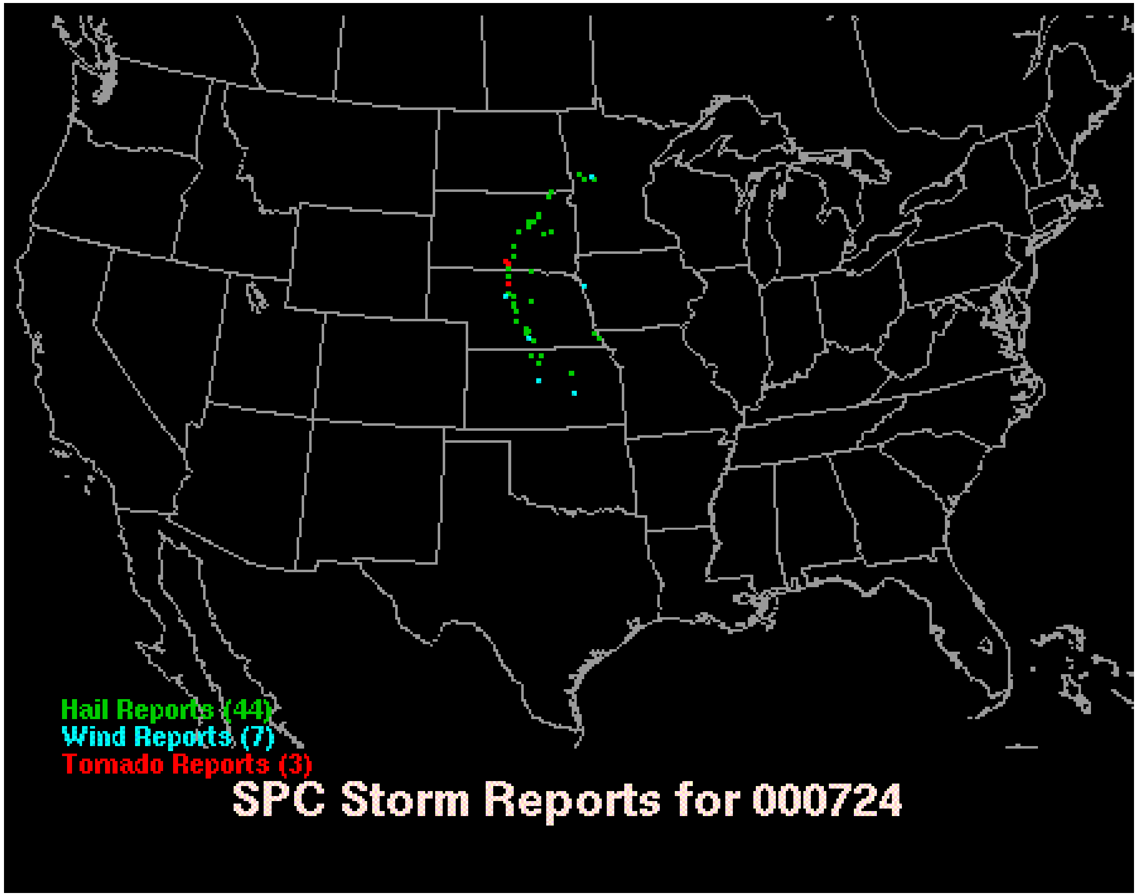
Routine coverage available during the **GOES-11** Science Test Period

Derived Product Imagery (**DPI**) of Lifted Index (**LI**) atmospheric stability at 2200 UTC



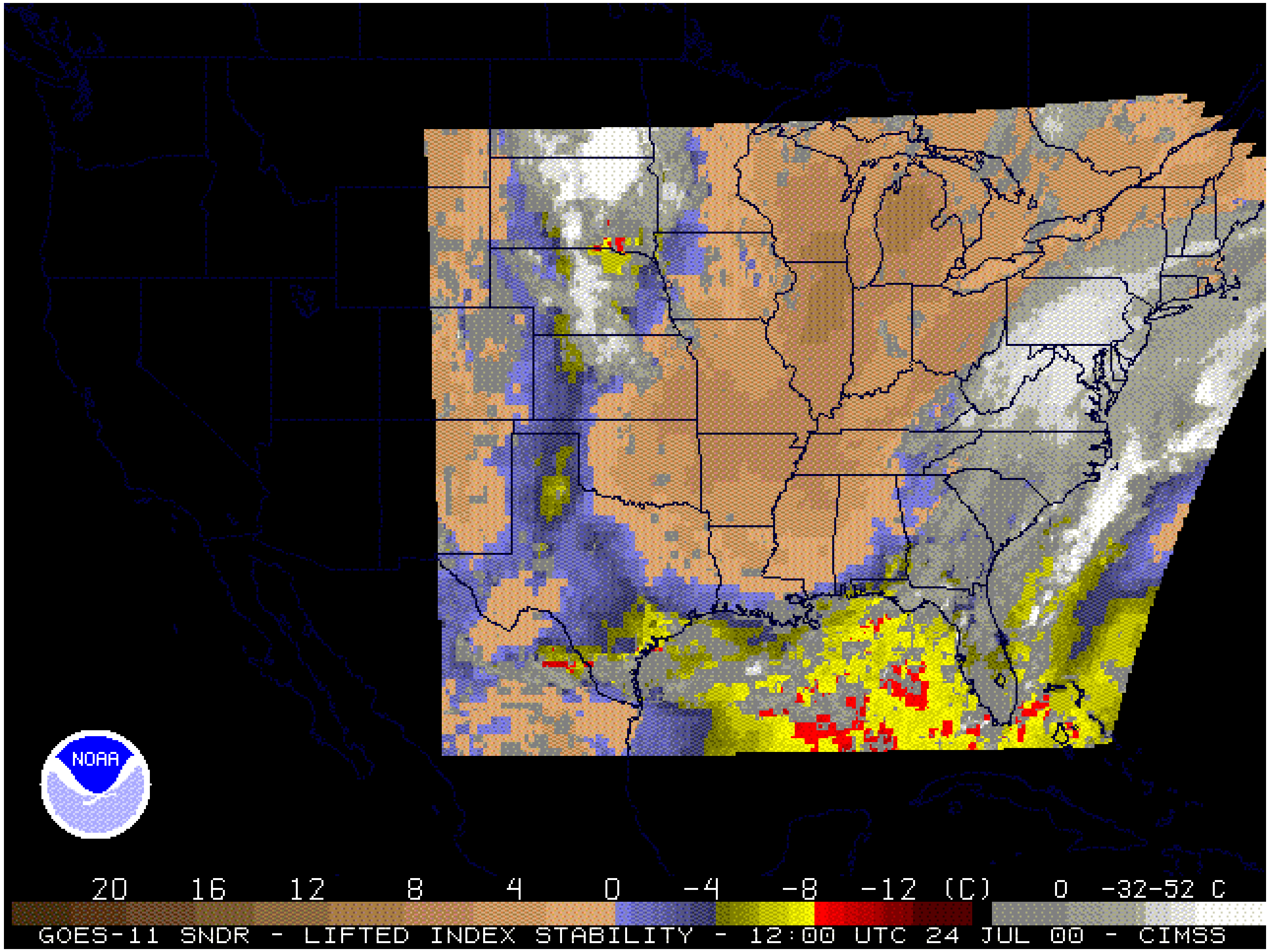
Decreasing stability →

Preliminary storm reports for 24-25 July 2000 from the NOAA/NWS/NCEP Storm Prediction Center

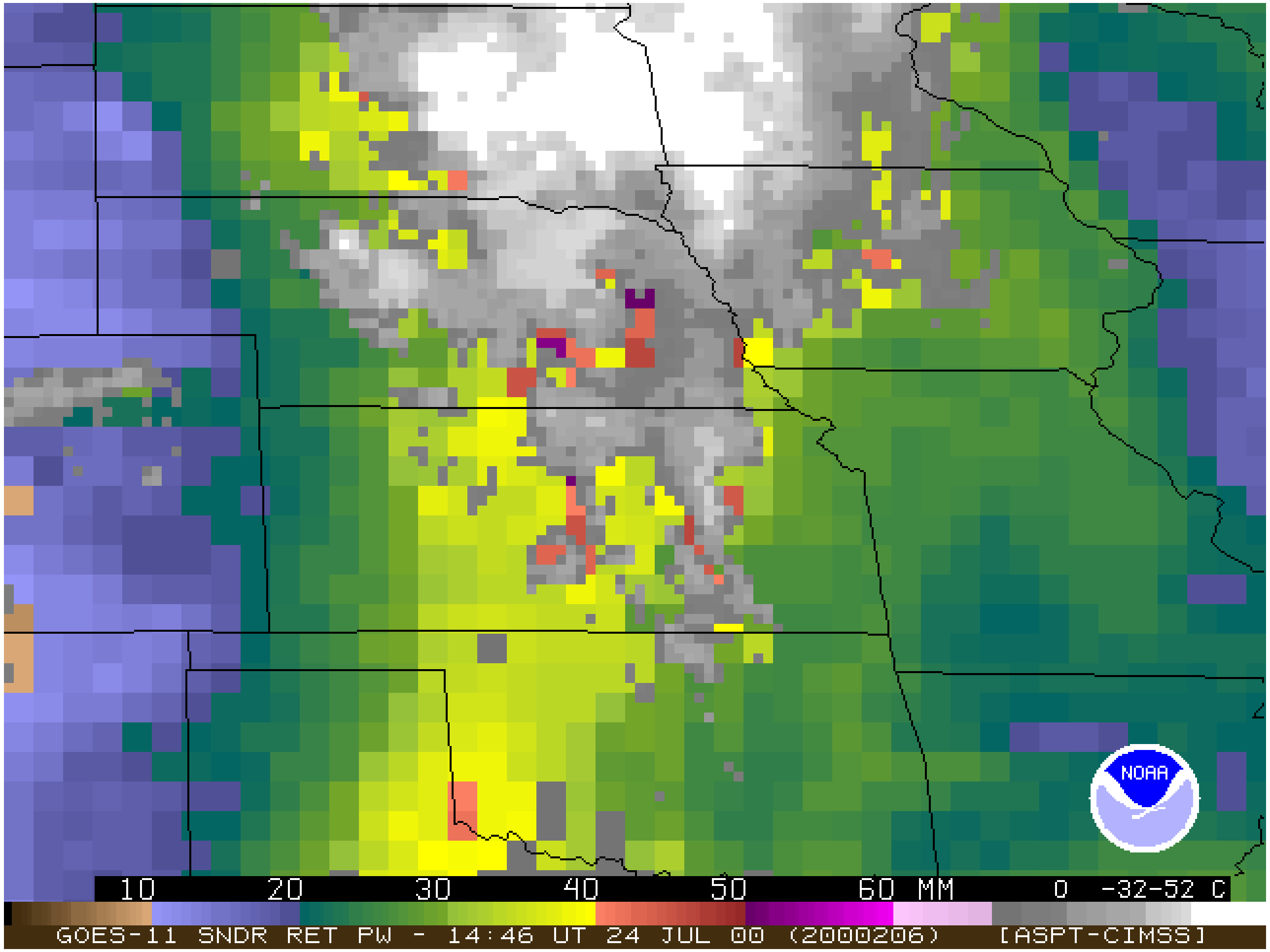


Note: All data is considered preliminary

Hourly animation of GOES-11 Sounder LI DPI from 1200 UTC on 24 July 2000 to 12 UTC on 25 July 2000

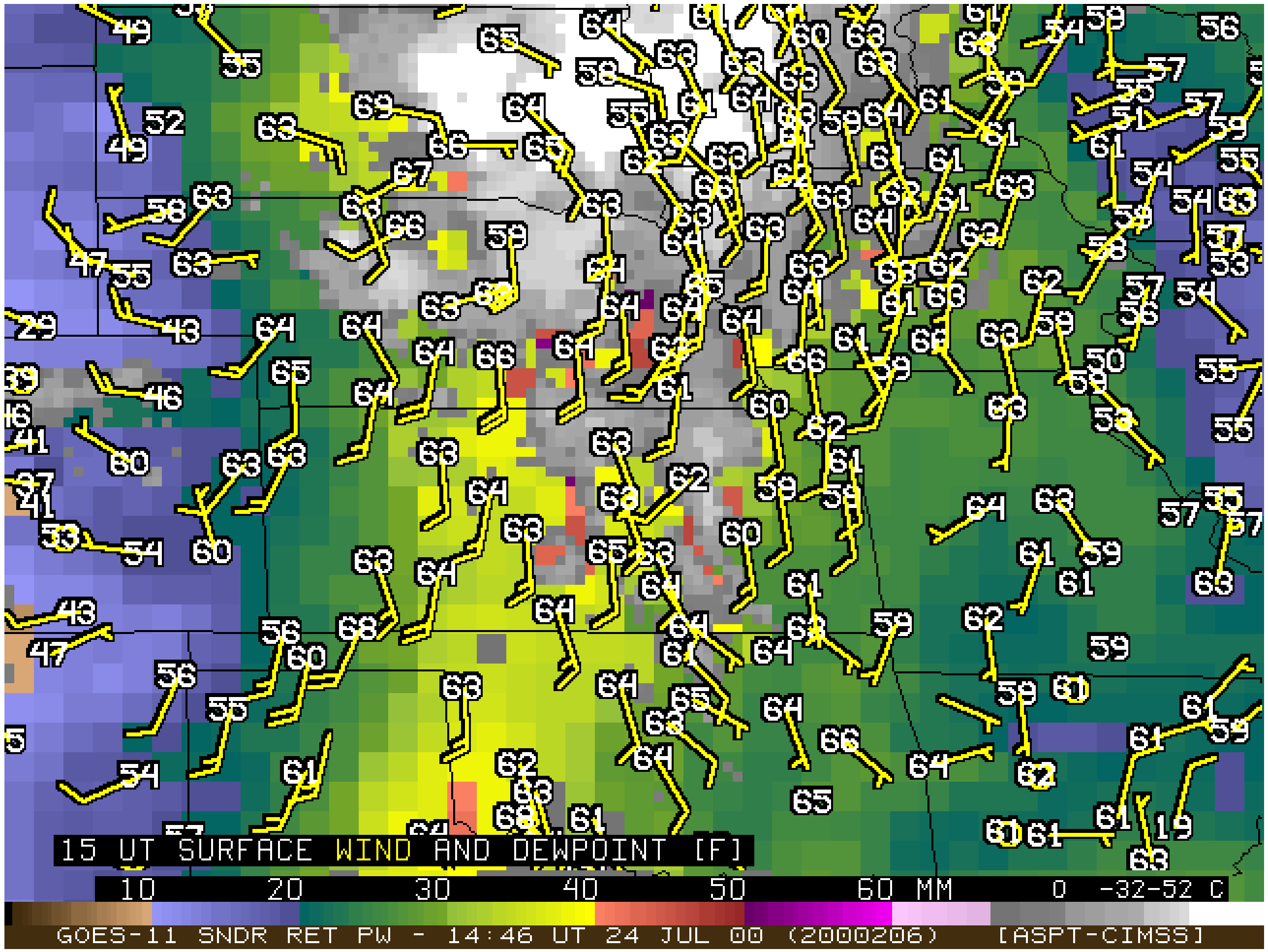


GOES Sounder total precipitable water (PW) shows ample available moisture on morning of 24 July 2000.



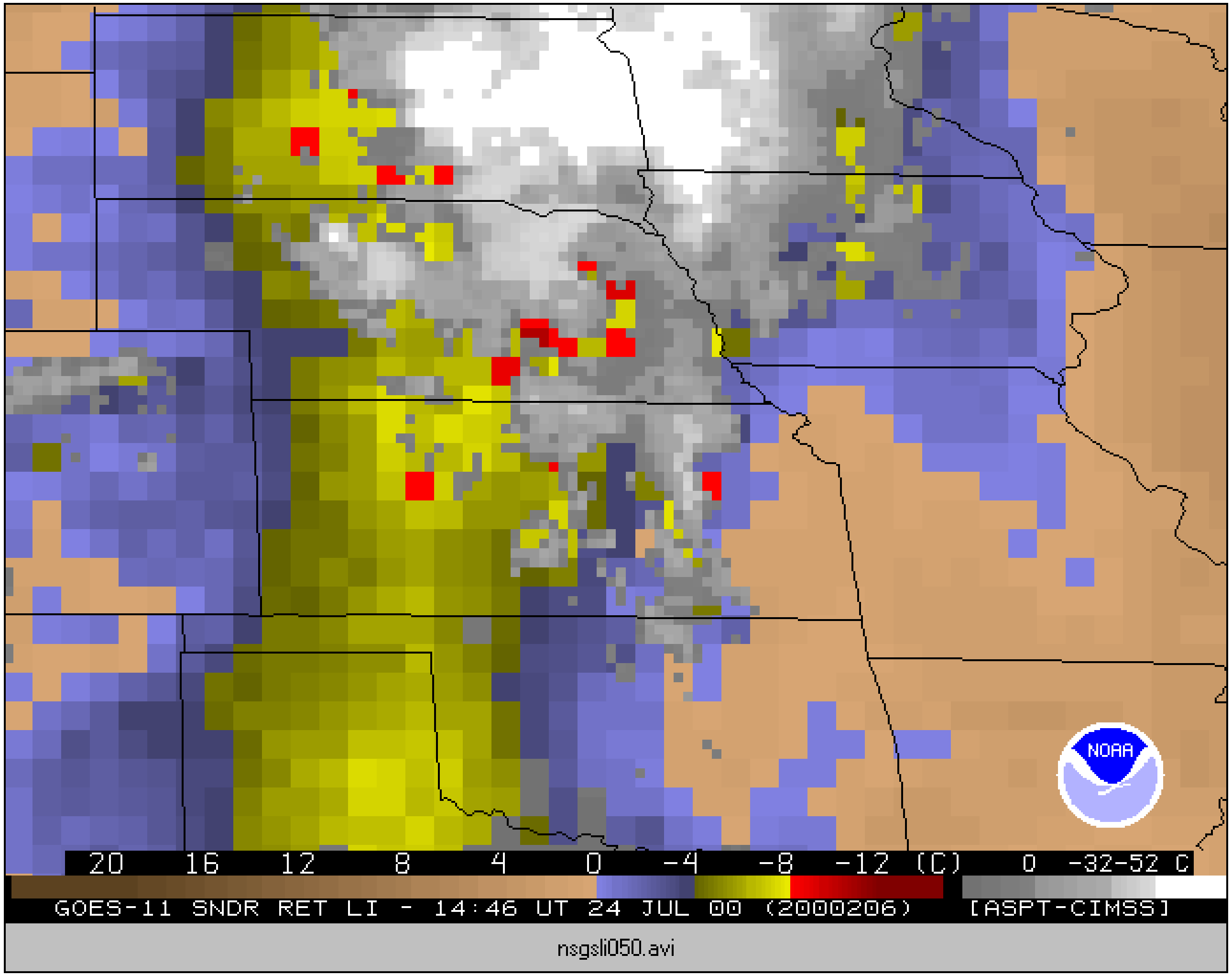
With low pressure in the Dakotas, strong southerly surface winds bring high dewpoint (64F+) air from OK across KS and NE to E SD and SW MN.

GOES Sounder total precipitable water (PW) shows ample available moisture on morning of 24 July 2000.



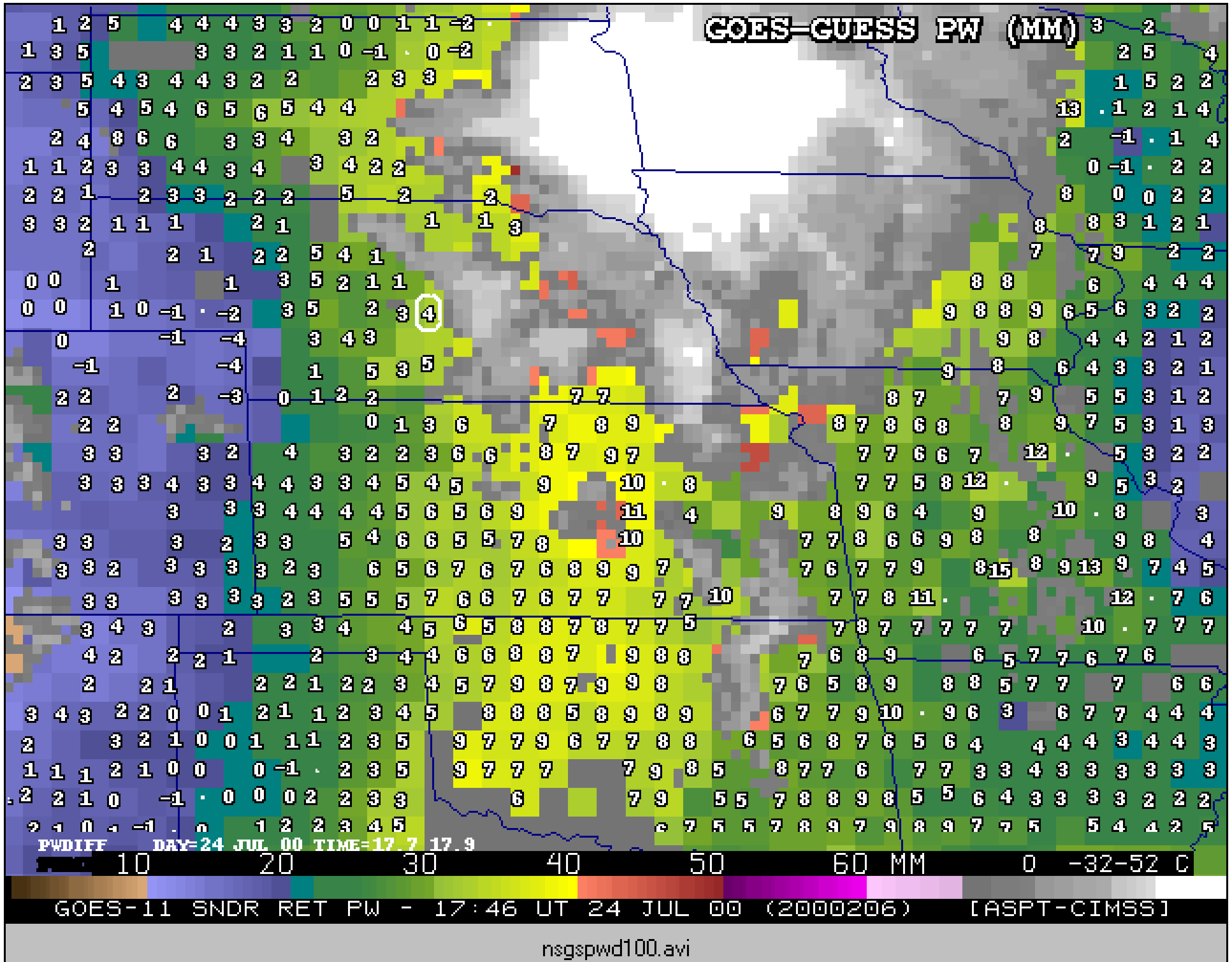
With low pressure in the Dakotas, strong southerly surface winds bring high dewpoint (64F+) air from OK across KS and NE to E SD and SW MN.

GOES Sounder Lifted Index indicates a strong axis of instability during the day and into the evening of 24 July 2000.



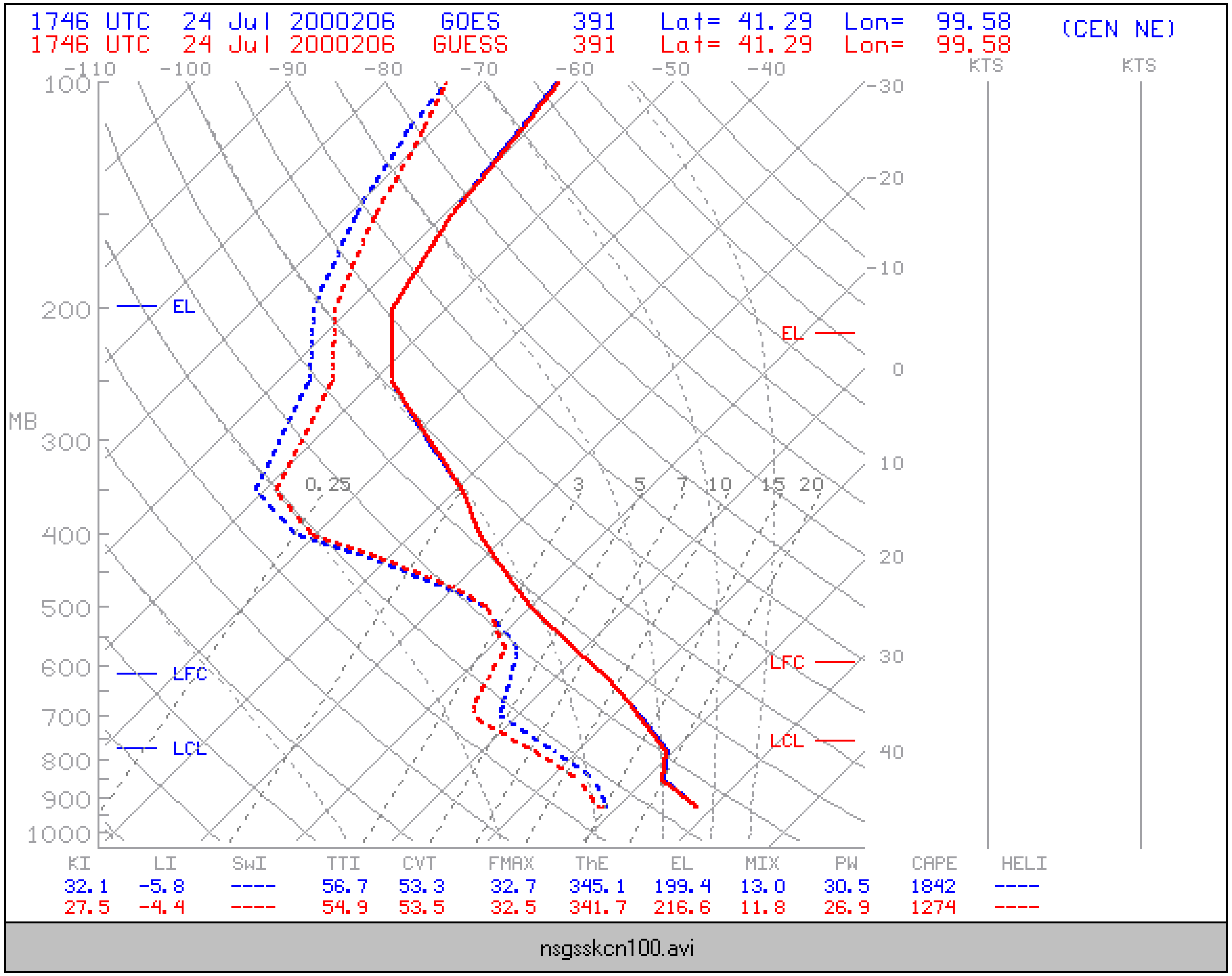
The LI is a measure of how the environment of the middle troposphere compares to a representative air parcel lifted from the surface.

“GOES - guess” differences of total PW show a dominance of GOES moistening of the first guess on 24 July 2000.



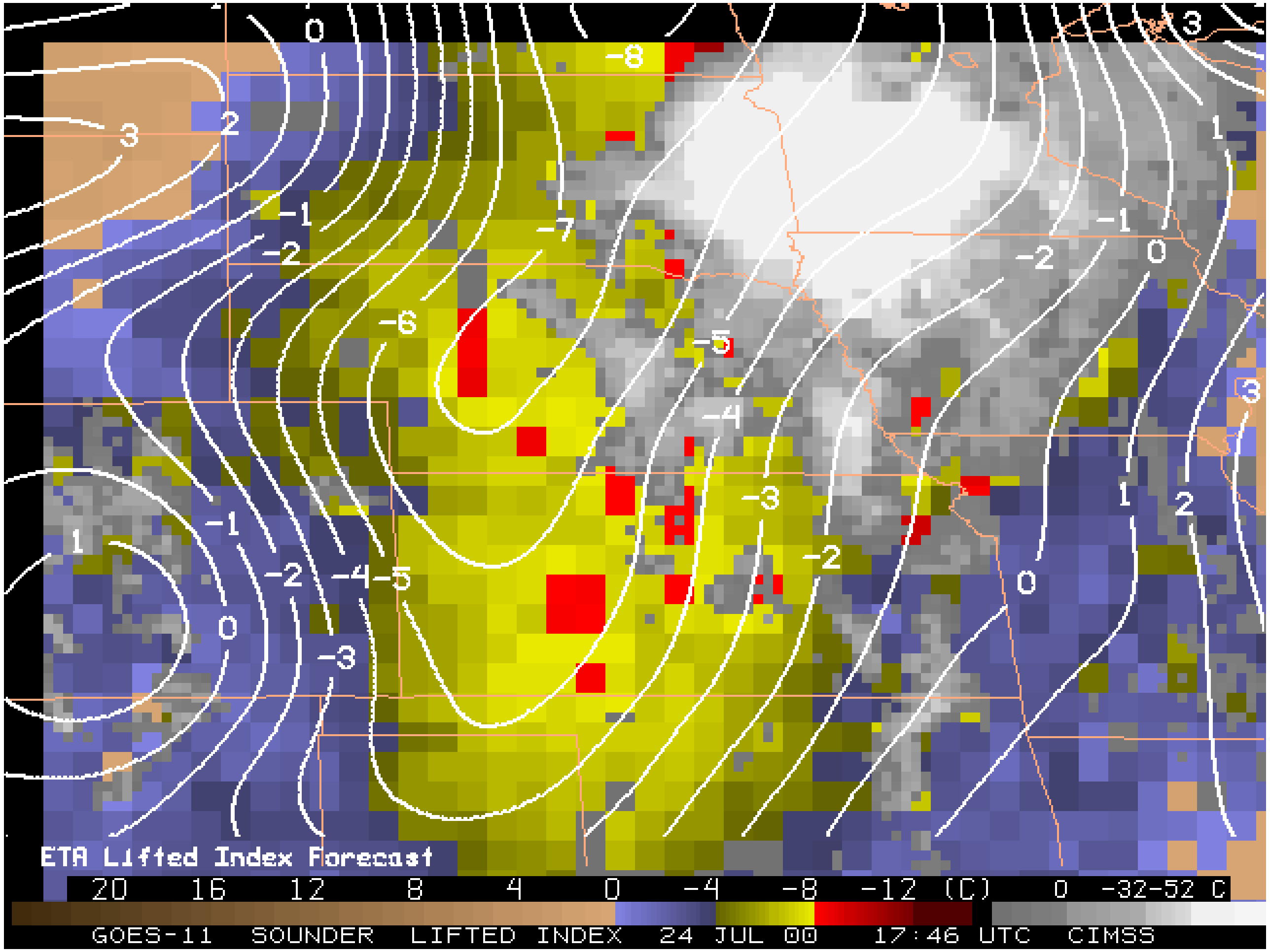
Persistent moist adjustment is evident from OK and AR through E NE while relative drying is seen along the SD/MN border.

Evolution of GOES profiles during afternoon of 24 July 2000 shows moistening, drying, and minimal temperature change.

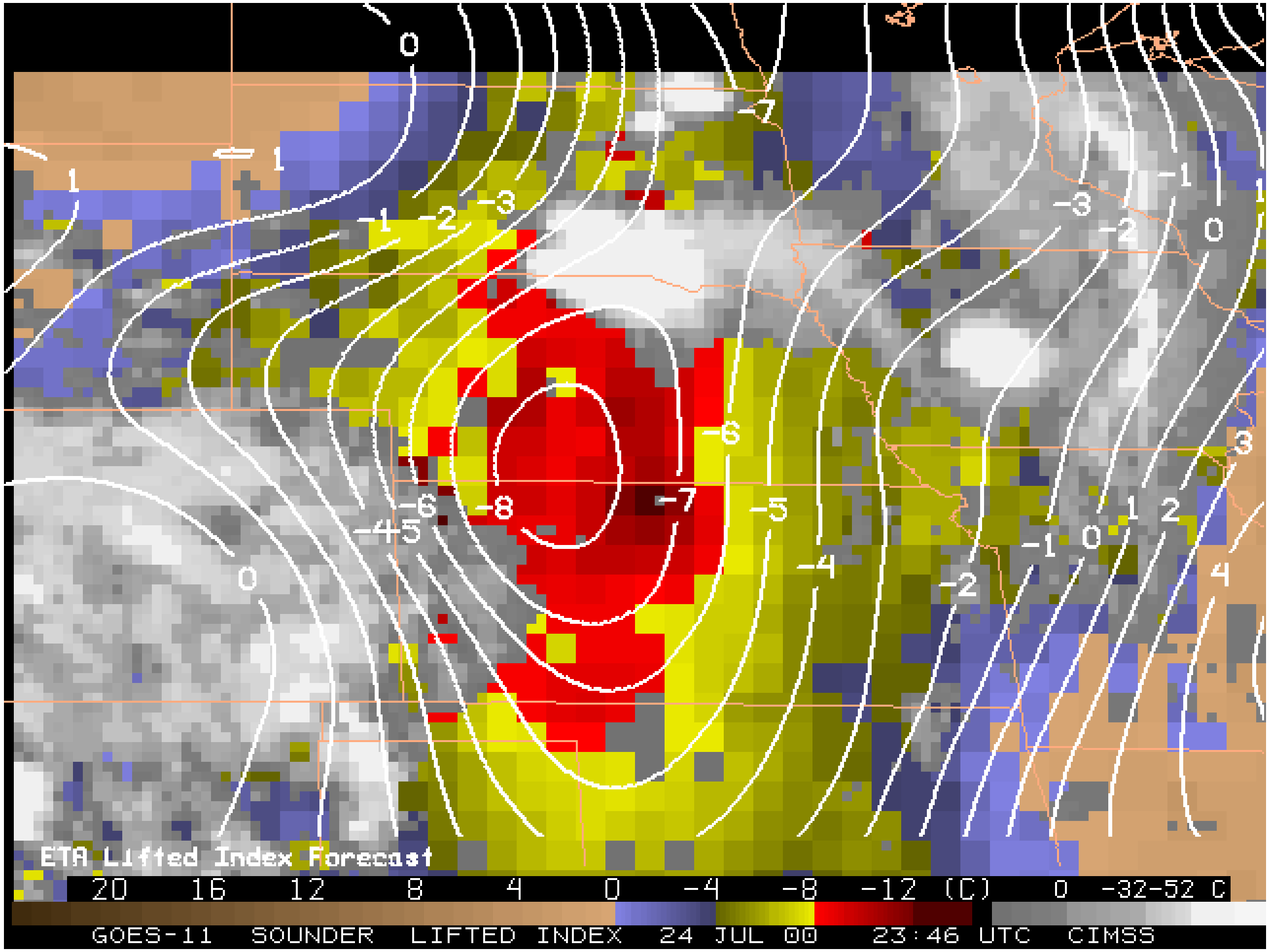


GOES stability adjustments are restricted to impact from low level moistening, as diurnal temperature changes follow the guess.

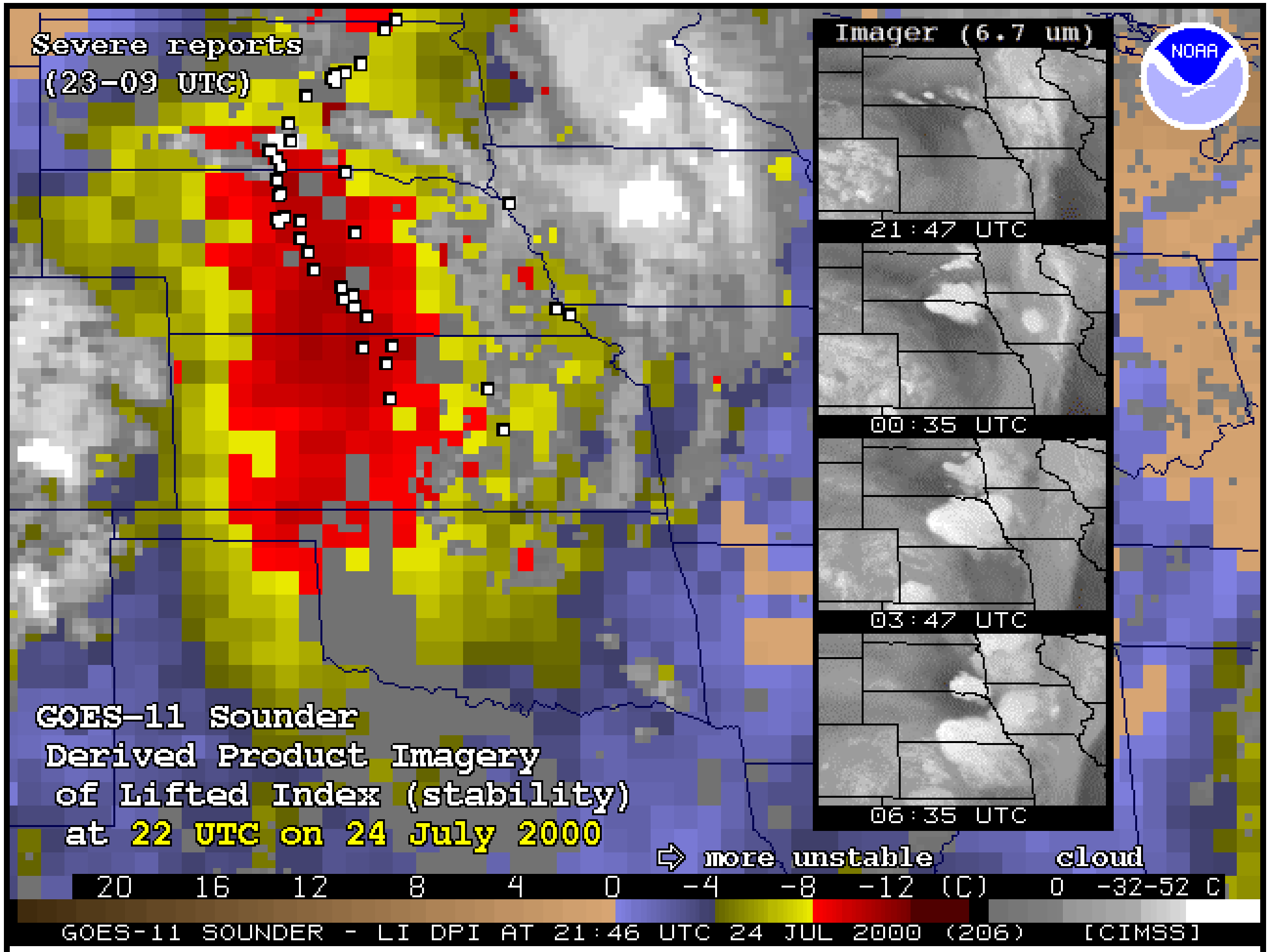
Comparison of GOES-11 Sounder **LI** DPI with ETA model forecast valid at 1800 UTC on 24 July 2000



Comparison of GOES-11 Sounder **LI** DPI with ETA model forecast valid at 0000 UTC on 25 July 2000

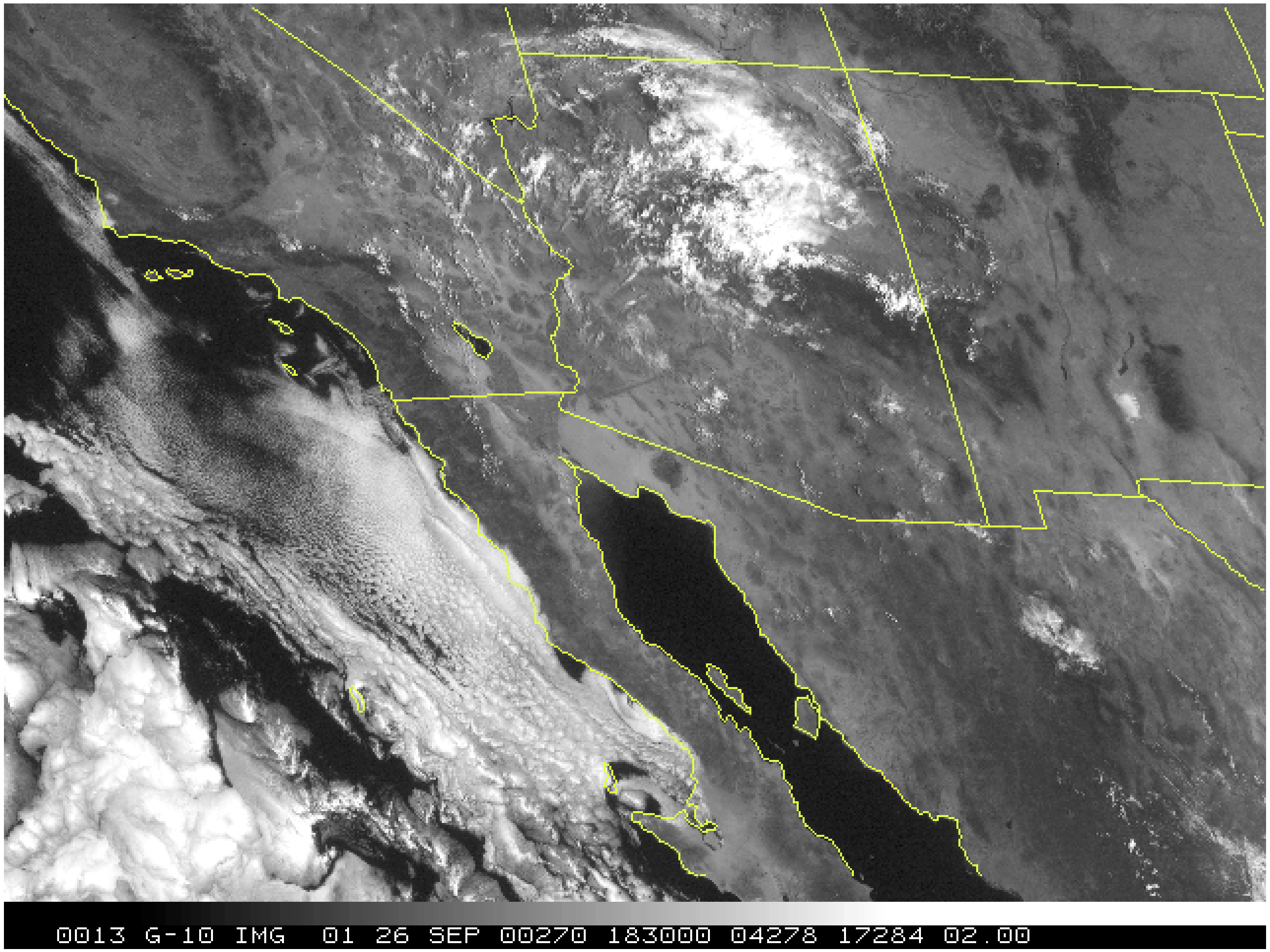


Example of GOES Sounder Lifted Index (stability) DPI from 24 July 2000



The GOES-11 Sounder depicted an axis of large atmospheric instability (red region) prior to a long-lived super cell. The development is shown by a time sequence of the GOES-11 Imager water vapor imagery. Subsequent severe weather reports illustrate the storm track.

A look at how GOES Sounder data may influence a typical routine forecasting situation - moist return in the Southwest US.

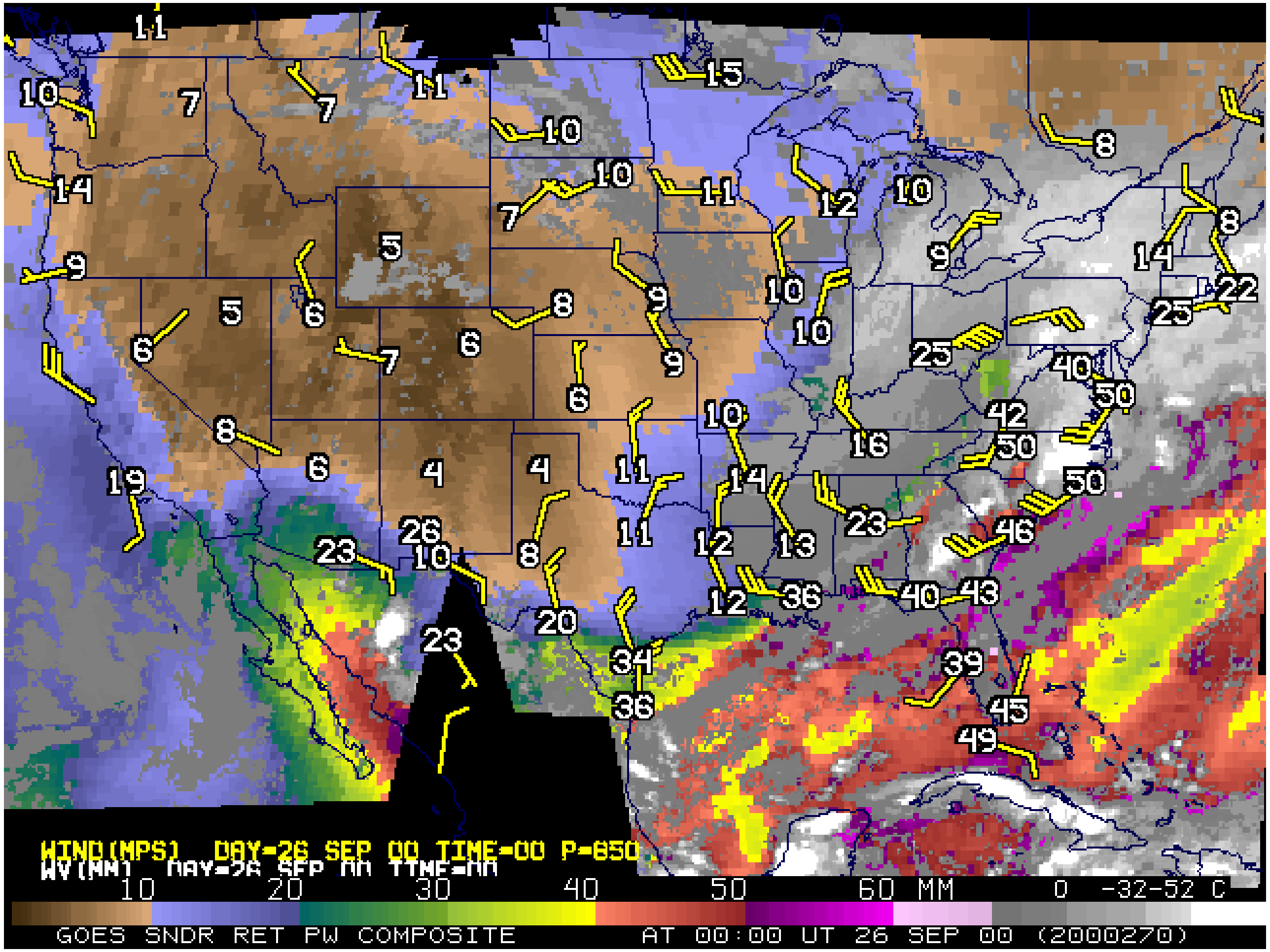


On 26 Sep 2000, did morning GOES Sounder products support or oppose the consensus for limited precipitation in Arizona ?

(GSW 28 Sep 2000)

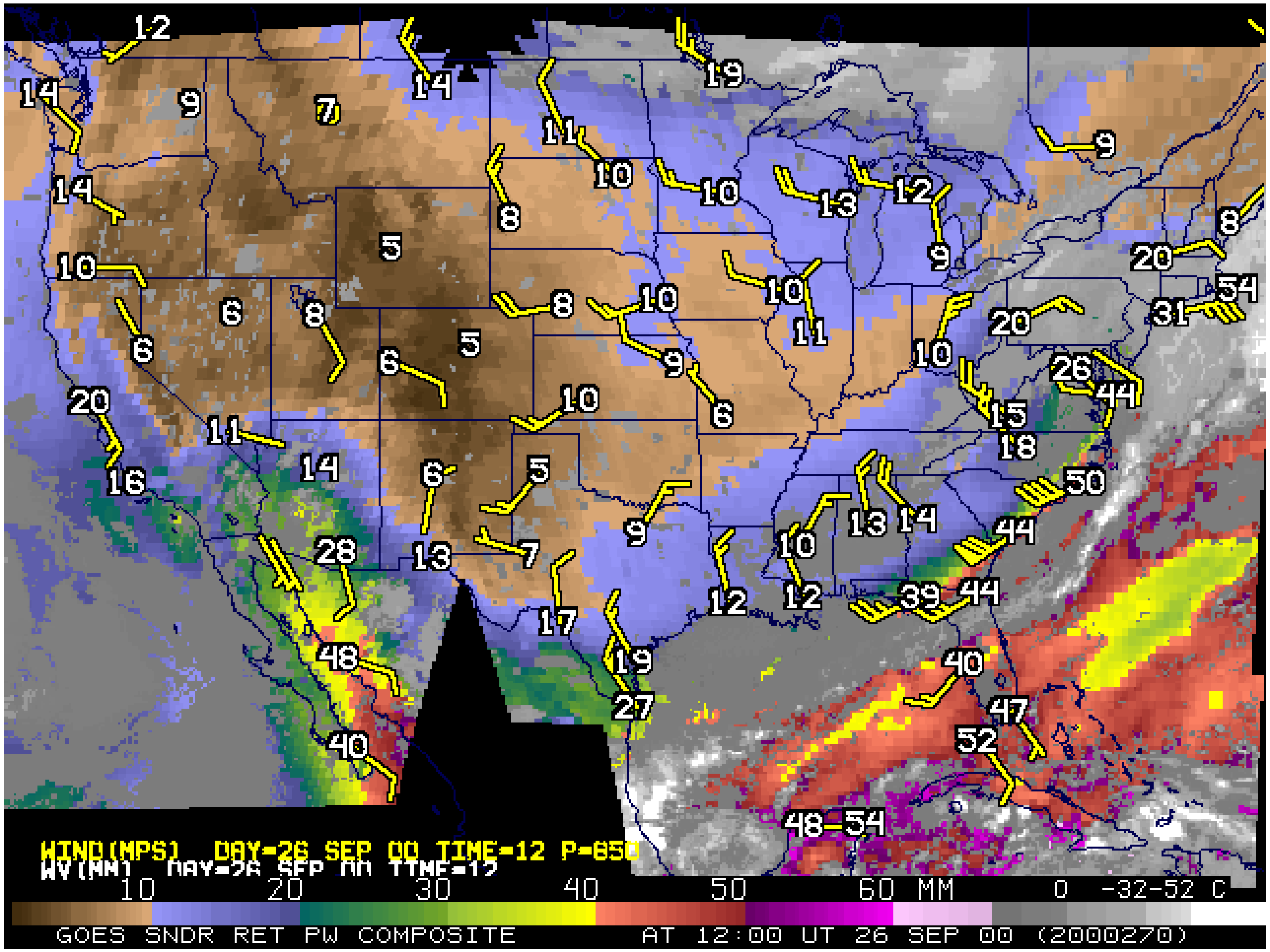
UW-Madison

GOES Sounder Total Precipitable Water DPI at **00 UTC** on 26 Sep 2000 with radiosonde plot (PW in mm).



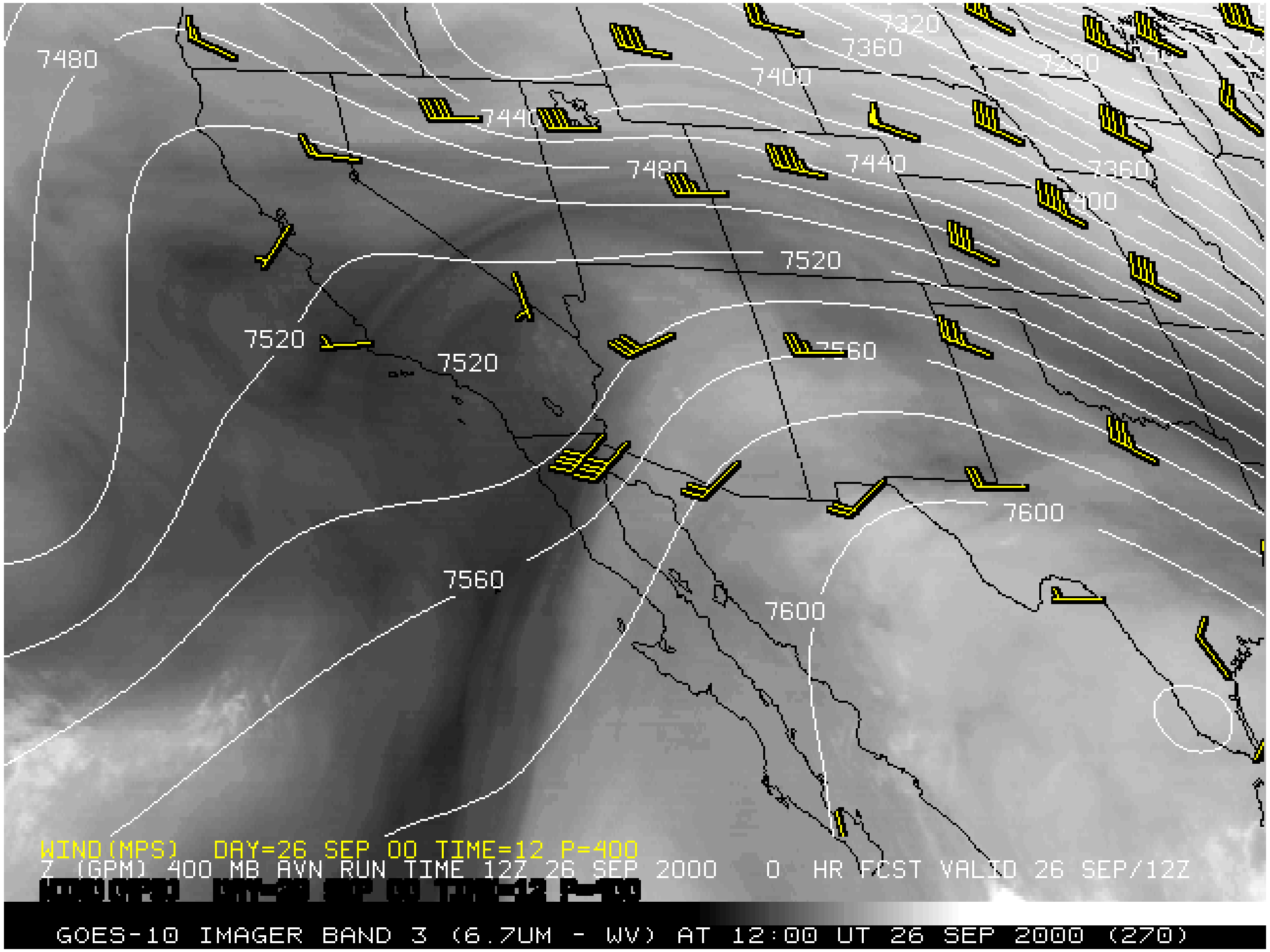
From high PW values (40mm +) over the southern Gulf of California source region, moisture (>20mm) has spread into southern Arizona.

GOES Sounder Total Precipitable Water DPI at **12 UTC** on 26 Sep 2000 with radiosonde plot (PW in mm).



From the Gulf of California source region, moisture continues to spread across Arizona (to 30mm in the south and >10mm in the north).

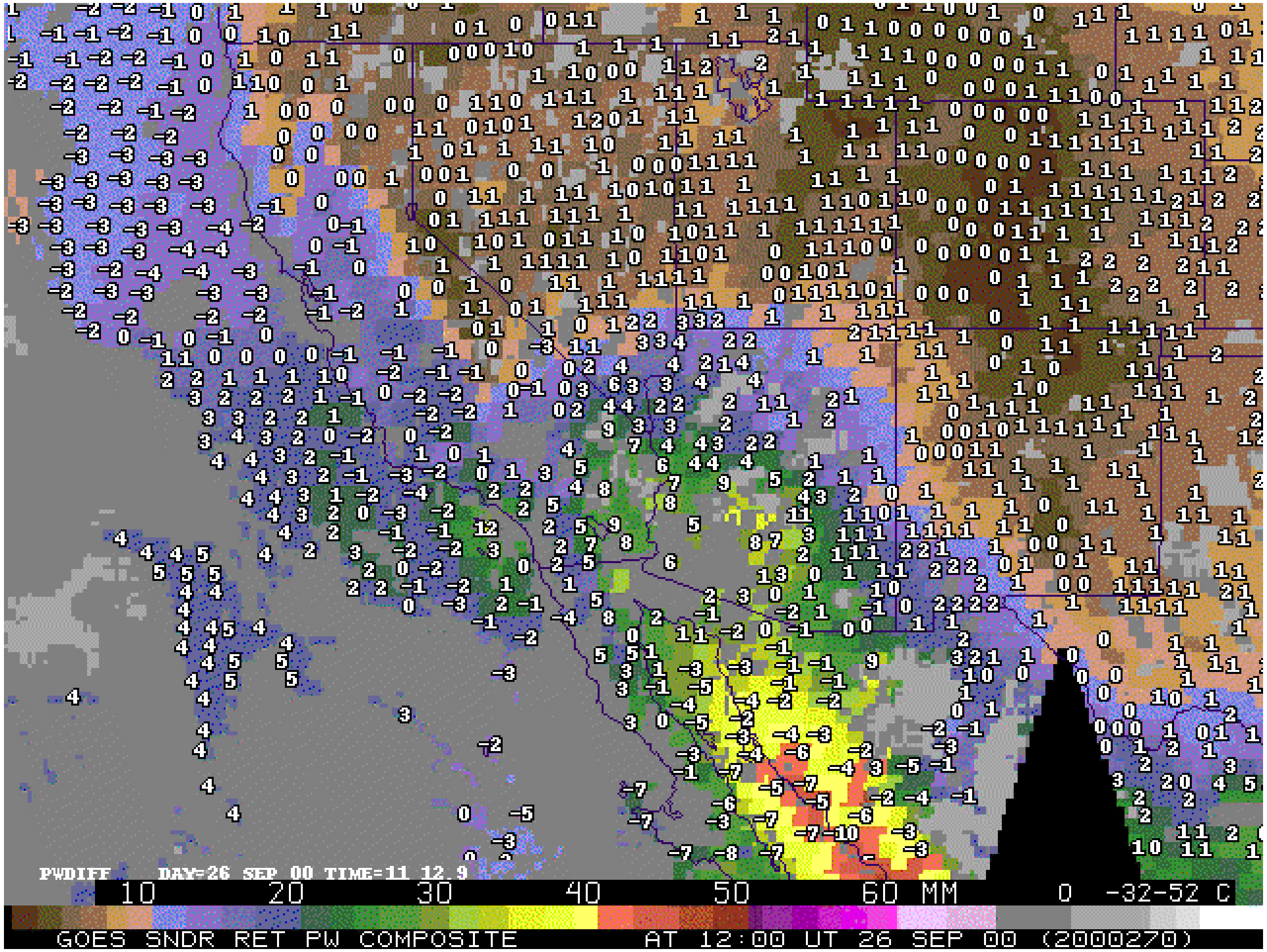
GOES-10 Imager upper level water vapor band (6.7 um) image at 12 UT on 26 Sep 2000 with 400 mb radiosonde wind plot and model height analysis.



Moist air is evident under the 400 mb ridge (across central Mexico through Arizona/New Mexico), while drier air advances across far northern Baja California into western Arizona.

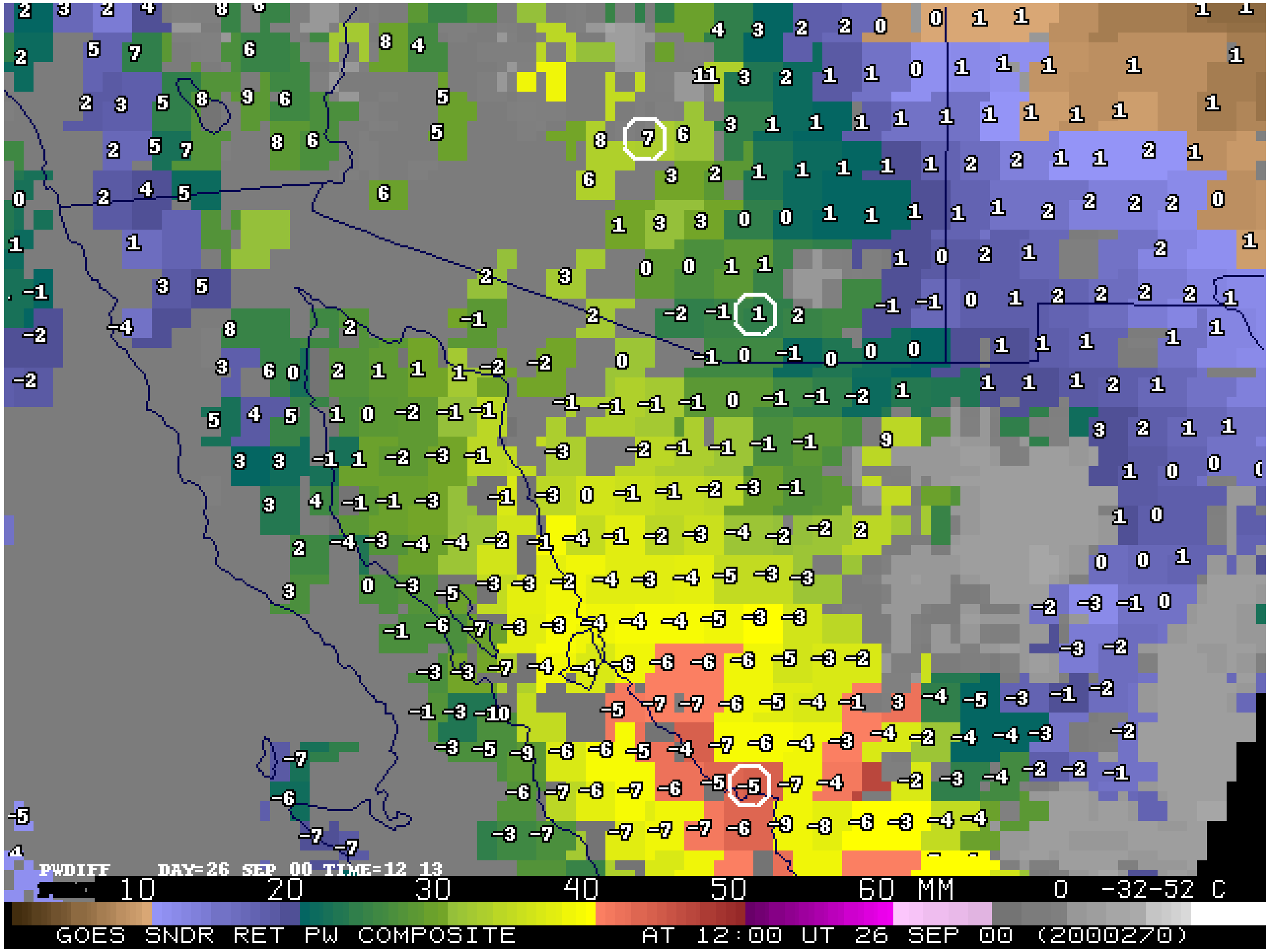
GOES Sounder PW DPI at 12 UT on 26 Sep 2000 with plot of “GOES - guess” PW difference values (in mm). (The first guess comes from the eta model.)

☑ map ☑ scale for GOES Sounder PW DPI ☑ GOES-guess PW difference (mm)



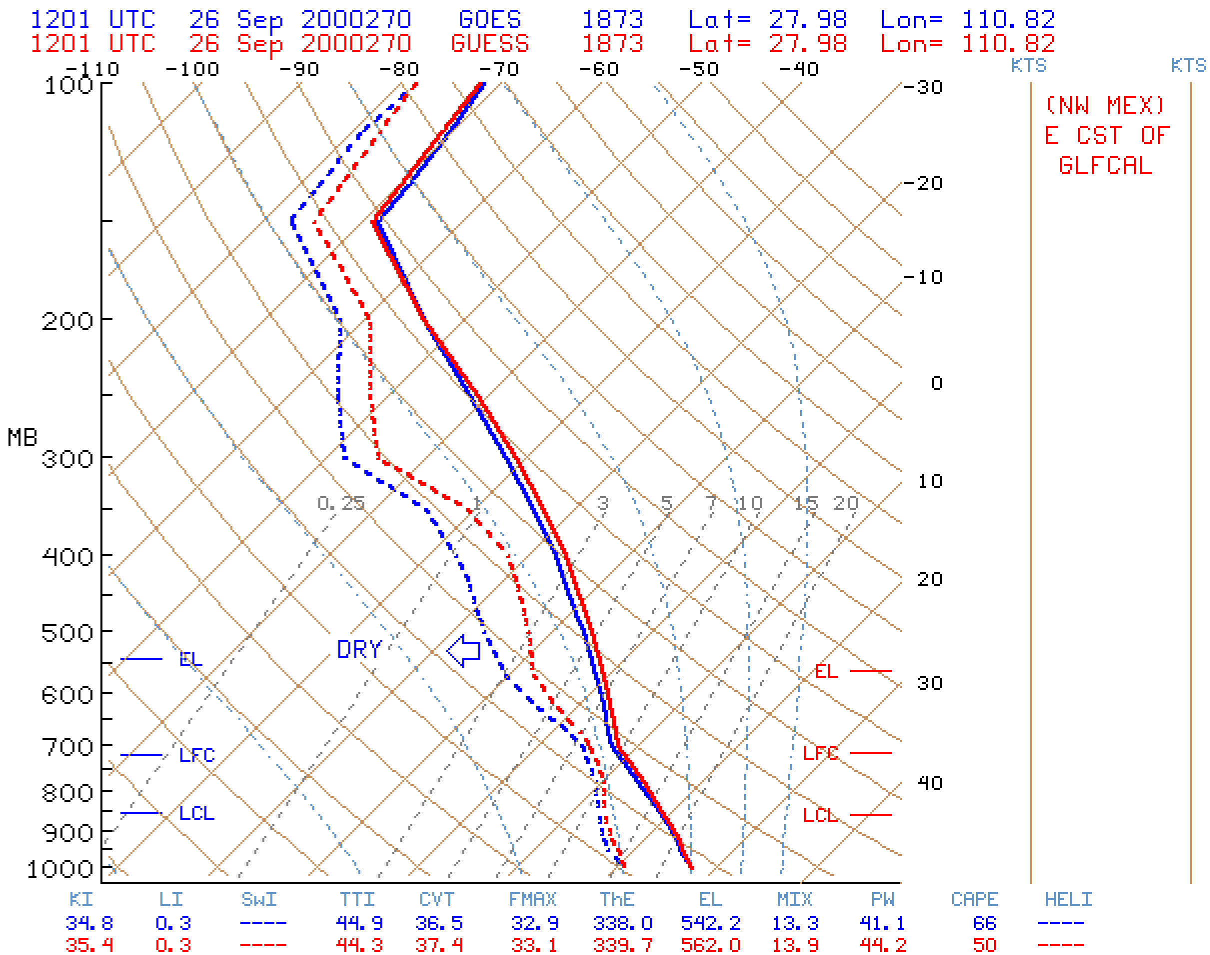
Besides large areas where differences are small, note relative moistening (with GOES) across south central Arizona and drying over the eastern Gulf of California.

GOES Sounder PW DPI at 12 UT on 26 Sep 2000 with plot of "GOES - guess" PW difference values (in mm). (The first guess comes from the eta model.)



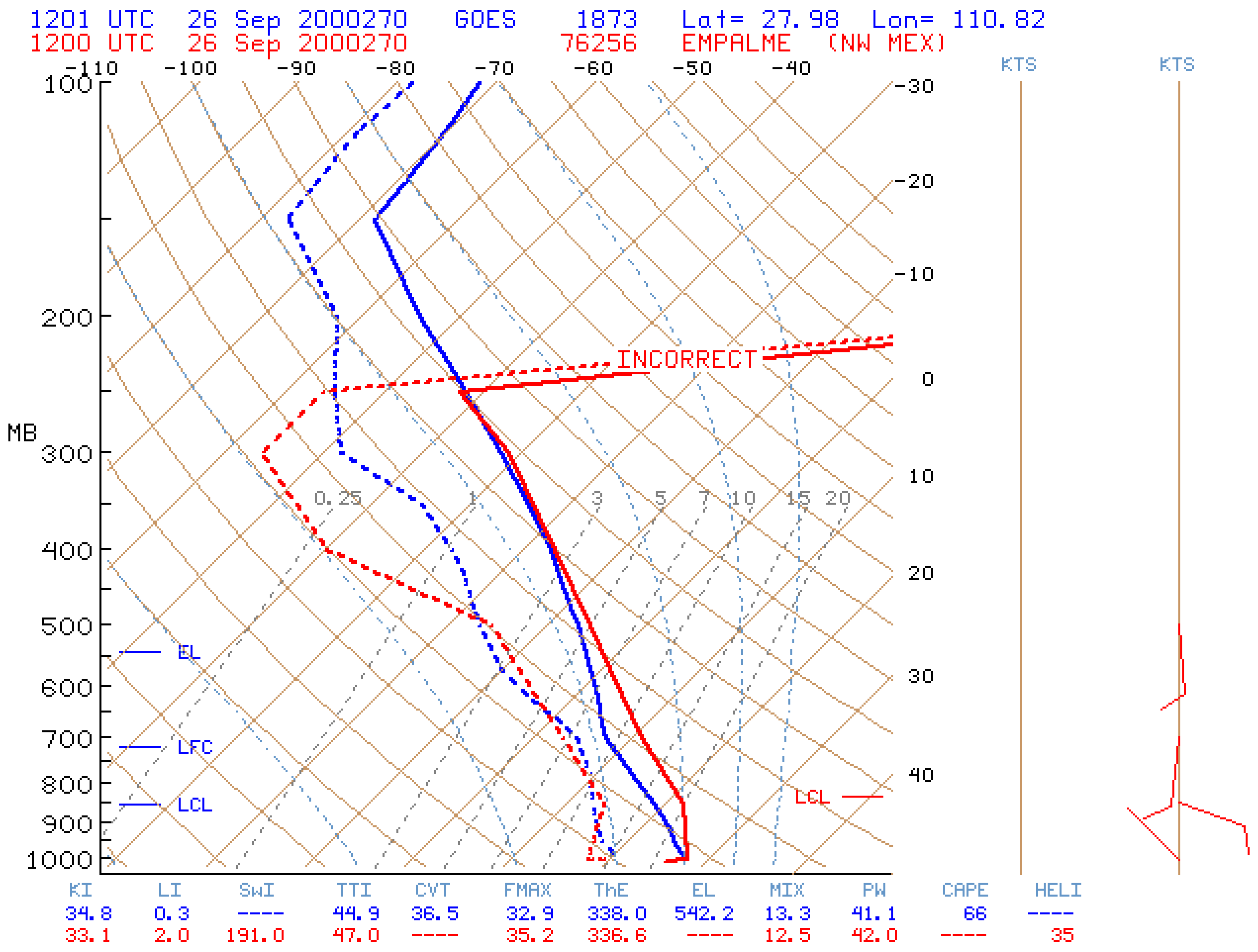
For a closer look, focus on radiosonde locations at Empalme, Mexico (E cen coast of Gulf of California) and Tucson (SE AZ) as well as near Phoenix (S cen AZ).

GOES Sounder retrieval profile (in blue) near Empalme, Mexico at 12 UT on 26 Sep 2000 versus the "first guess" profile (in red).



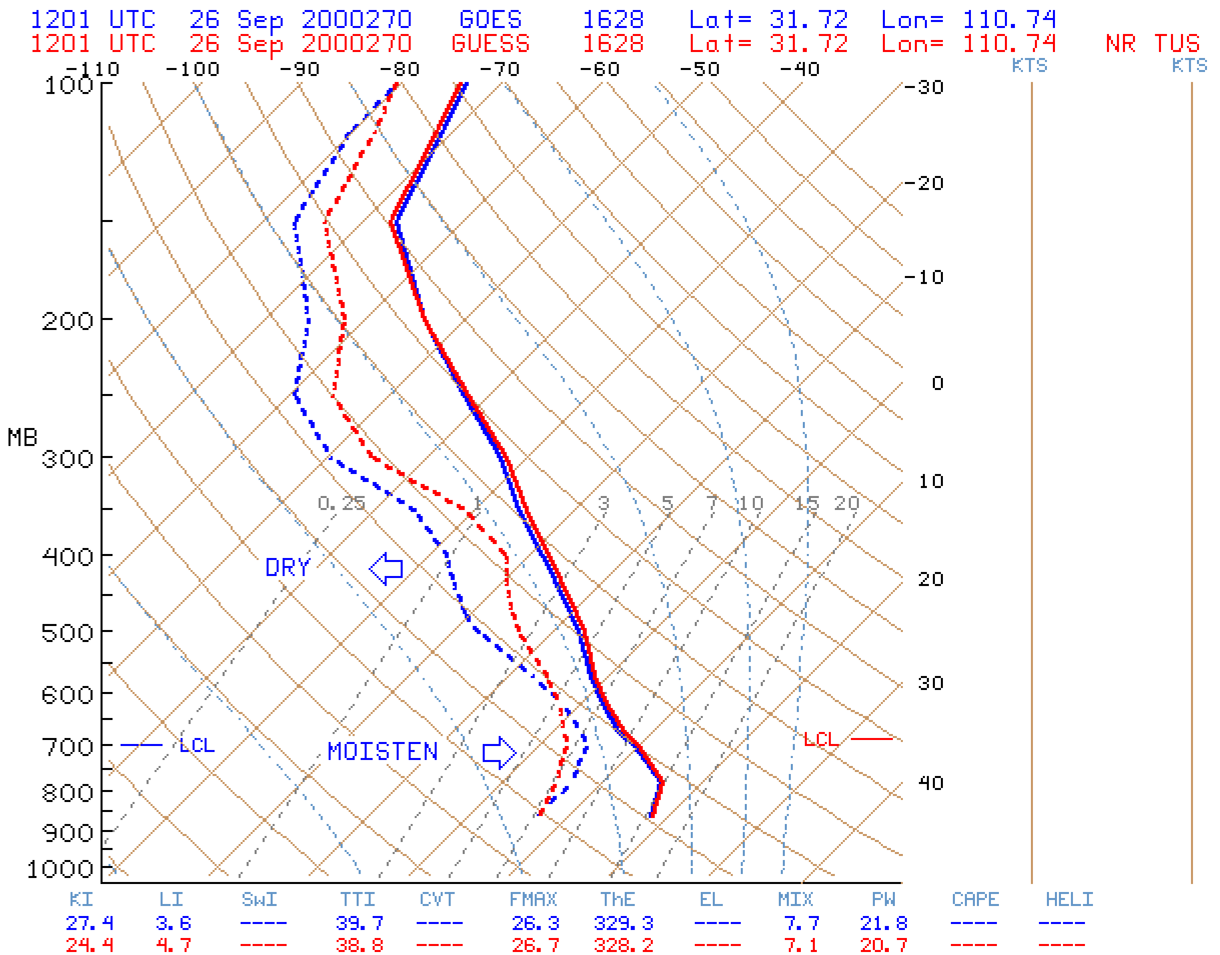
Note that the largest change, made by GOES, from the first guess is overall drying, especially at mid and upper levels. The computed PW decreases from 44 to 41 mm.

GOES Sounder retrieval profile (in blue) near Empalme, Mexico at 12 UT on 26 Sep 2000 versus the Empalme radiosonde profile (in red).



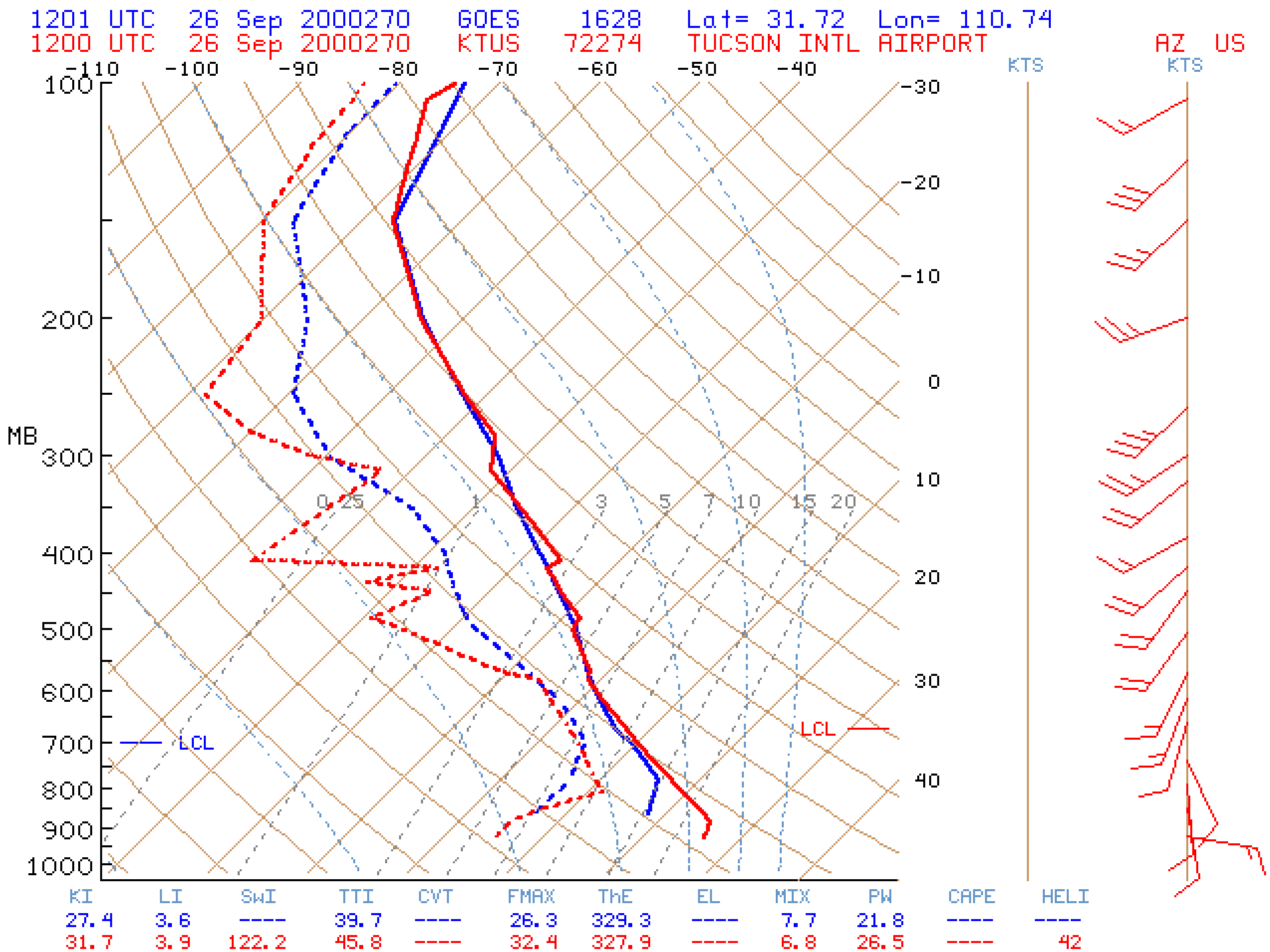
Recall that first guess PW value was 44 mm; the radiosonde value is only 42 mm. This comparison supports the relative drying with the GOES retrievals in that region.

GOES Sounder retrieval profile (in blue) near Tucson, Arizona at 12 UT on 26 Sep 2000 versus the "first guess" profile (in red).



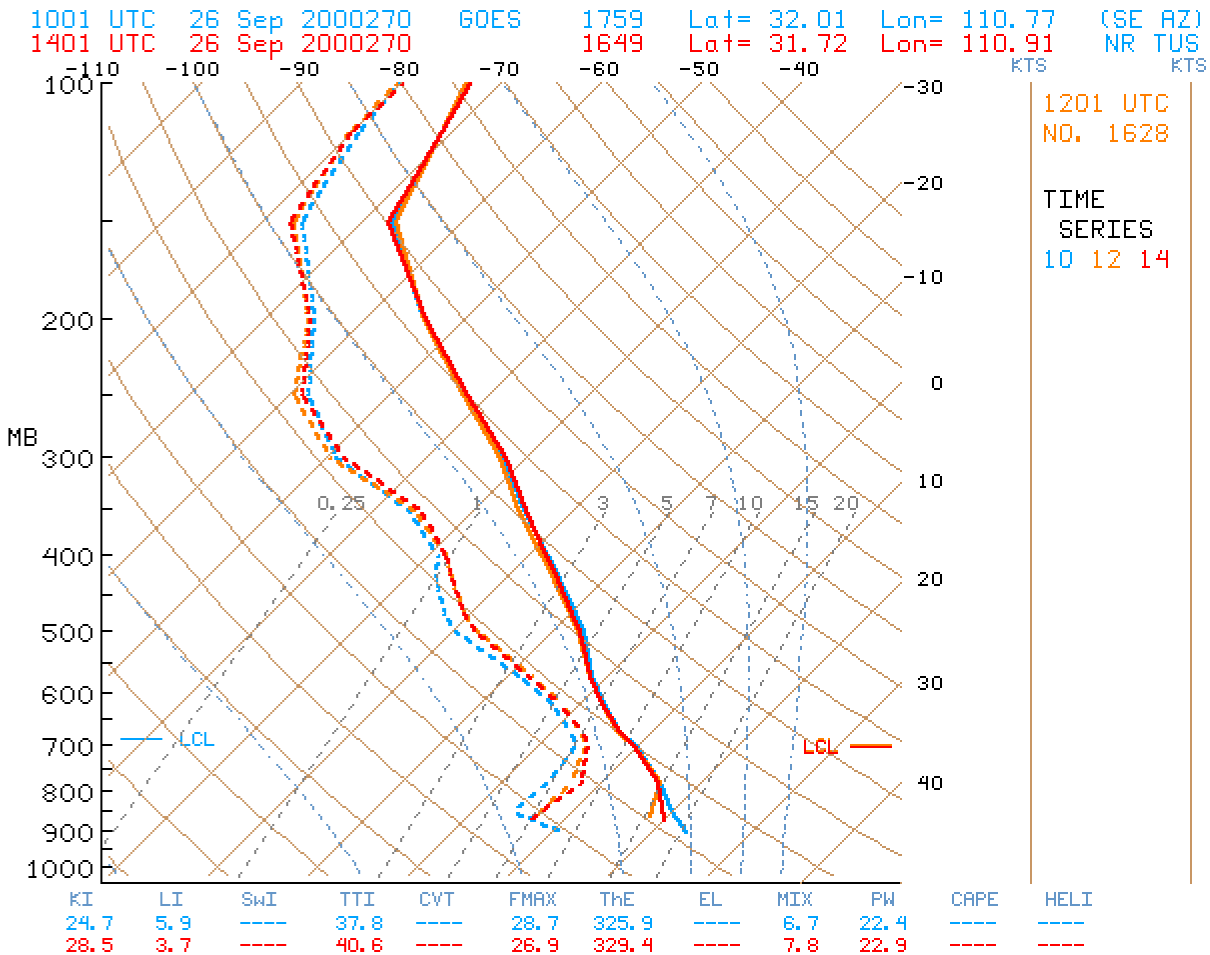
Note that low level moistening and upper level drying, made by GOES relative to the first guess, results in a slight increase in the overall PW (from 21 to 22 mm).

GOES Sounder retrieval profile (in blue) near Tucson, Arizona at 12 UT on 26 Sep 2000 versus the Tucson radiosonde profile (in red).



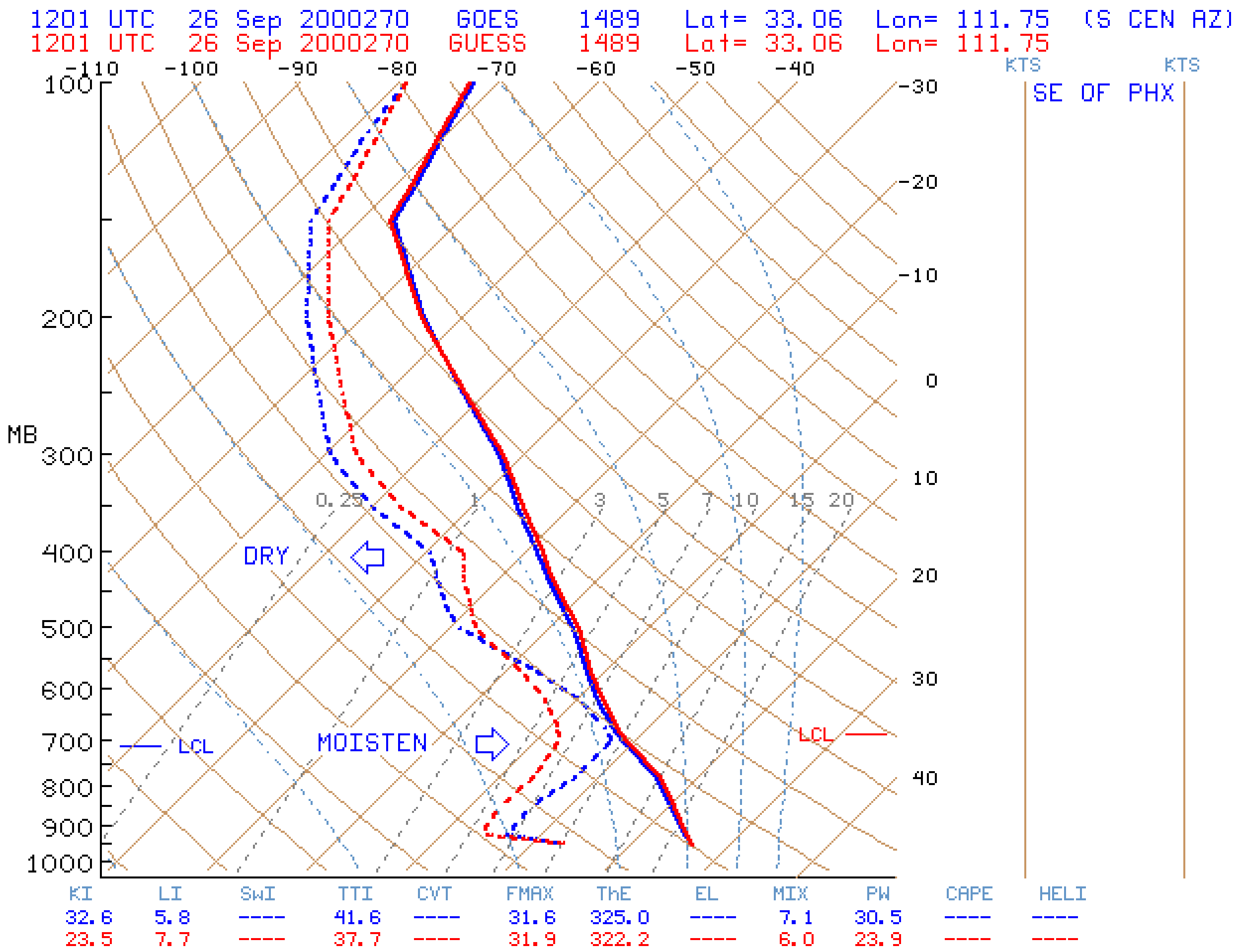
Recall that first guess PW value was 20 mm; the radiosonde value is 26.5 mm. The GOES tendency seems correct: drying aloft; moistening at low levels (overall increase).

Time series of GOES Sounder retrieval profiles near Tucson, Arizona at 10 (light blue), 12 (orange), and 14 (red) UT on 26 Sep 2000.



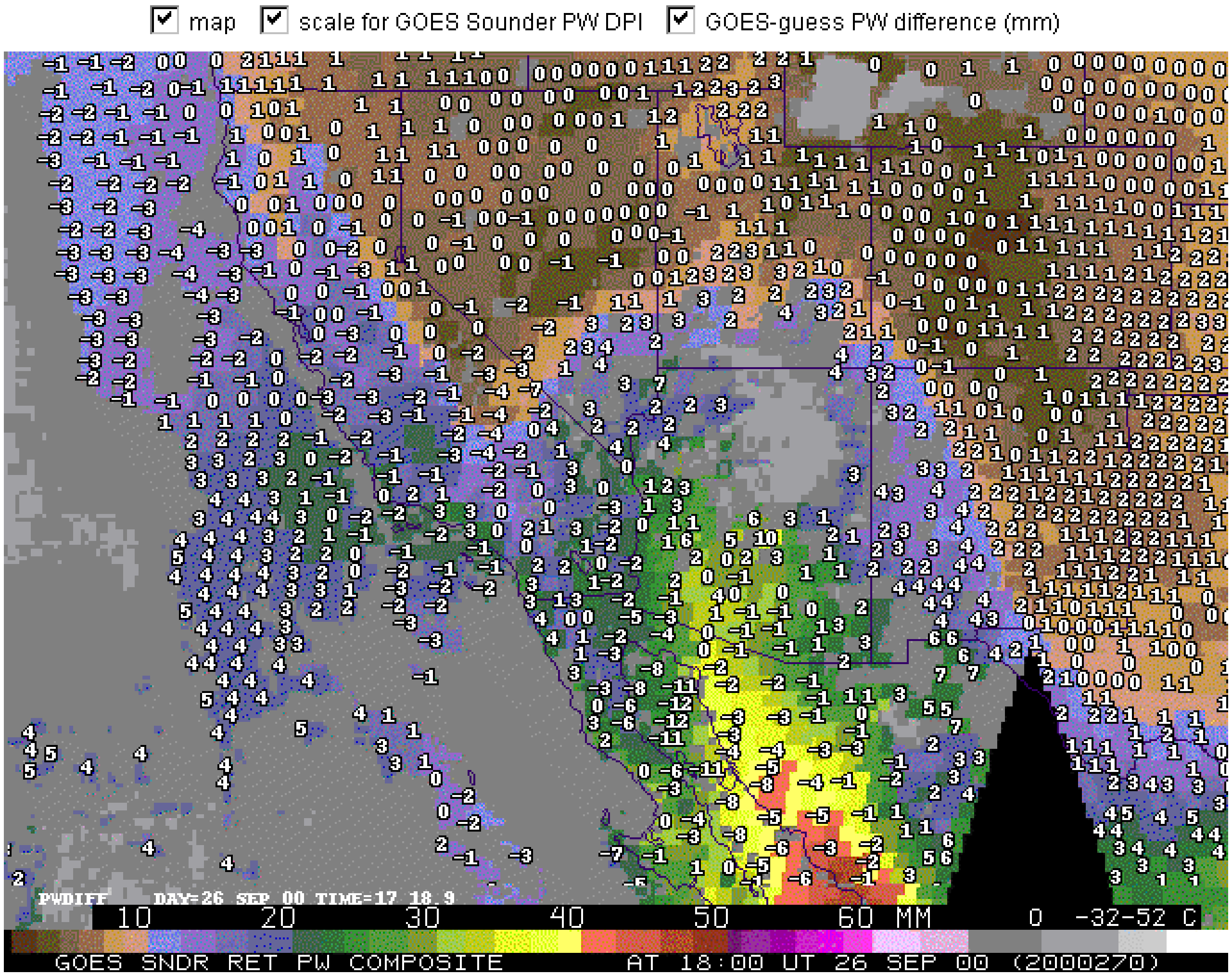
Note over the 4 hour period that low level moisture generally increases (with time), resulting in a small overall PW increase. Minimum surface temperature is at 12 UT.

GOES Sounder retrieval profile (in blue) near Phoenix, Arizona at 12 UT on 26 Sep 2000 versus the "first guess" profile (in red).



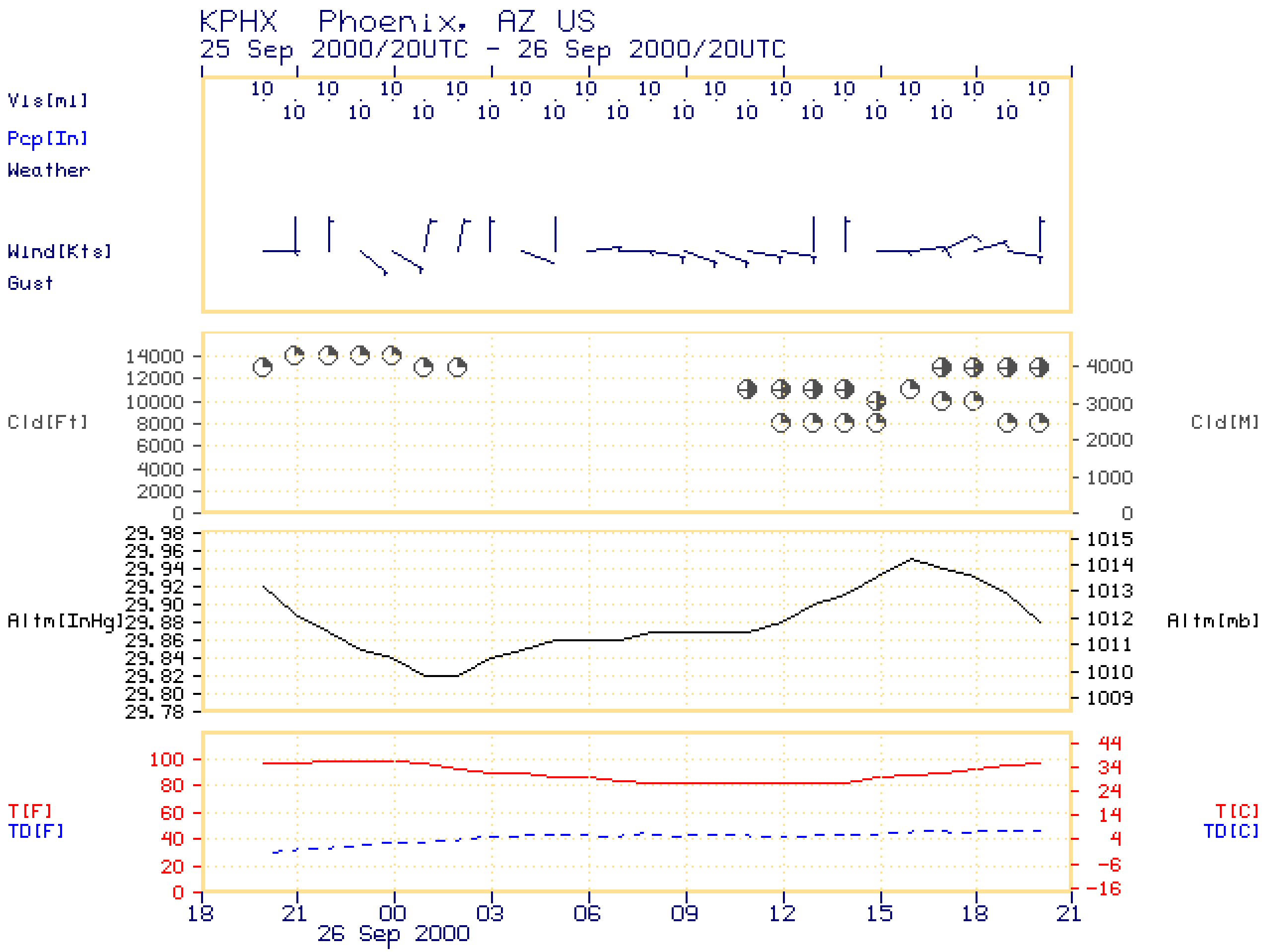
Note that largest change, made by GOES, from the first guess is strong moistening at low (non-surface) levels. The computed PW increases from 24 to 30.5 mm.

GOES Sounder PW DPI at **18 UT** on 26 Sep 2000 with plot of "GOES - guess" PW difference values (in mm). (The first guess comes from the eta model.)



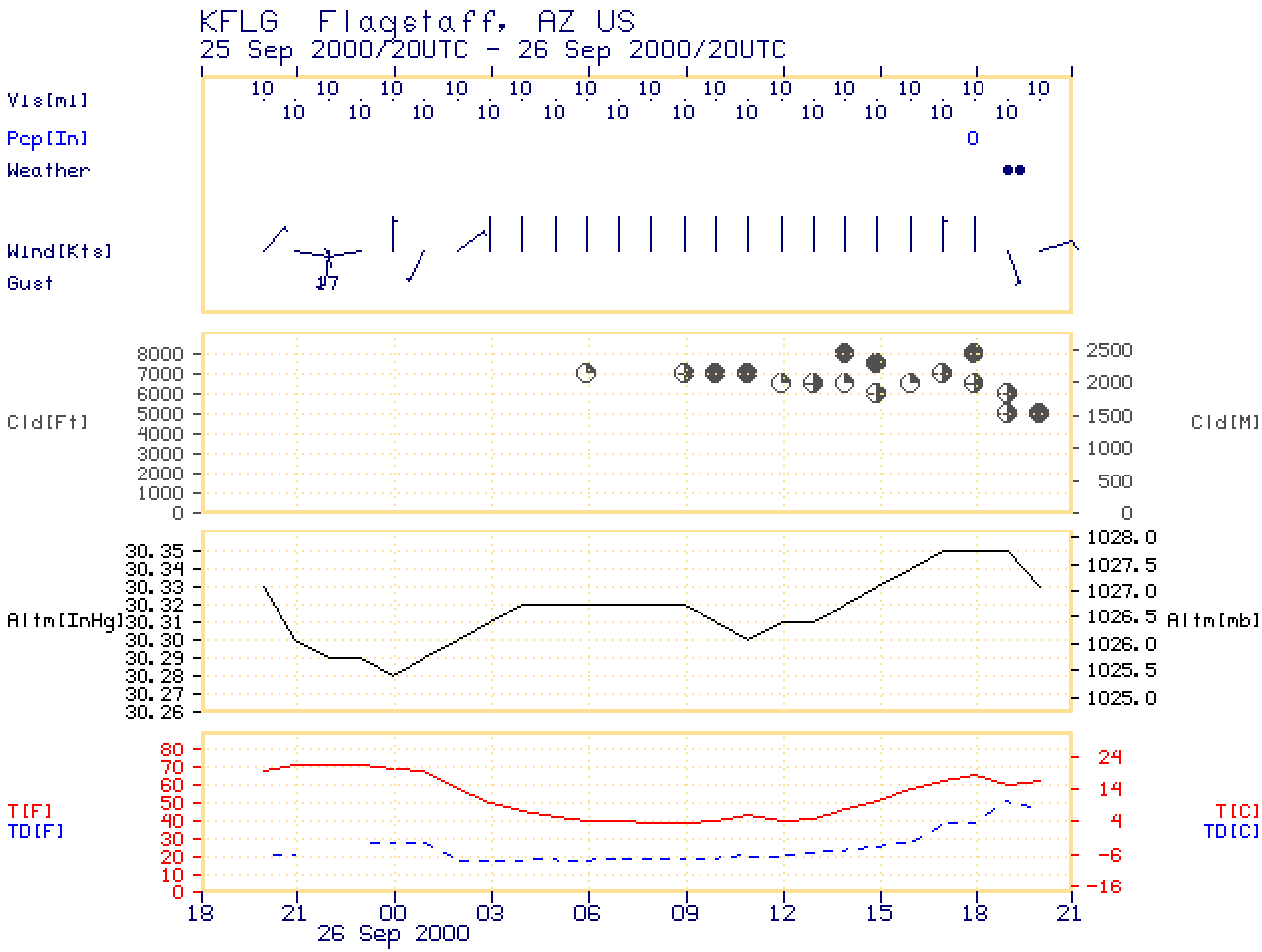
Note that GOES continues, at 18 UT, to show higher overall PW values, relative to the eta first guess, across central Arizona, as clouds partially obscure the region.

Meteogram for Phoenix, Arizona showing hourly surface observations from 20 UT on 25 Sep 2000 through 20 UT on 26 Sep 2000.



Note that surface moisture remains low at Phoenix (Td < 9C with large dewpoint depression). No precipitation occurs from more moist lower mid-levels aloft.

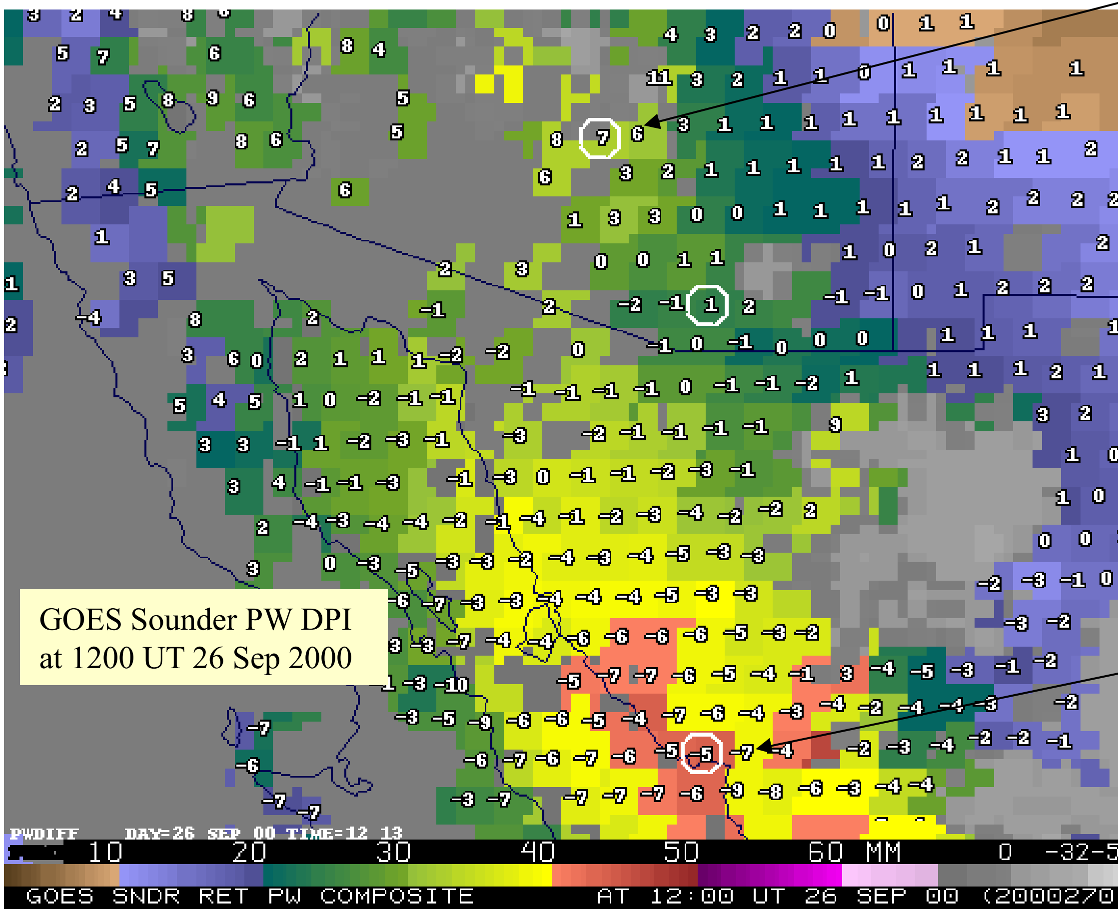
Meteogram for Flagstaff, Arizona showing hourly surface observations from 20 UT on 25 Sep 2000 through 20 UT on 26 Sep 2000.

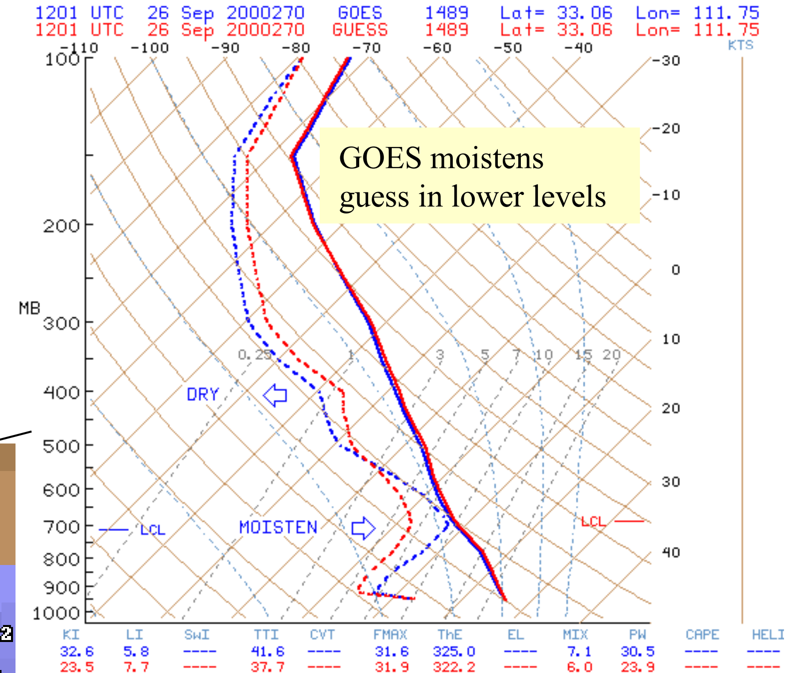


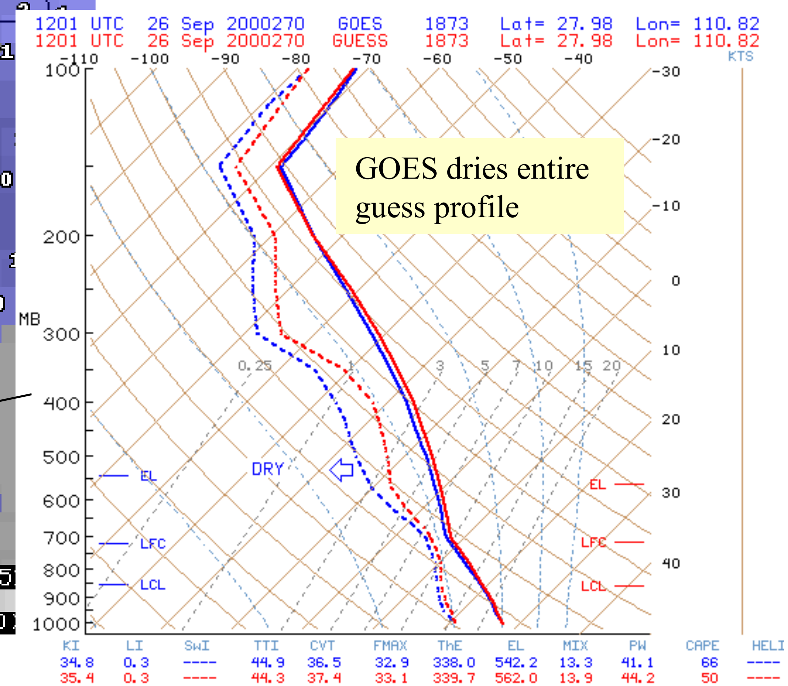
The low level (but non surface) moisture indicated from GOES was more evident at the 2 km high Flagstaff site (N cen AZ); at 20 UT, Td was 11C with rain reported.

Example of Difference Plots (of GOES - guess total PW values) from 26 September 2000

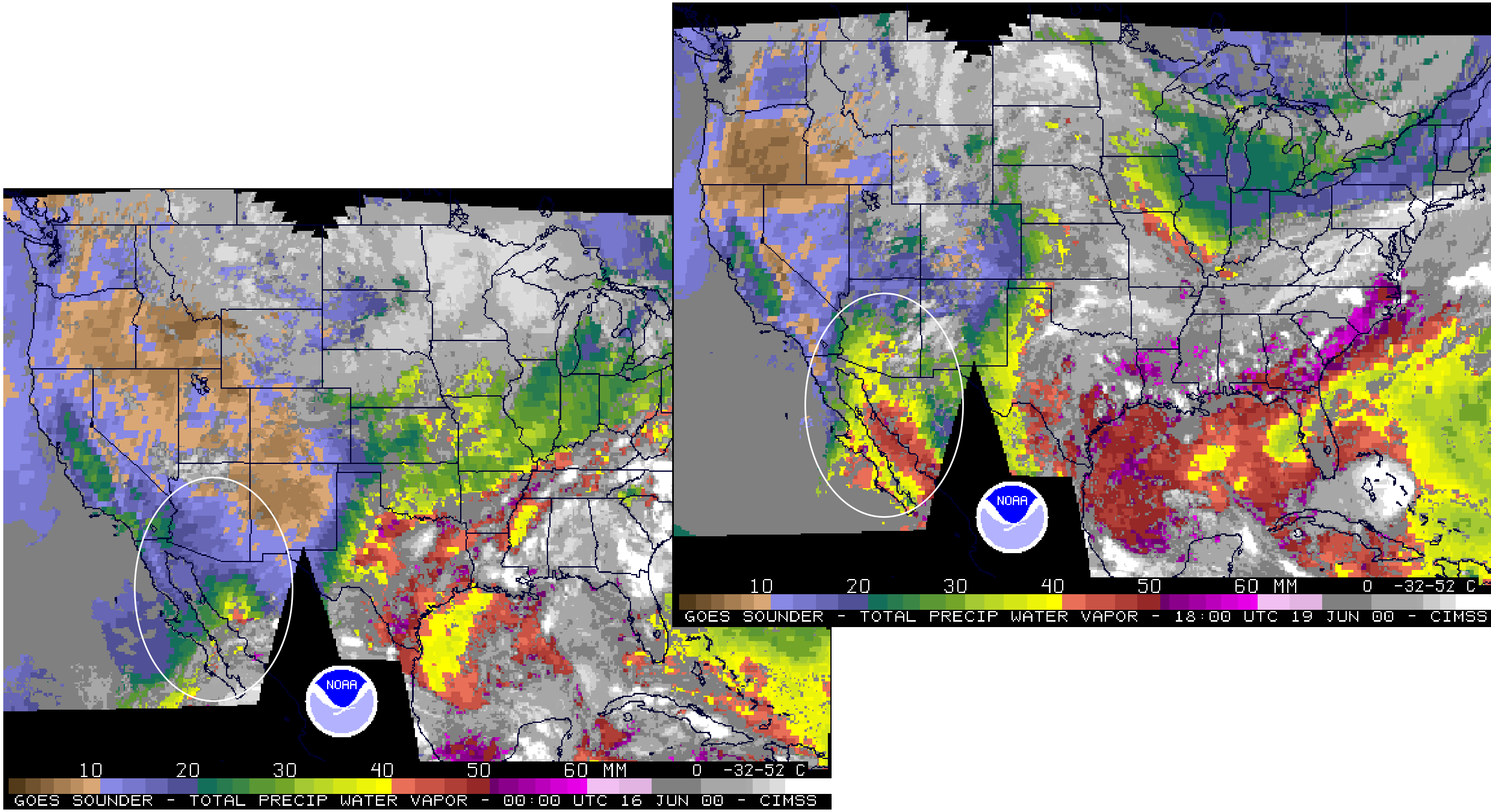
Large differences from the first guess highlight targets of potential impact by the satellite data. Light rain did occur later in central AZ.



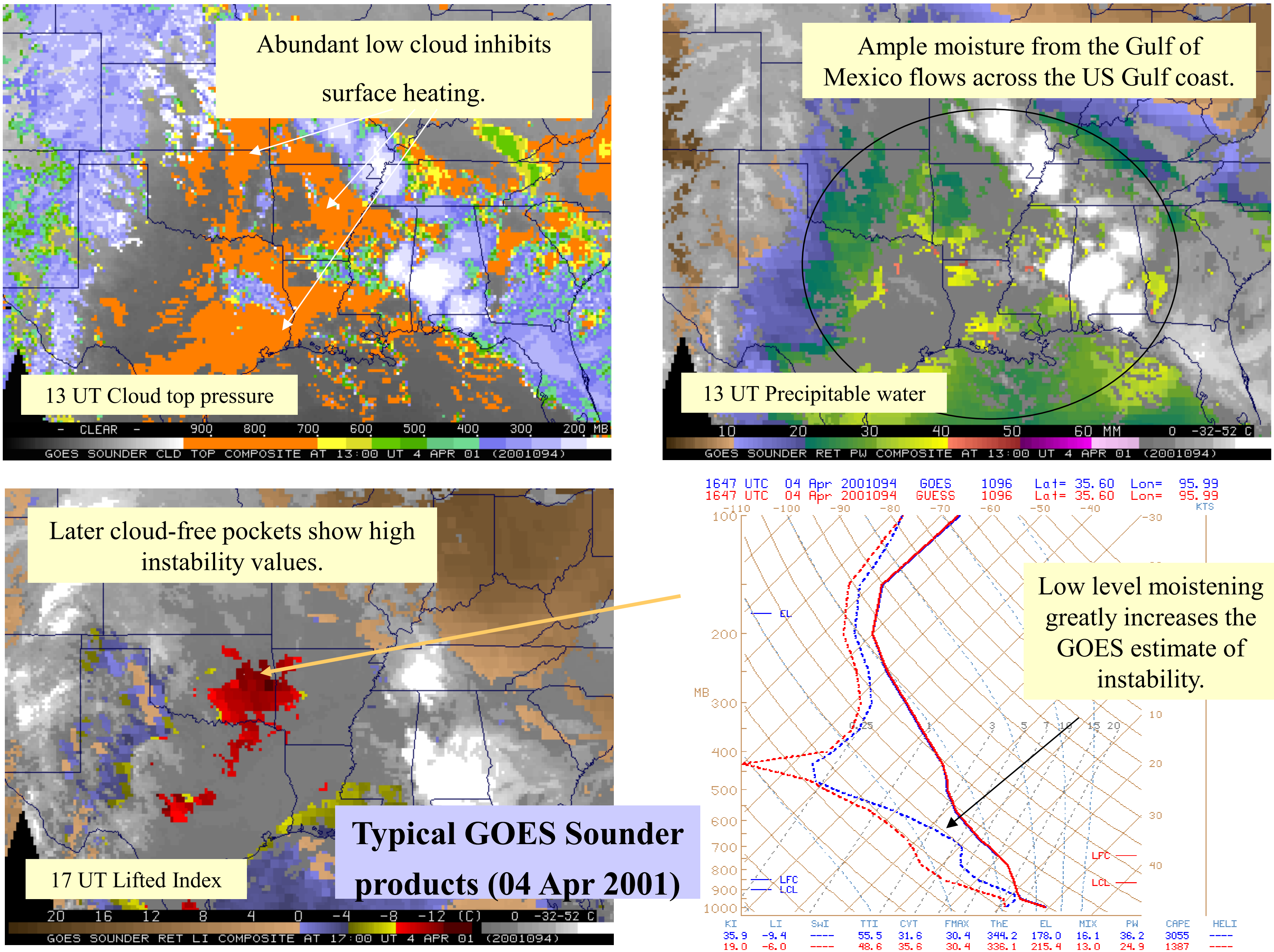




Example of GOES Sounder Precipitable Water (moisture) DPI from late June 2000

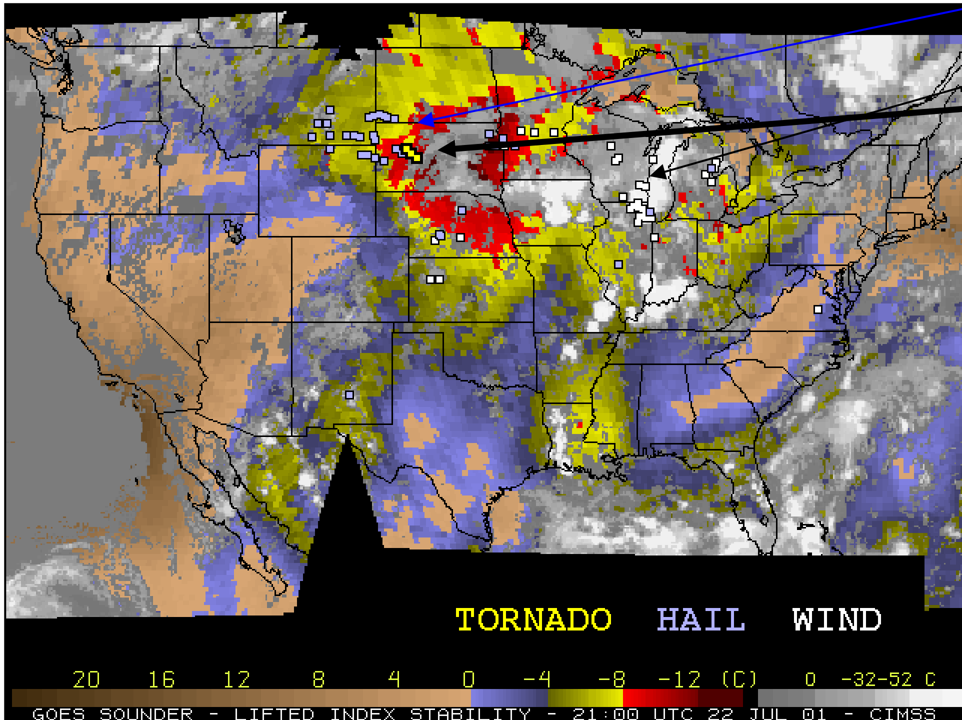


*From the **GOES Gallery** web page for the 22 June 2000 case…* The second earliest start on record of the annual Arizona "monsoon" began on 19 June 2000, leading to several days of convective activity over the southwest US. NOAA GOES Sounder Precipitable Water (PW) images (above) show the northward surge of higher PW values during the 16-19 June period. PW values across Arizona on 16 June were less than 20 mm (blue enhancement), but increased to 30-40 mm (yellow to red enhancement) during the following few days.



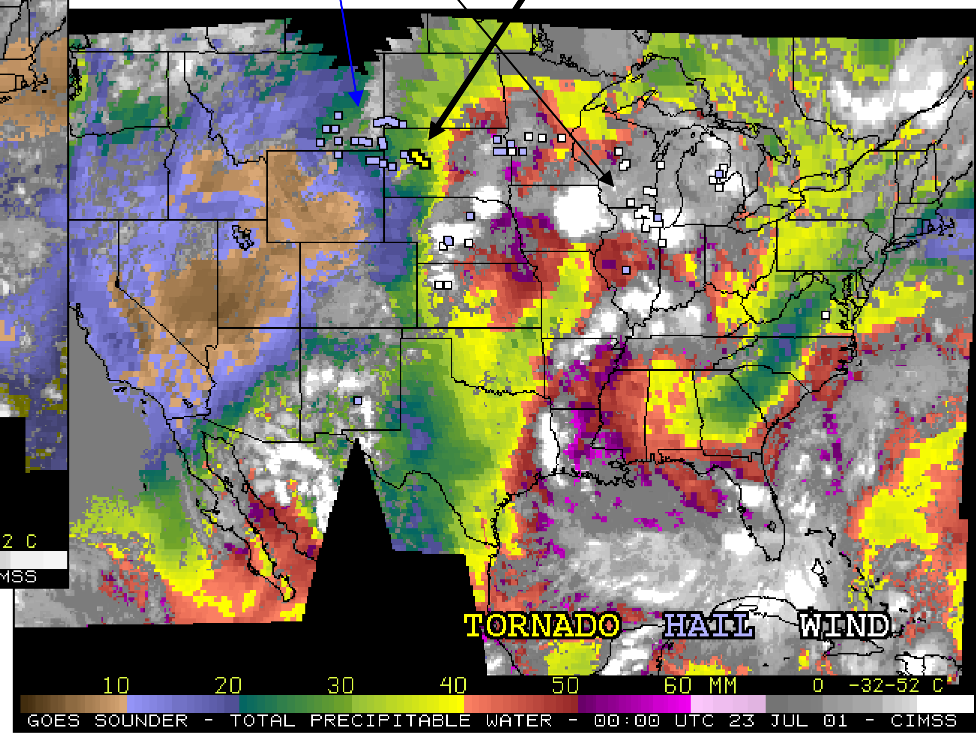
Abundant low cloud inhibits surface heating.
13 UT Cloud top pressure
- CLEAR - 900 800 700 600 500 400 300 200 MB
GOES SOUNDER CLD TOP COMPOSITE AT 13:00 UT 4 APR 01 (2001094)
Ample moisture from the Gulf of Mexico flows across the US Gulf coast.
13 UT Precipitable water
10 20 30 40 50 60 MM 0 -32-52 C
GOES SOUNDER RET PW COMPOSITE AT 13:00 UT 4 APR 01 (2001094)
Later cloud-free pockets show high instability values.
17 UT Lifted Index
20 16 12 8 4 0 -4 -8 -12 (C) 0 -32-52 C
GOES SOUNDER RET LI COMPOSITE AT 17:00 UT 4 APR 01 (2001094)
Typical GOES Sounder products (04 Apr 2001)
1647 UTC 04 Apr 2001094 GOES 1096 Lat= 35.60 Lon= 95.99
1647 UTC 04 Apr 2001094 GUESS 1096 Lat= 35.60 Lon= 95.99
Low level moistening greatly increases the GOES estimate of instability.
MB
EL
LFC
LCL
KI LI SWI TTI CVT FMAX ThE EL MIX PW CAPE HELI
35.9 -9.4 ---- 55.5 31.6 30.4 344.2 178.0 16.1 36.2 3055 ----
19.0 -6.0 ---- 48.6 35.6 30.4 336.1 215.4 13.0 24.9 1387 ----

Monitoring simple correlation between select late day GOES Sounder Derived Product Imagery and subsequent severe weather reports



GOES atmospheric stability at 21 UTC

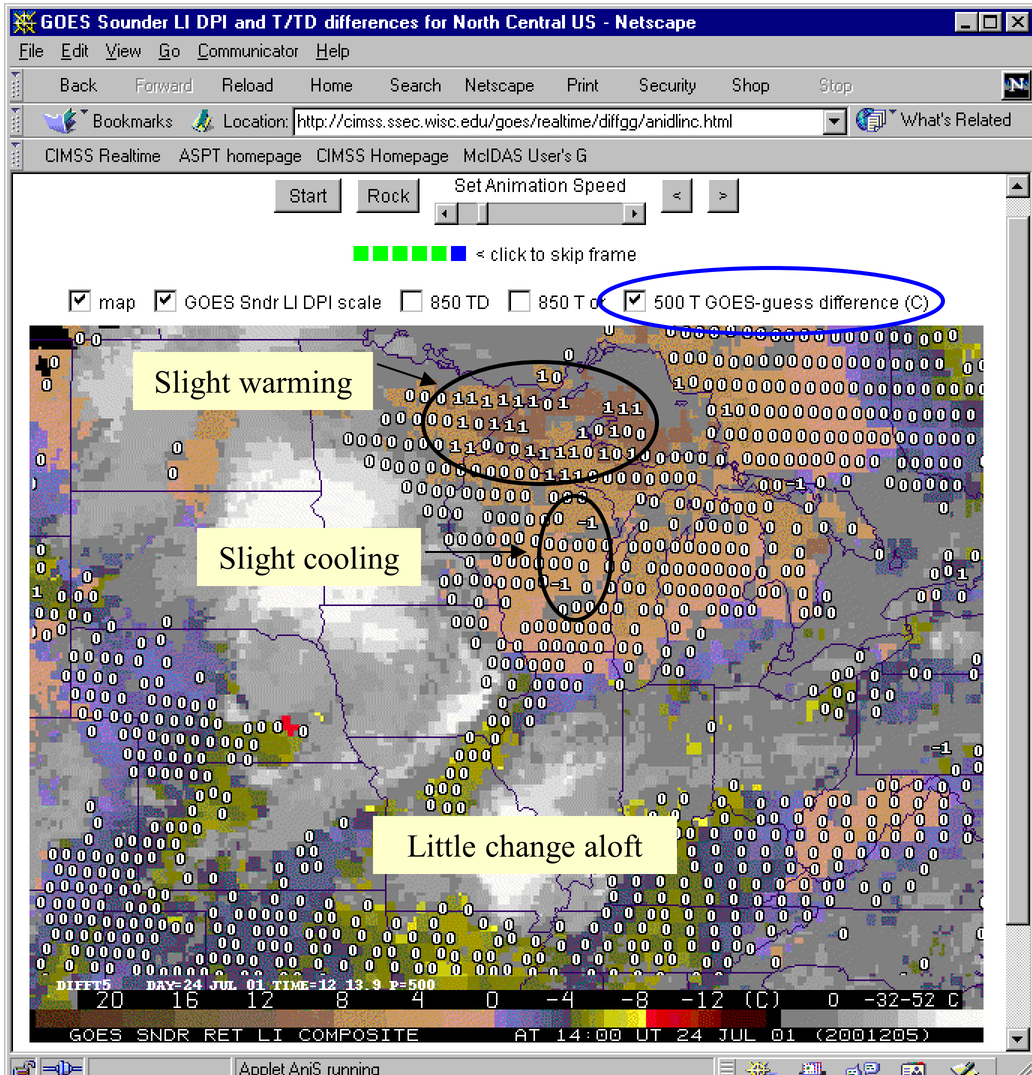
(22-23 July 2001)



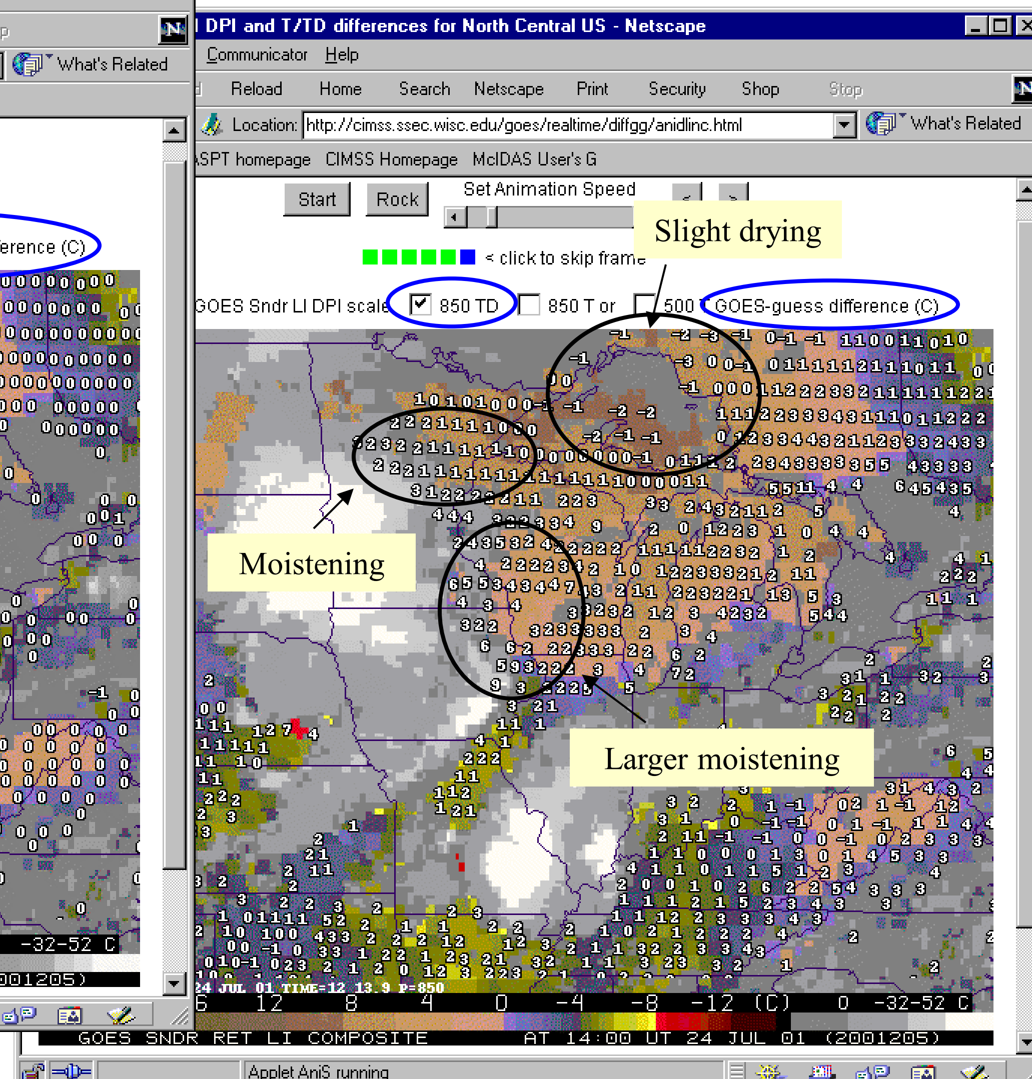
GOES total moisture at 00 UTC

This addition to the CIMSS Realtime GOES Page was realized through collaborative results in support of the summer (2001) project of visiting (NASA) SHARP student C. Nosal.

Monitoring how GOES soundings modify their initial (forecast) first guess profiles for representative parameters and levels

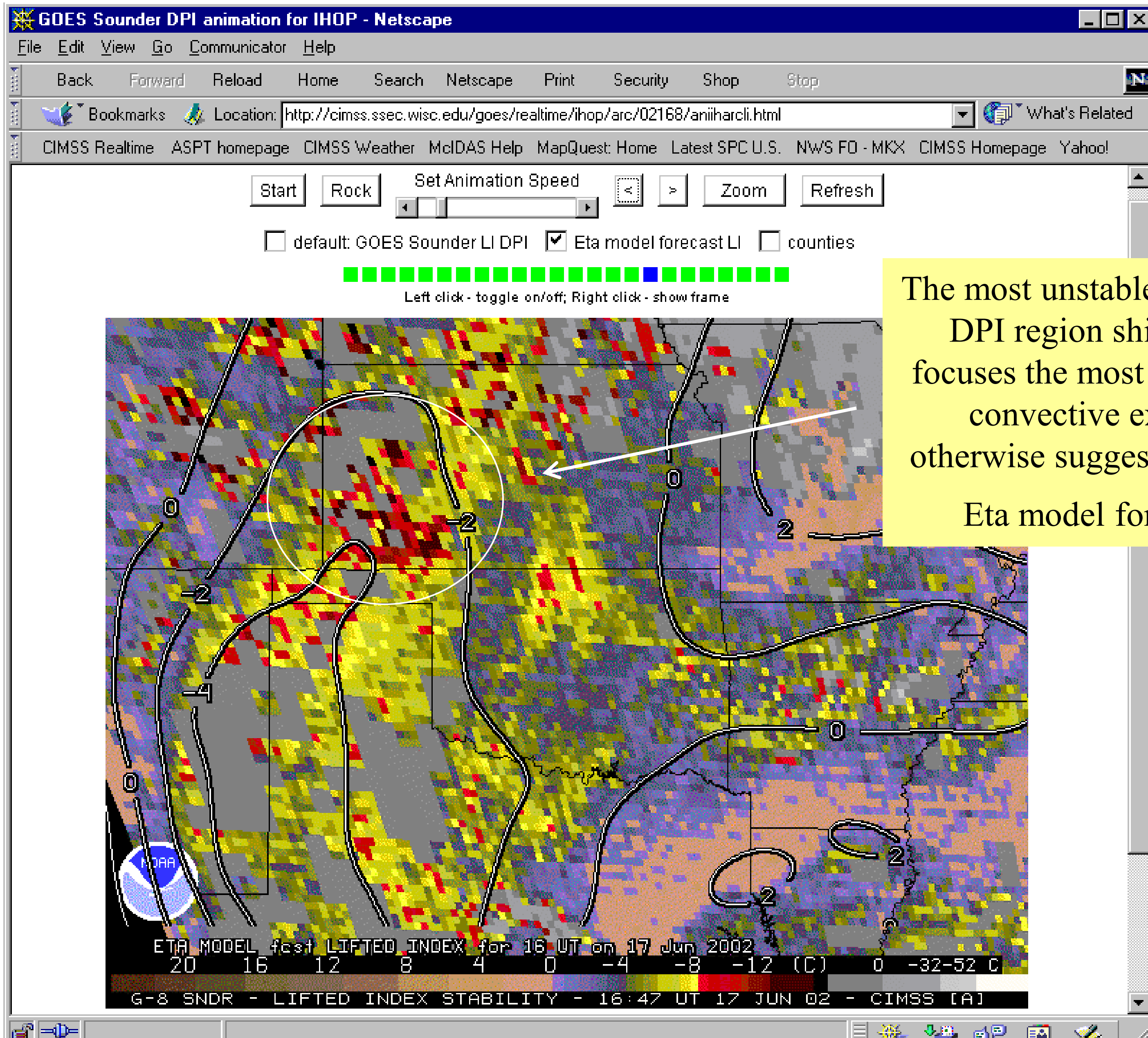


Background is GOES LI Derived Product Image.



(14 UTC 24 July 2001)

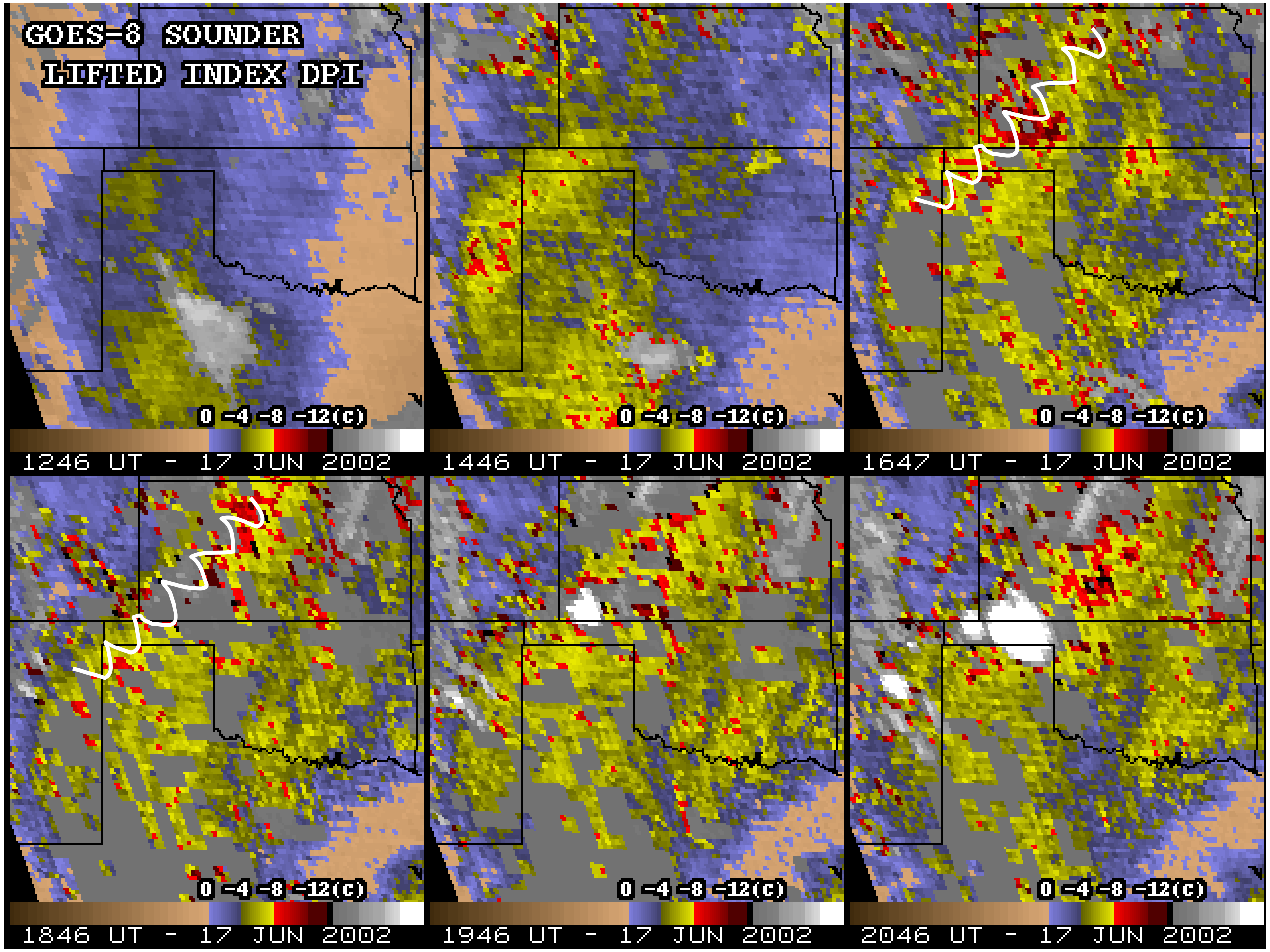
Refinement of instability forecast with GOES Sounder Lifted Index DPI on 17 June 2002



The most unstable SFOV LI DPI region shifts and focuses the most favorable convective extents otherwise suggested by the Eta model forecast.

Data shown are nominally for 17 UTC.

Evolution of GOES Sounder SFOV Lifted Index (stability) DPI on 17 June 2002

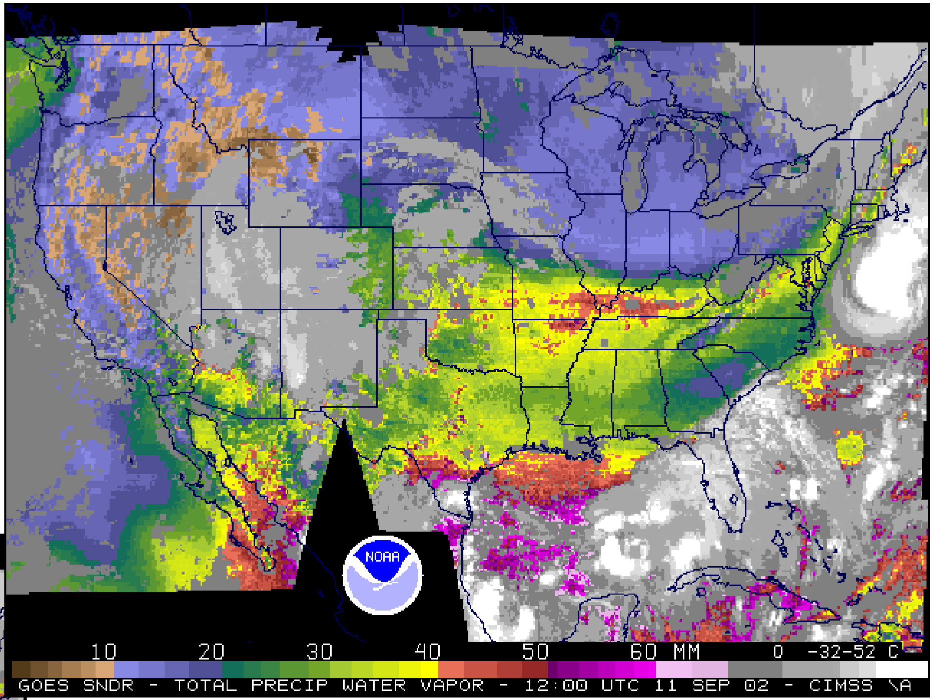


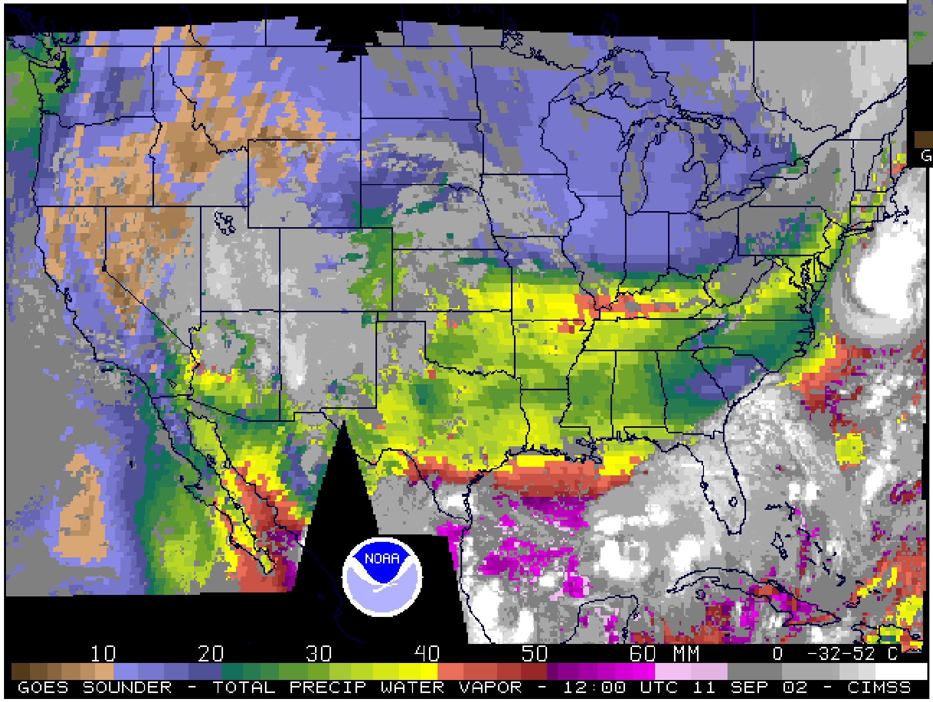
Panels show nominal times from 13 to 23 UTC.

The axis of instability (<-8) and the persistence in the sequence of two-hourly interval GOES LI DPI focus the attention for favorable convective conditions from central west Kansas through the Oklahoma and far northwest Texas Panhandles. Later severe weather reports included numerous hail reports (to 1.25”) from the far northern Texas Panhandle into far southwest Kansas. Other hail also fell around the western central Kansas/Nebraska border region.

GOES Sounder DPI of TPW at varying horizontal resolution

Single field-of-view (**SFOV**) Derived Product Imagery (DPI) of total precipitable water (TPW), starting from an **AVN** model first-guess



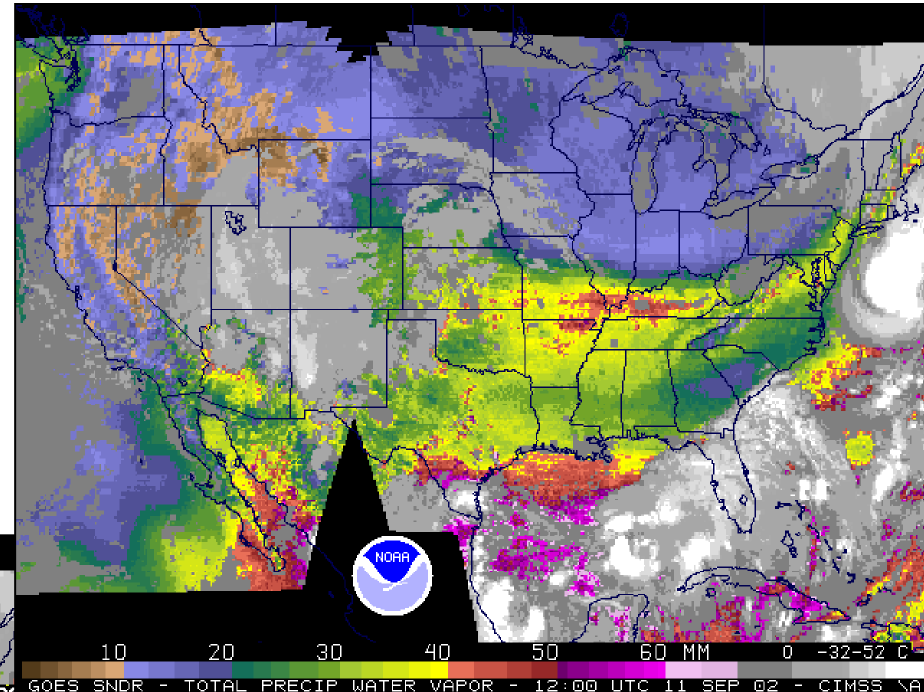


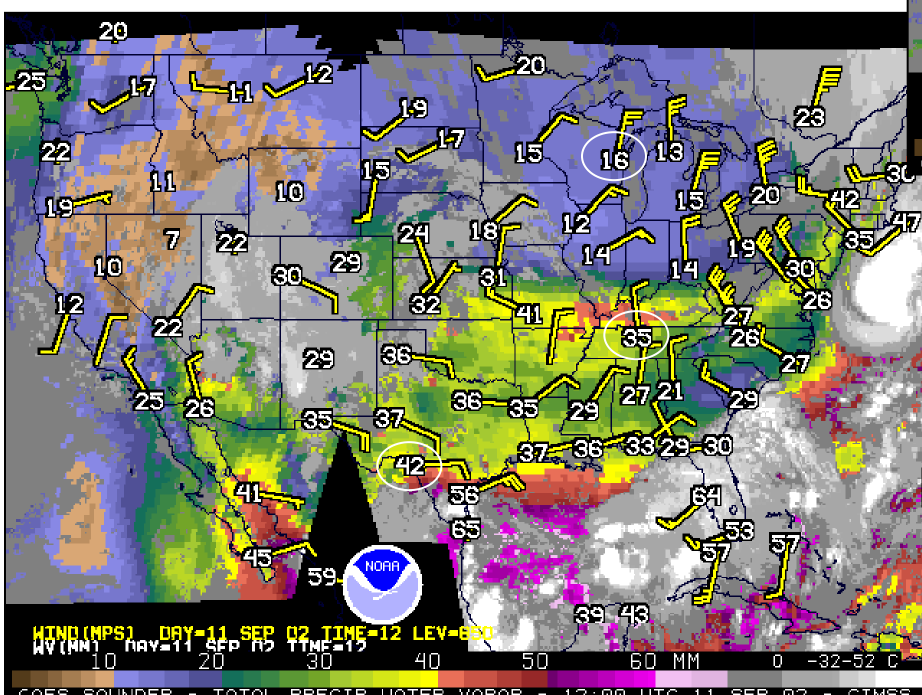
3x3 field-of-view (FOV) Derived Product Imagery (DPI) of total precipitable water (TPW), starting from an **Eta** model first-guess

12 UT 11 Sep 2002

GOES Sounder DPI of TPW at varying horizontal resolution

Single field-of-view (**SFOV**) Derived Product Imagery (DPI) of total precipitable water (TPW), starting from an **AVN** model first-guess

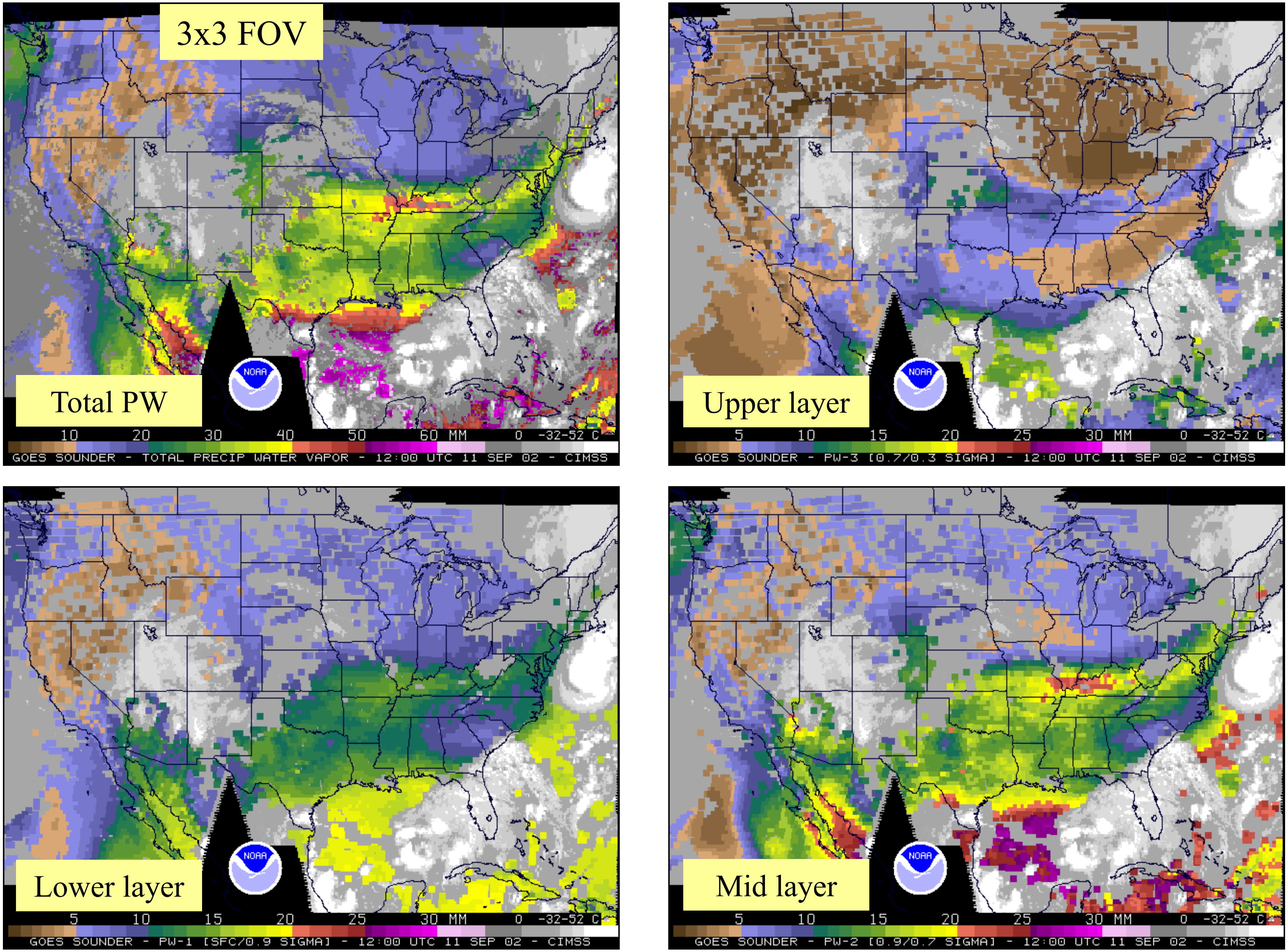




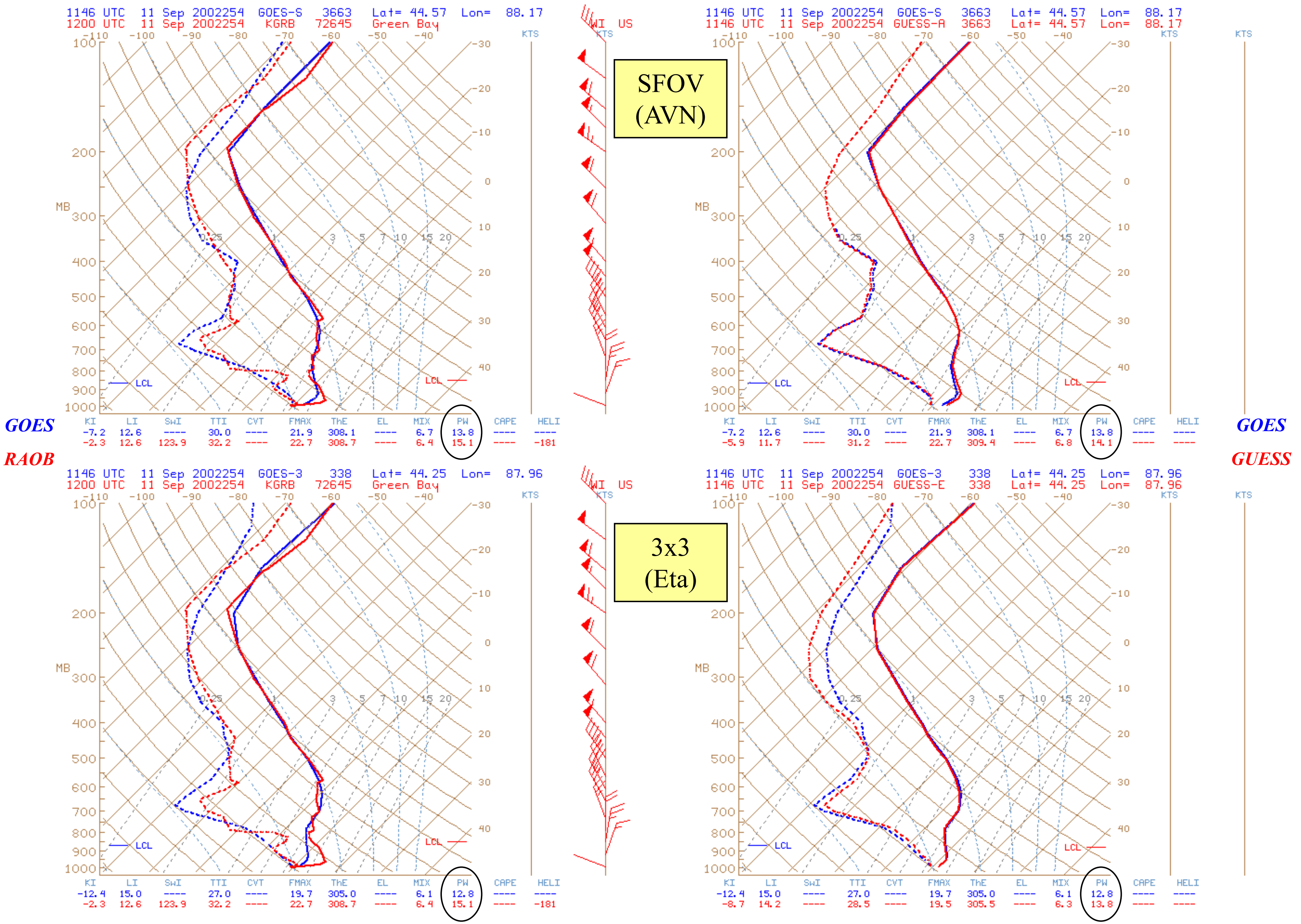
3x3 field-of-view (FOV) Derived Product Imagery (DPI) of total precipitable water (TPW), starting from an **Eta** model first-guess

12 UT 11 Sep 2002

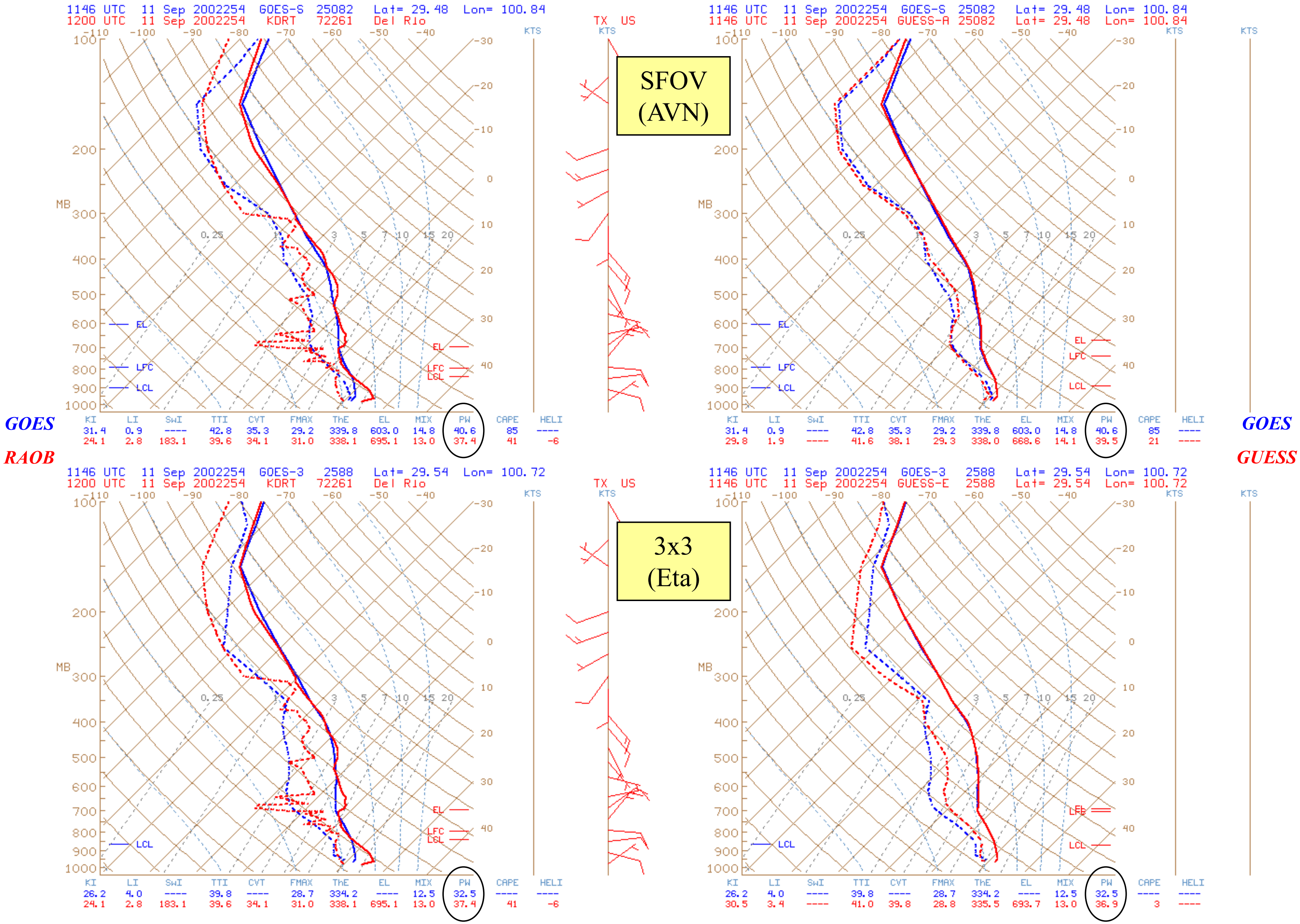
GOES Sounder DPI of PW for varying vertical layers



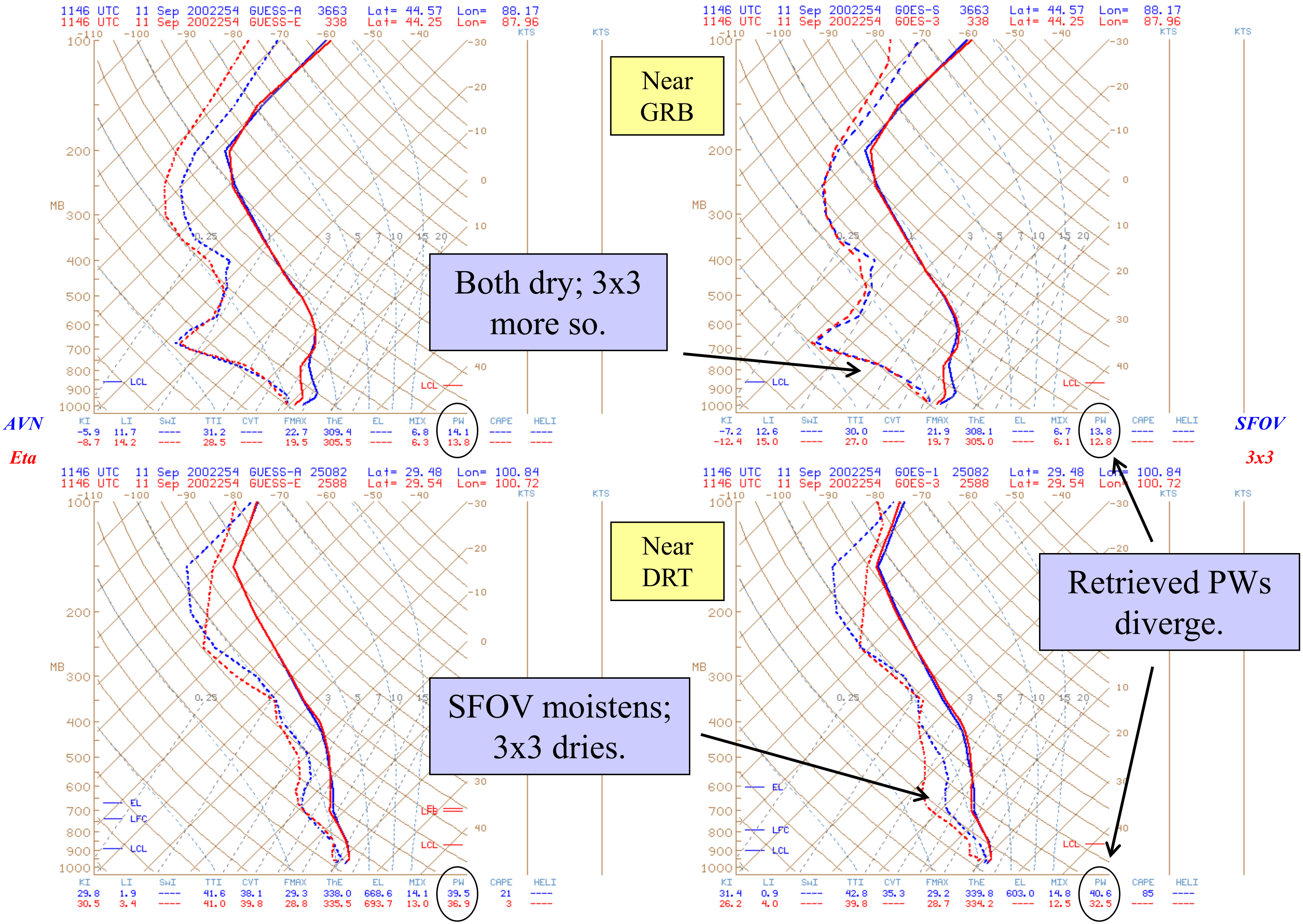
GOES Sounder profile/guess near GRB (WI) radiosonde



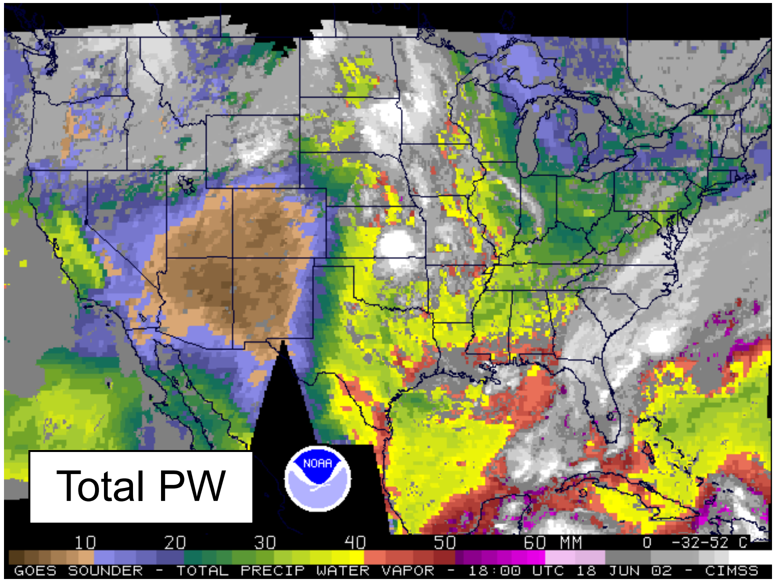
GOES Sounder profile/guess near DRT (TX) radiosonde



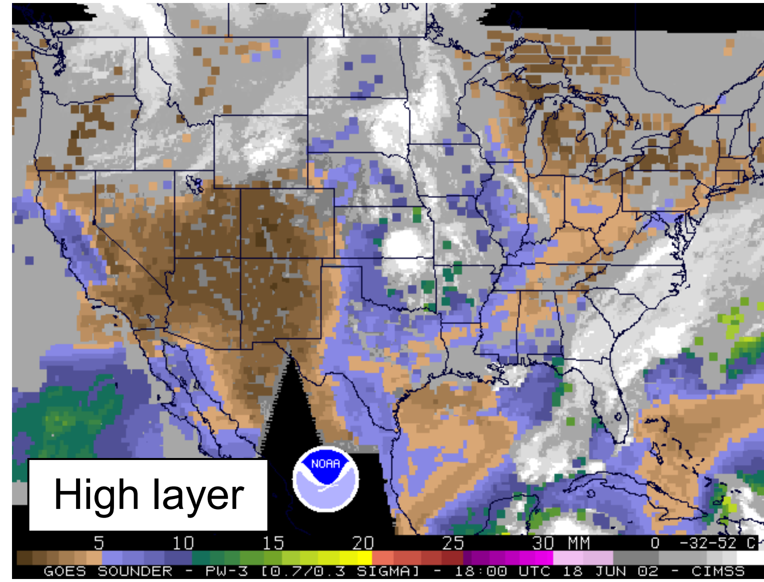
Guess (AVN vs Eta) and GOES retrieval (SFOV vs 3x3) variations



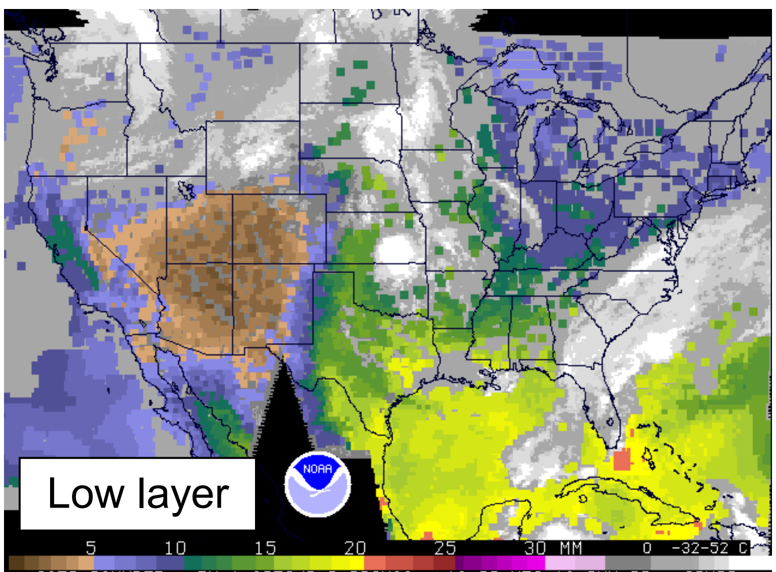
Vertical partitioning of precipitable water derived from the GOES Sounder



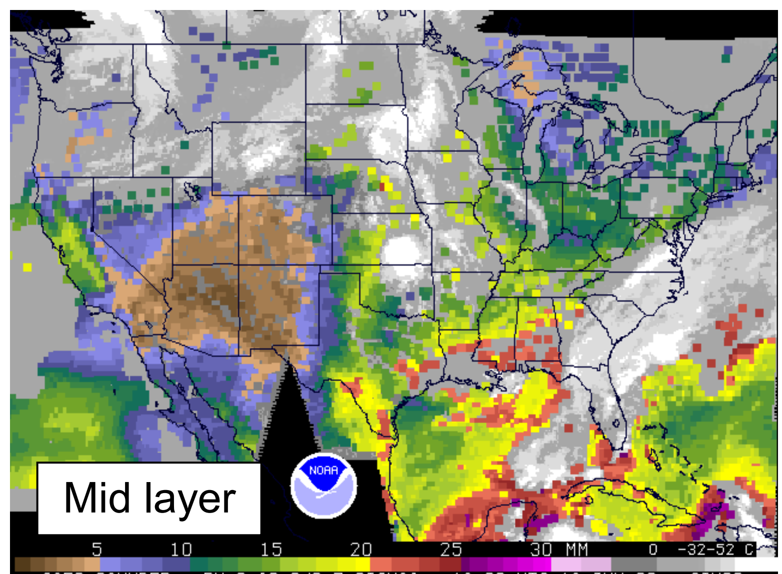
=



+



+



GOES-8 and GOES-10

at 1800 UTC on 18 June 2002

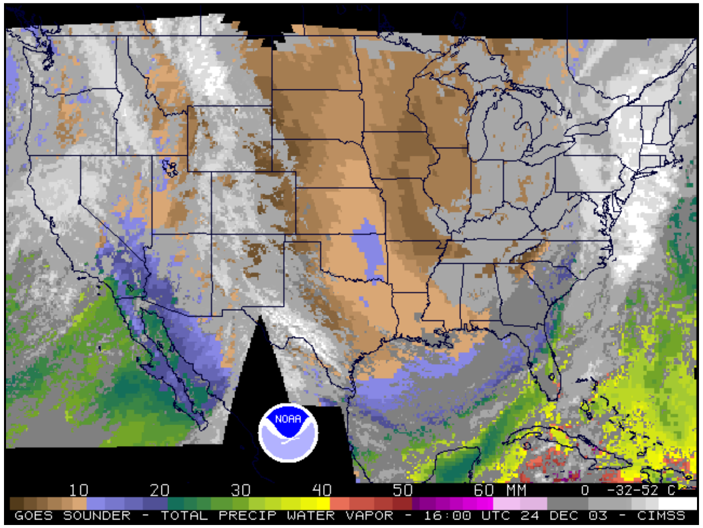
ASPT

(See - http://cimss.ssec.wisc.edu/goes/realtime/aniuspwall.html)

Total and layered precipitable water from the GOES Sounders at 3x3 FOV and SFOV

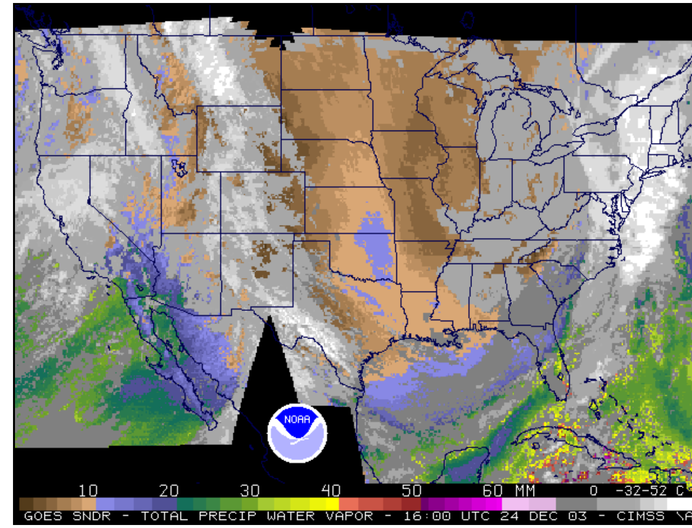
3x3 FOV

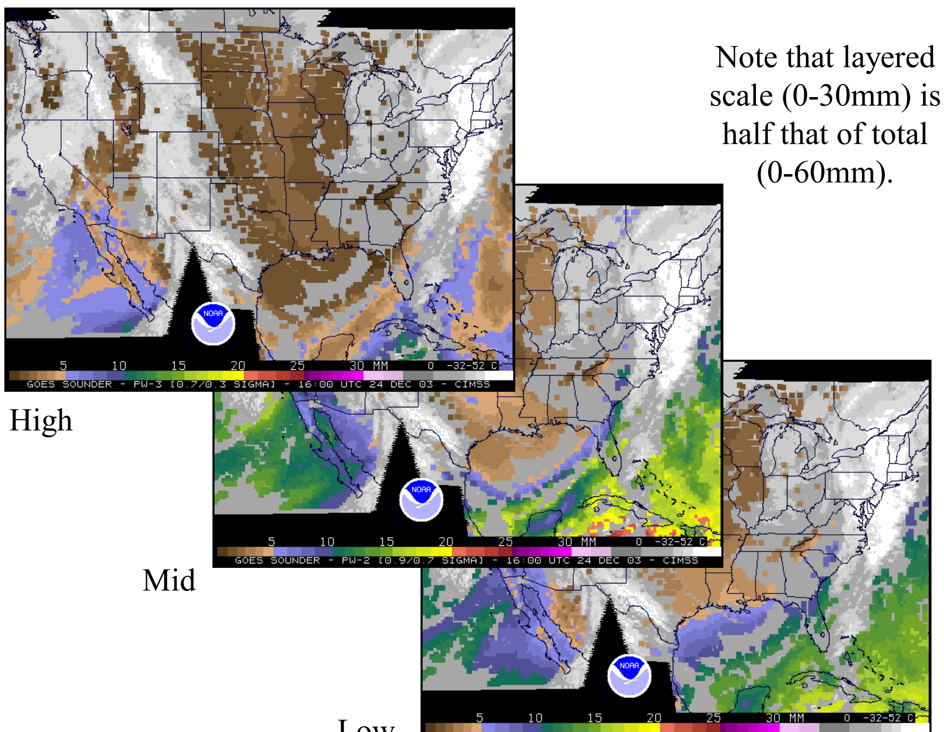
Total PW



Single FOV

Total PW



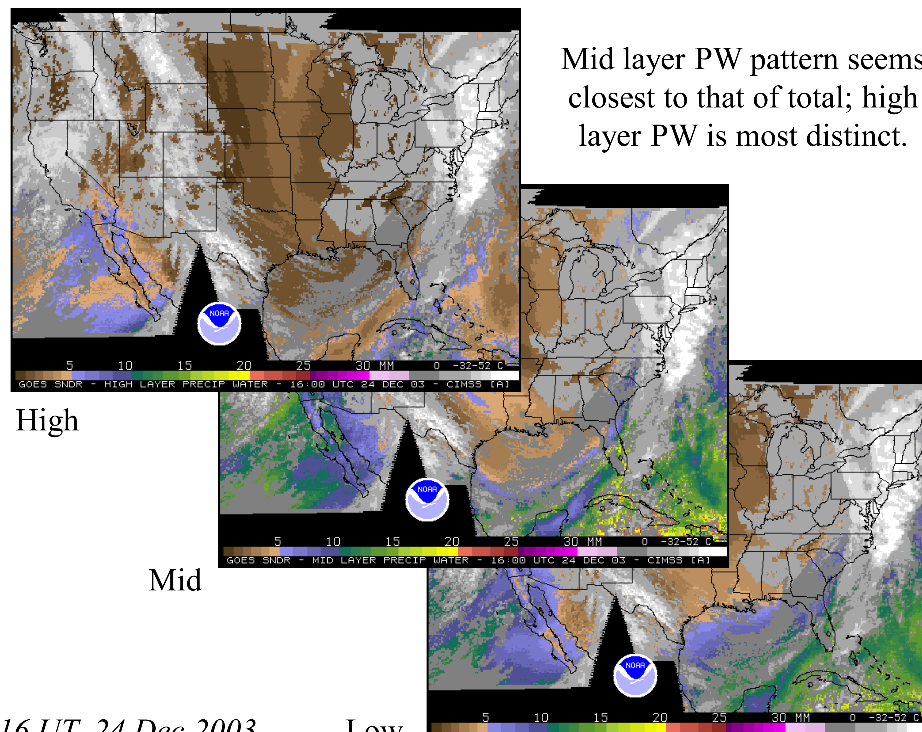


High

Mid

Low

Note that layered scale (0-30mm) is half that of total (0-60mm).



High

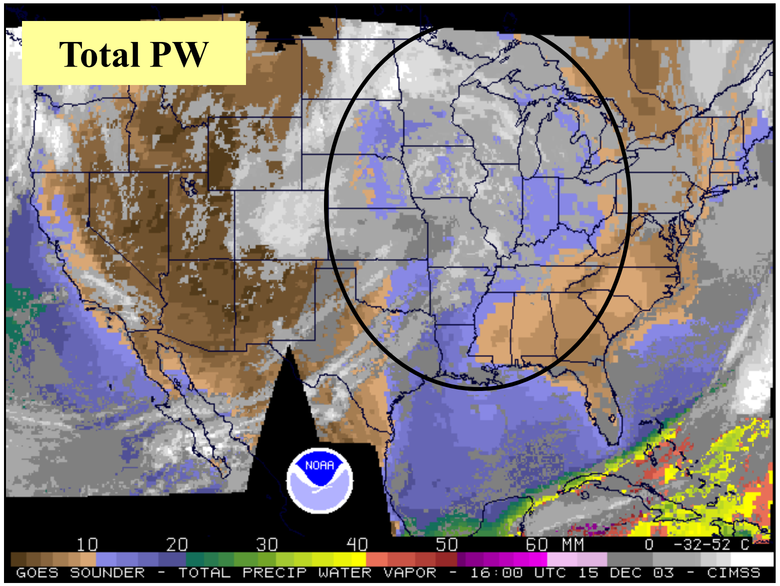
Mid

Low

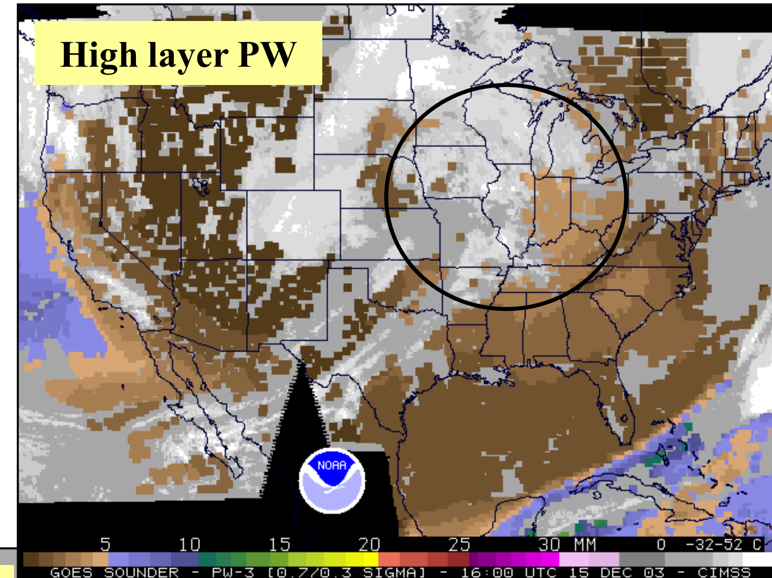
Mid layer PW pattern seems closest to that of total; high layer PW is most distinct.

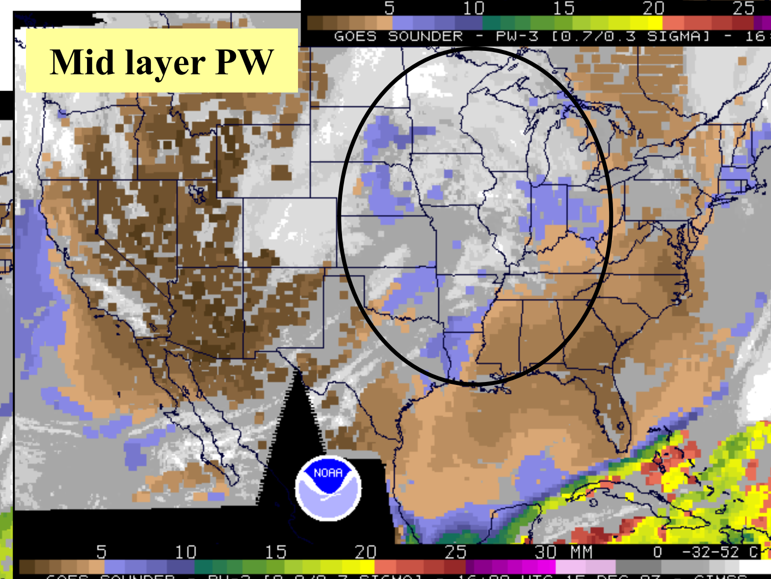
16 UT 24 Dec 2003

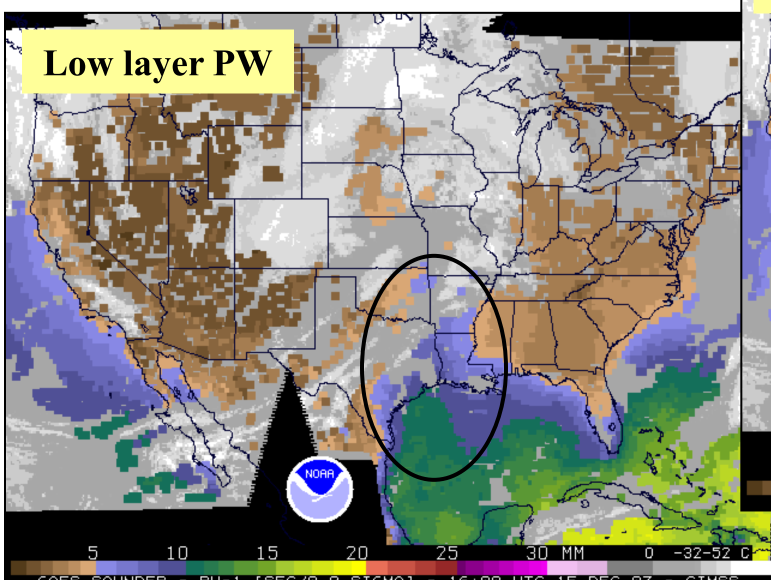
Differentiation of the three vertical layers of precipitable water from the GOES Sounders



16 UT 15 Dec 2003



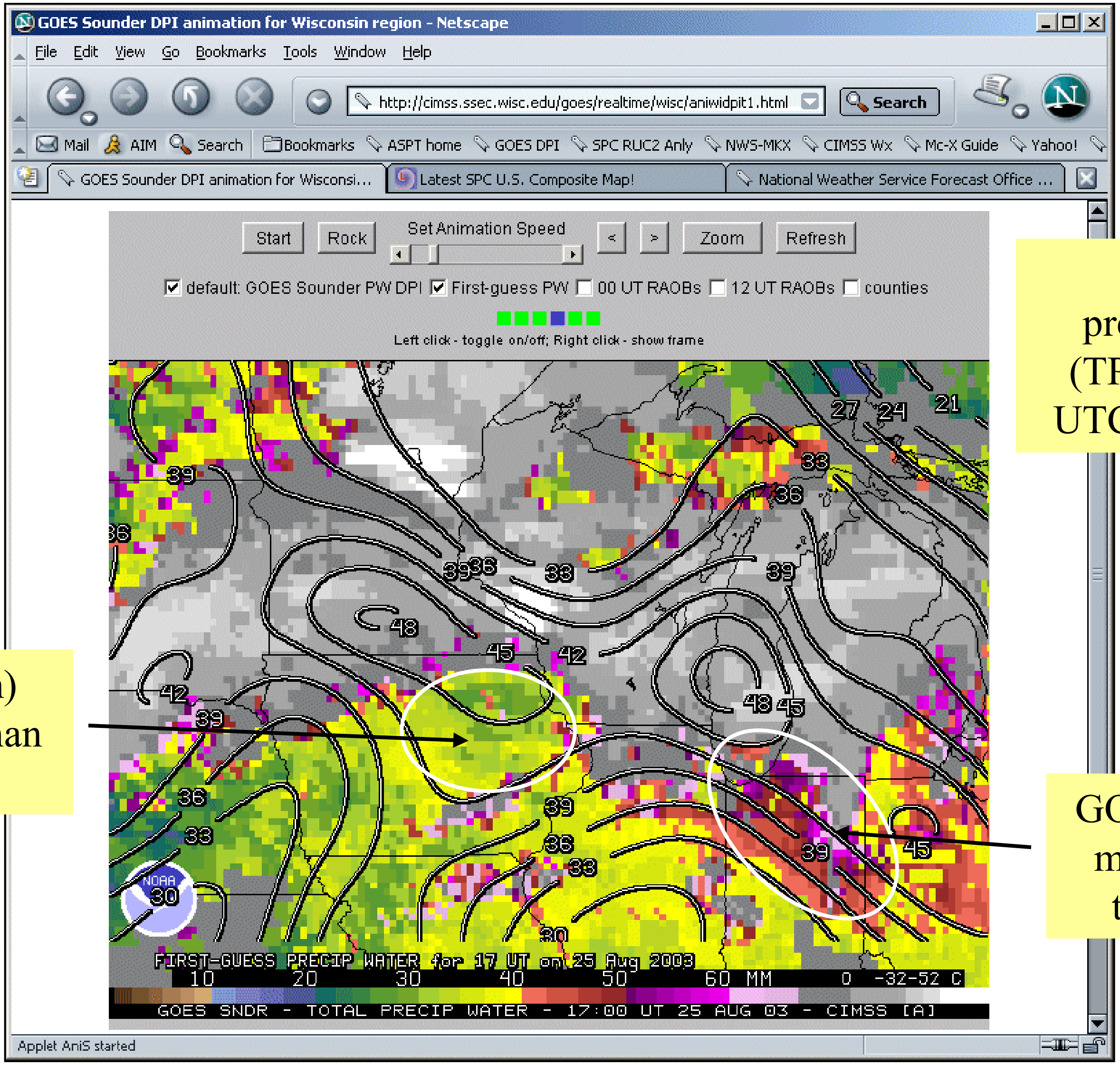




Note how ovals of relative maximum PW, over US, shift with height.

[See - http://cimss.ssec.wisc.edu/goes/realtime/grtmain.html#uspw-31]

Example of real-time GOES Sounder Derived Product Imagery Focused on Wisconsin



GOES total precipitable water (TPW) DPI at 1700 UTC on 25 Aug 2003

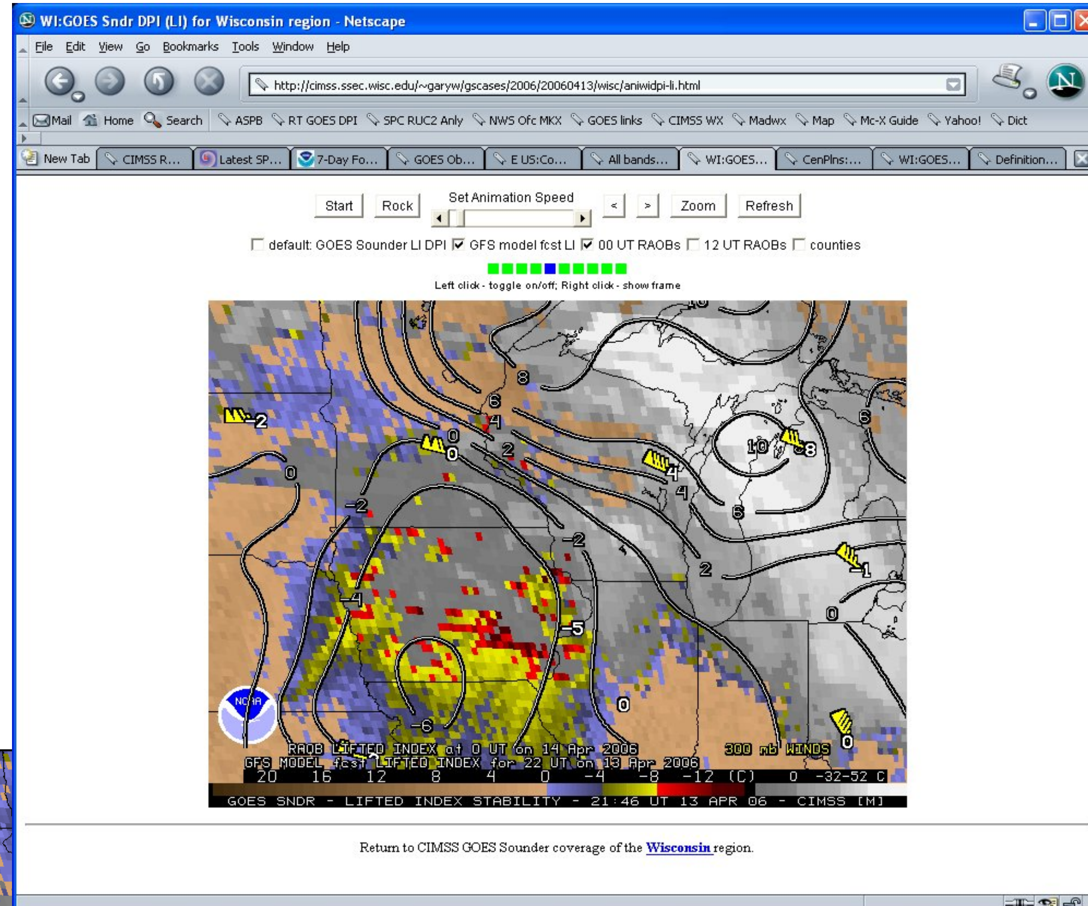
GOES (<40mm) evidently drier than first-guess

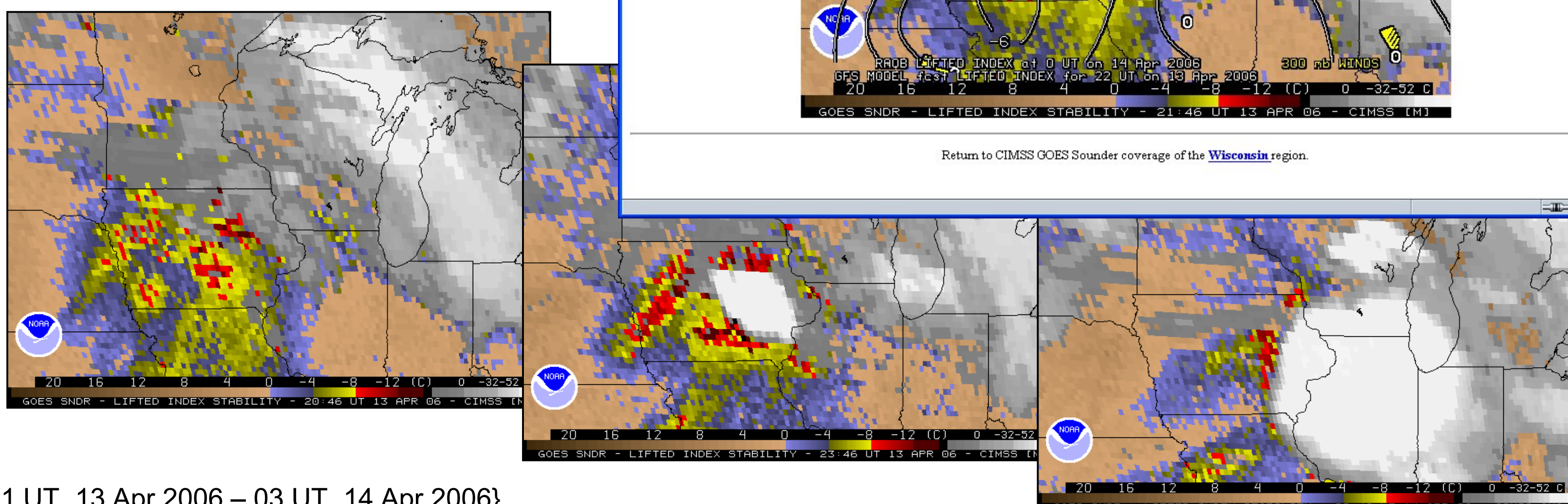
GOES (40-50mm+) markedly moister than first-guess

(Shouldn't such differences impact forecasts ?)

Small scale view of GOES Sounder SFOV LI DPI

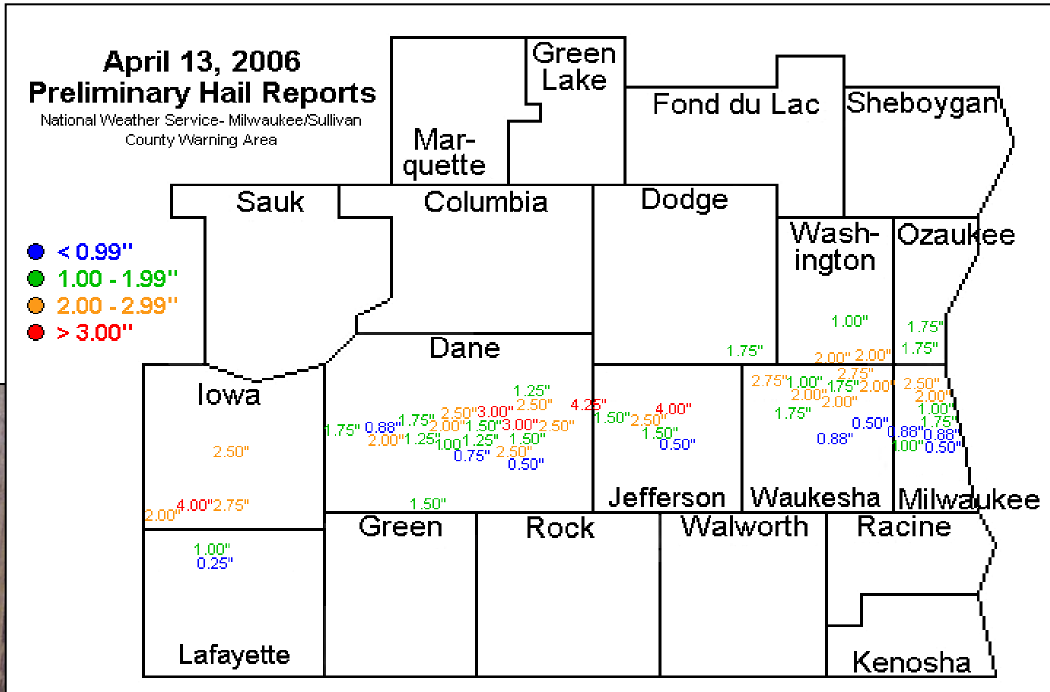
The SFOV resolution is evident (the nominal sub-satellite 10 km FOV being ~ 11-16 km over the Midwest). However, practical confidence remains stronger with the larger pattern and the temporal trend.



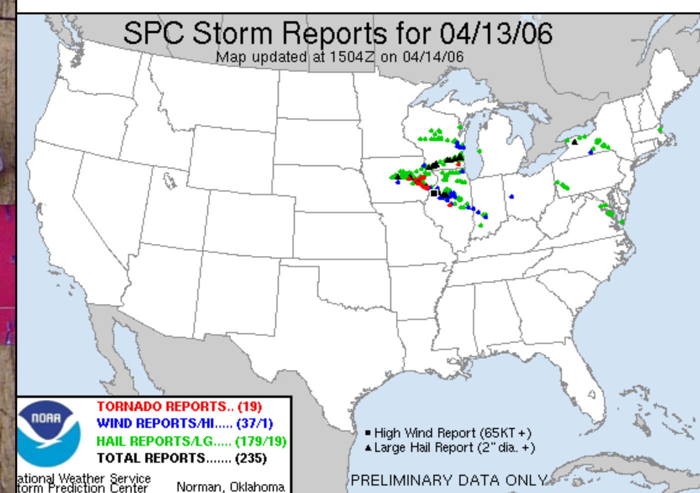


{21 UT 13 Apr 2006 – 03 UT 14 Apr 2006}

…some verification of that strong convection

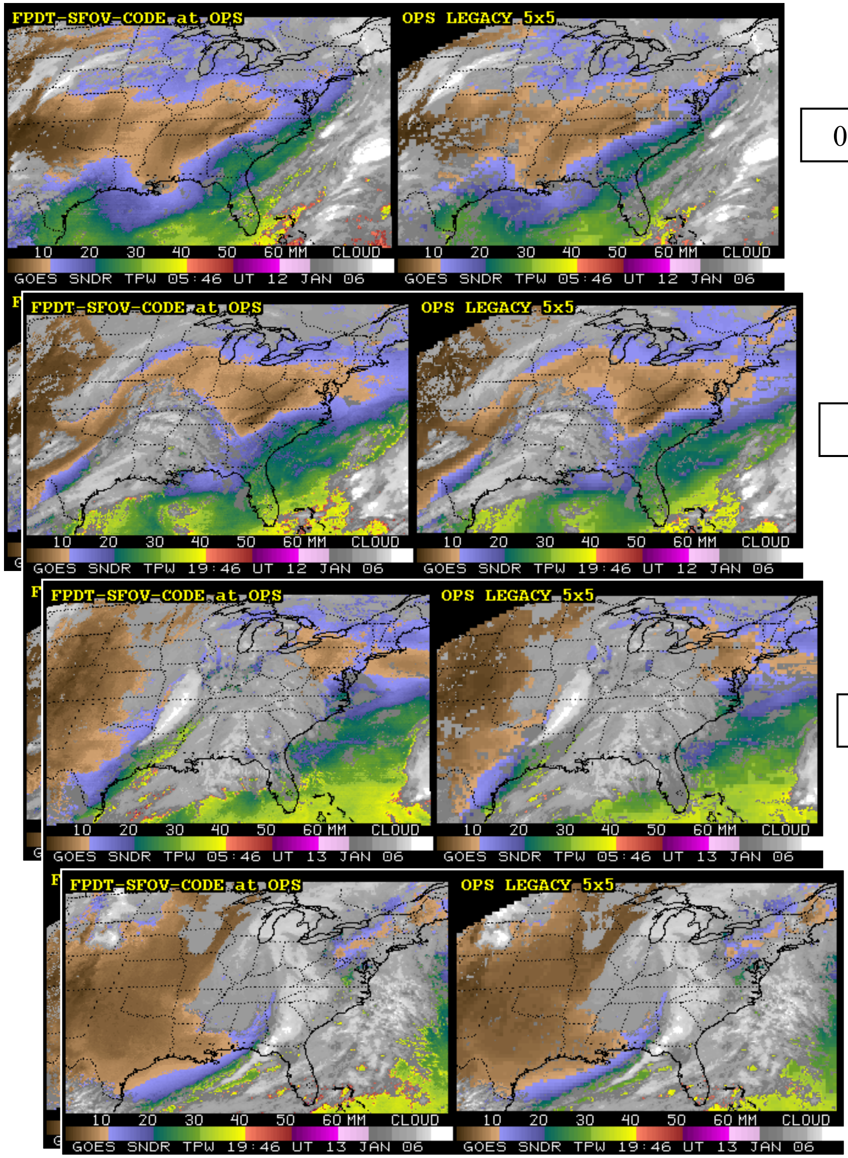


Maybe across parts of the central Plains, this weather wouldn't be a big deal; but around southern Wisconsin, it was pretty exciting!



A sequence showing new SFOV (versus old 5x5 FOV) TPW DPI from the GOES-12 Sounder in a typical real-time situation

Derived Product Images (**DPI**) of total precipitable water (**TPW**)



Single field-of-view (SFOV)

5x5 Field-of-view

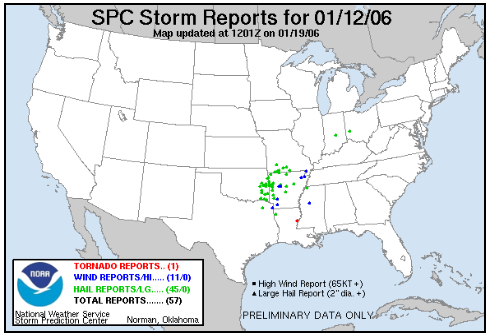
06 UT - 12 Jan 2006

20 UT - 12 Jan 2006

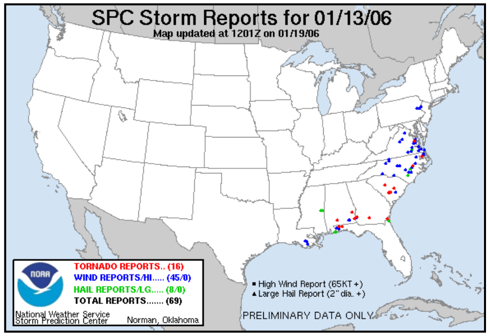
06 UT - 13 Jan 2006

20 UT - 13 Jan 2006

SFOV DPI, with higher horizontal resolution, are markedly smoother and less blocky, thus being more aesthetically appealing as depictions of actual atmospheric evolution and more capable of defining gradients. The new system for processing the SFOV retrievals handles cloud detection in a more consistent manner than that for the 5x5 FOV DPI.

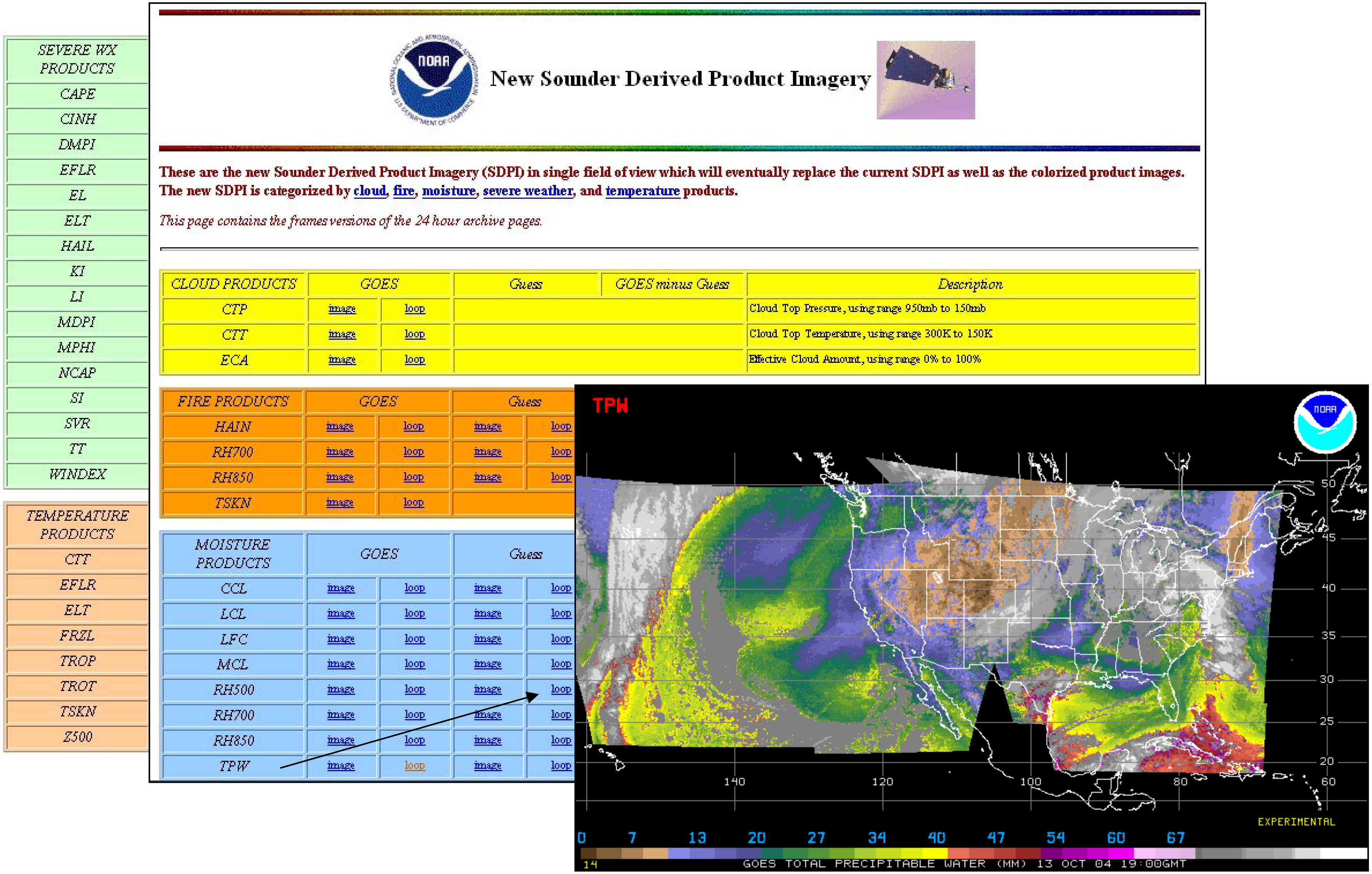


The impulse of Gulf of Mexico moisture across SE TX, and then into the lower-to-mid MS Valley, is critical for severe convection there, followed the next day by propagation to the US East Coast. Strong drying is evident along the Gulf Coast in the wake of the system. Animation helps to mitigate the detrimental effects of obscuration by cloud.



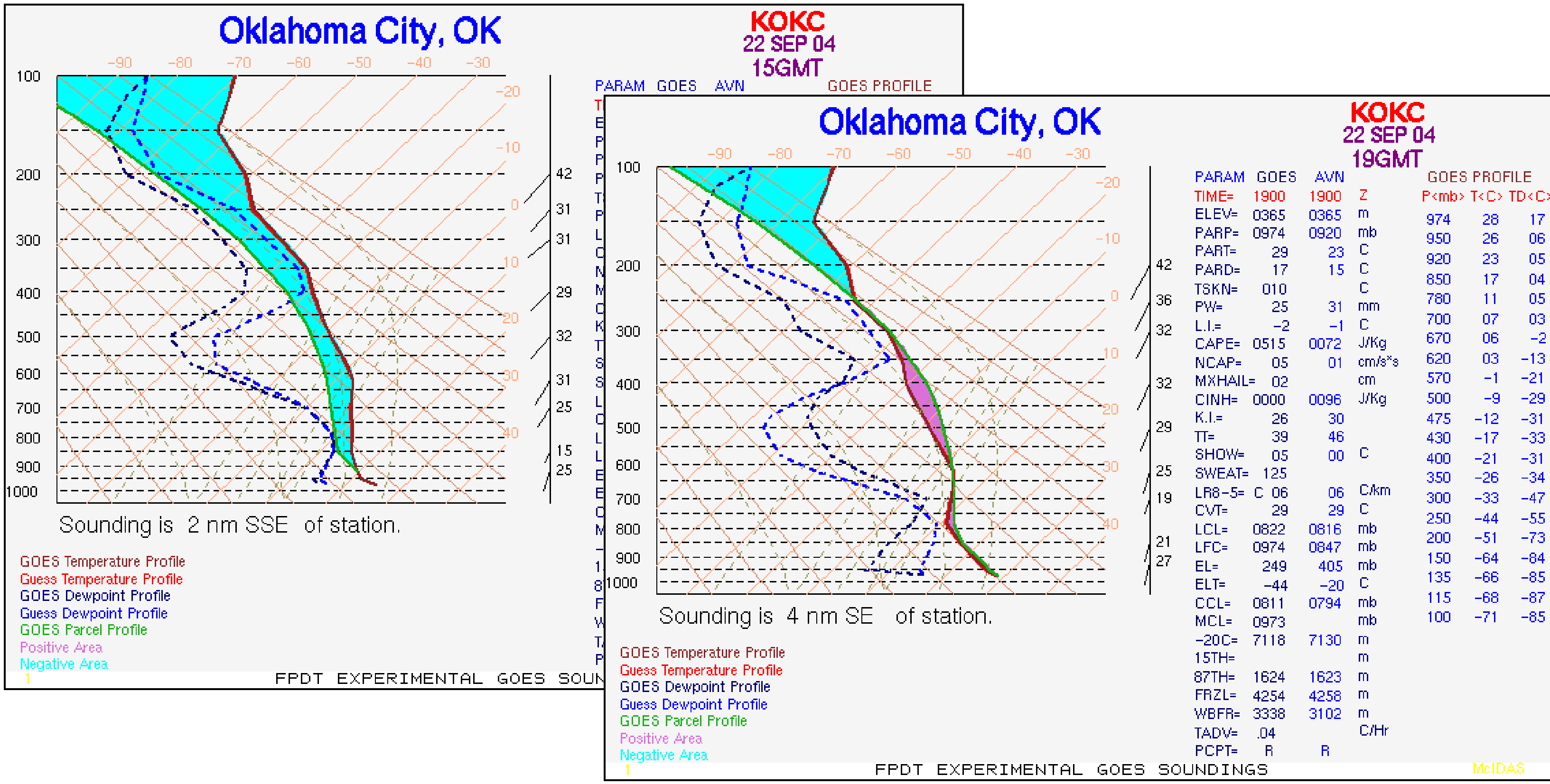
The new SFOV GOES Sounder DPI were provided on the NWS AWIPS starting in November 2005.

Available current GOES Sounder DPI



http://www.orbit.nesdis.noaa.gov/smcd/opdb/goes/soundings/index.html#products

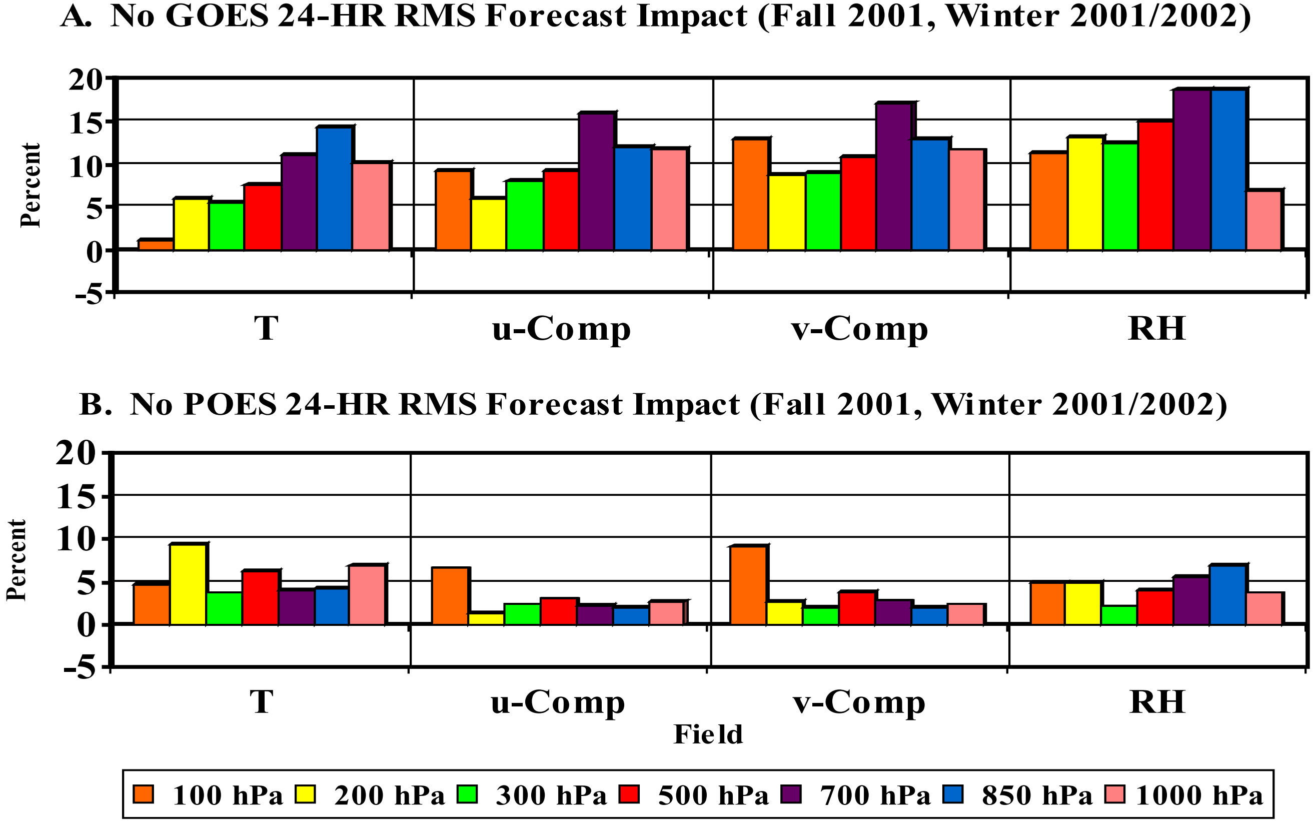
Real-time GOES Sounder retrieval profiles (NOAA/NESDIS OPDB)



http://www.orbit.nesdis.noaa.gov/smcd/opdb/goes/soundings/skewt/html/skewhome.html

GOES Data Improving Regional Forecasts

Hyperspectral Geo could do much more

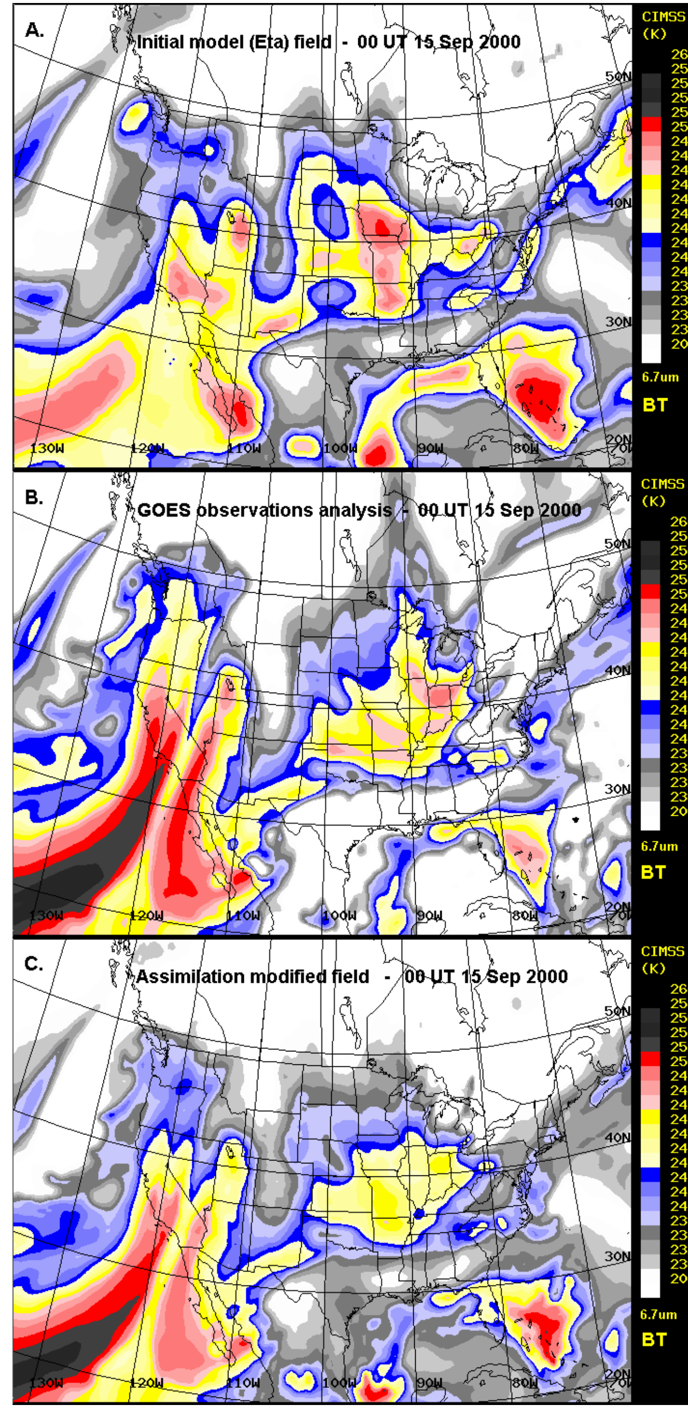


Positive forecast impact (%) of both GOES and POES data in regional model (Eta Data Assimilation/Forecast System) on standard meteorological state variables for fall 2001 and winter 2001/2002.

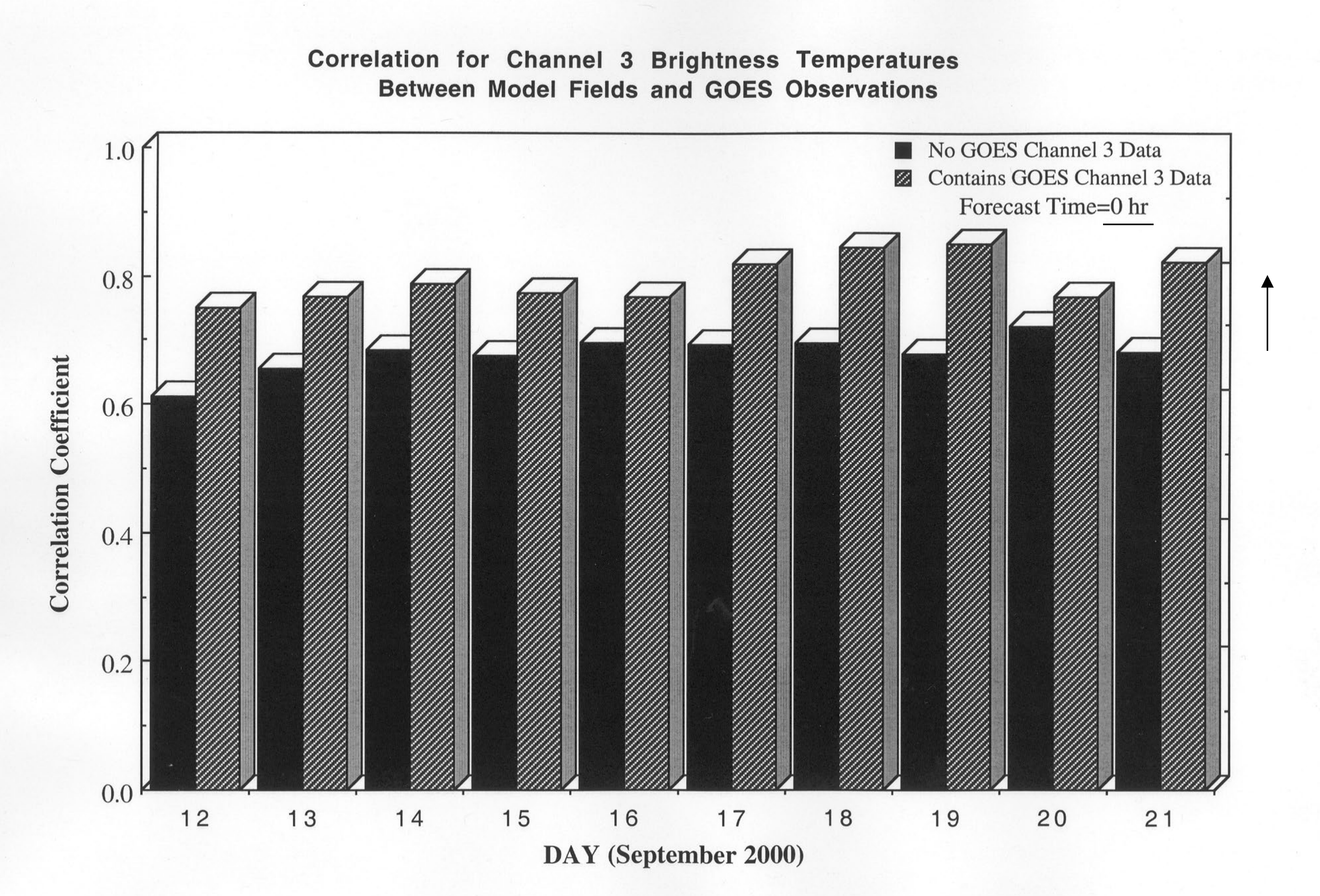
Zapotocny et al, 2004

Adjusting a model field with GOES observations

The demonstrated assimilation procedure modifies only the moisture field in physical space (in contrast to radiance space). The numerical optimization of the differences for channel 3 brightness temperatures (water vapor at 6.7 um), between the forecast initial conditions (by a forward radiative model) and the observed GOES values, is incorporated directly into the CIMSS Regional Assimilation System (CRAS) forecast model. The partitioning of changes made to the model moisture field, in physical space, is directly proportional to the observational weighting functions.



Inclusion of GOES channel 3 brightness temperature in the model assimilation improves correlation of model synthetic images compared to observed images



For these 00 UTC runs during the 10 day period, the average improvement in correlation was **12**%.

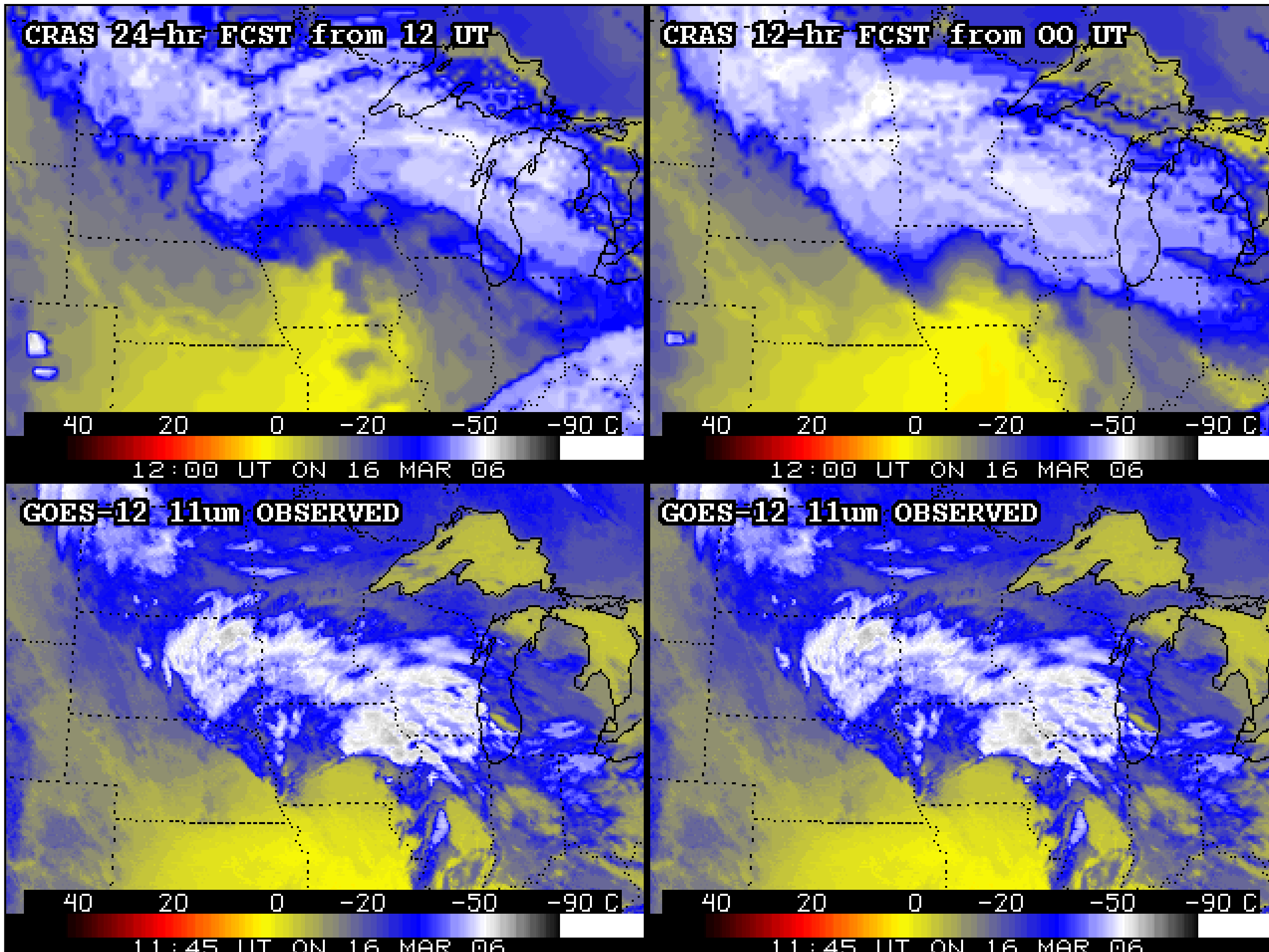
Uniquely monitoring model output with satellite imagery

Model runs from two different start times can be used to provide forecast fields both valid at the same time (as for 12 UT on 16 Mar 2006 in this example).

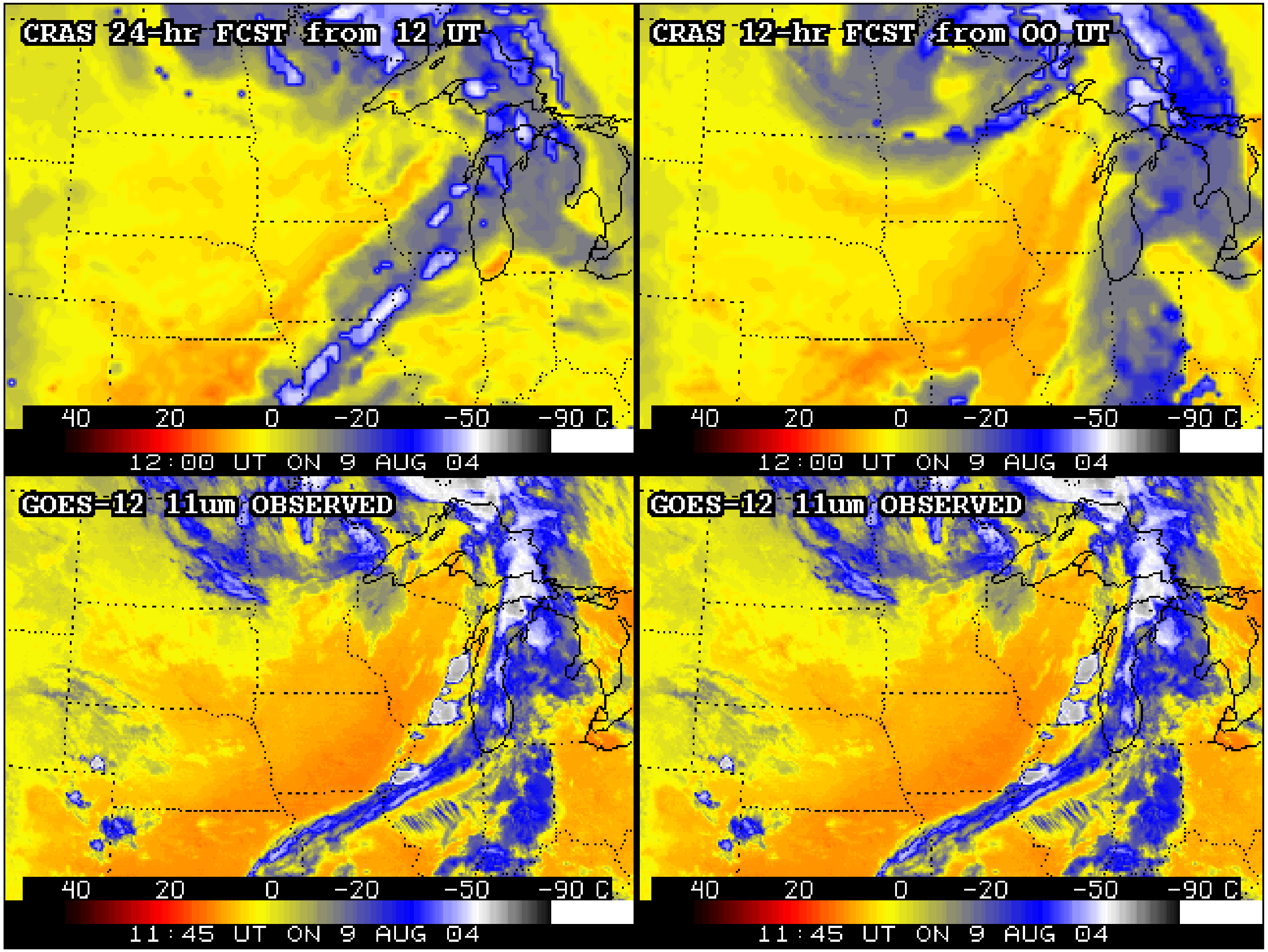
CRAS forecast imagery

versus

verifying GOES observed imagery

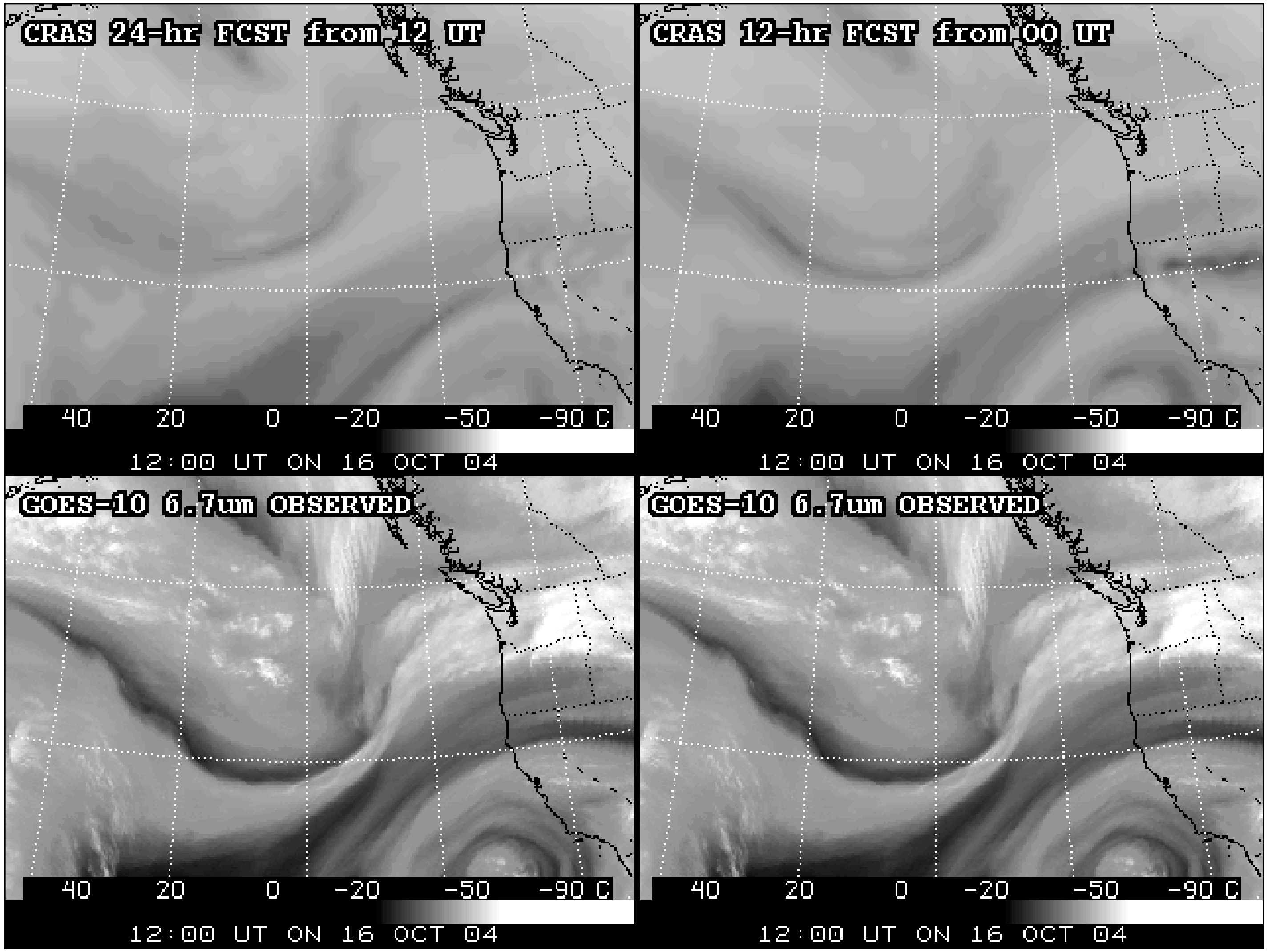


GOES Observed Imagery versus CRAS Forecast Imagery
(IR window over upper Midwest)



http://cimss.ssec.wisc.edu/goes/realtime/cf/anilatestgovcf.html

GOES Observed Imagery versus CRAS Forecast Imagery (IR water vapor over NE Pacific)



http://cimss.ssec.wisc.edu/goes/realtime/cf/anilatestgovcfp.html

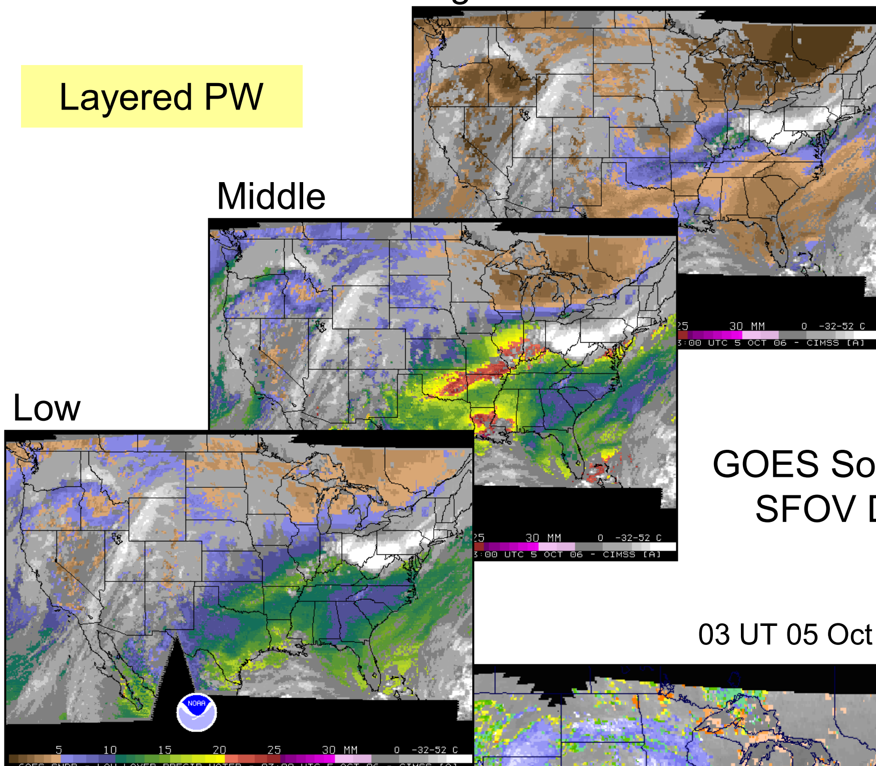
Assimilating GOES Sounder products into a numerical model and generating forecast imagery (1)

Layered PW

High

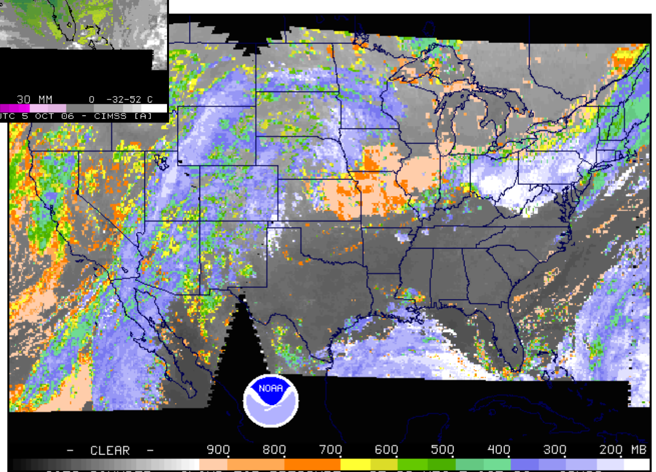
Middle

Low



GOES Sounder SFOV DPI

03 UT 05 Oct 2006

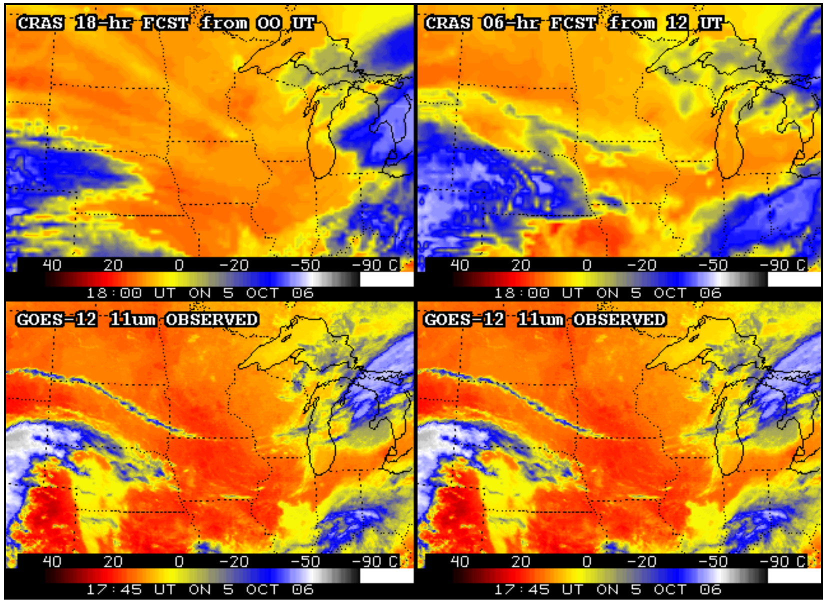


Cloud top pressure (CTP)

The CRAS (CIMSS Regional Assimilation System) model starts initializing 12 hours earlier, with 3-hourly GOES insertions, within an NCEP GFS background for producing the initial 00-hour analyses.

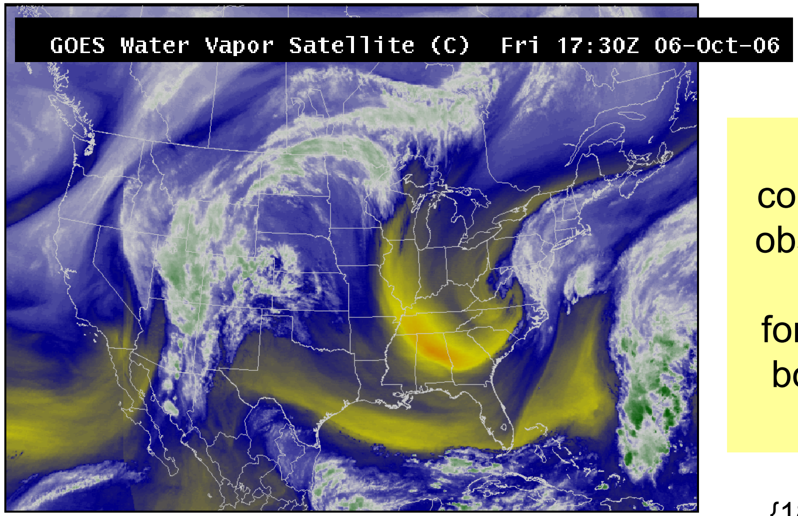
Assimilating GOES Sounder products into a numerical model and generating forecast imagery (2)

Forward radiative transfer equations (RTE) are used to compute the expected image radiative temperatures, at a given wavelength, from the forecast temperature and moisture profiles predicted by the CRAS.

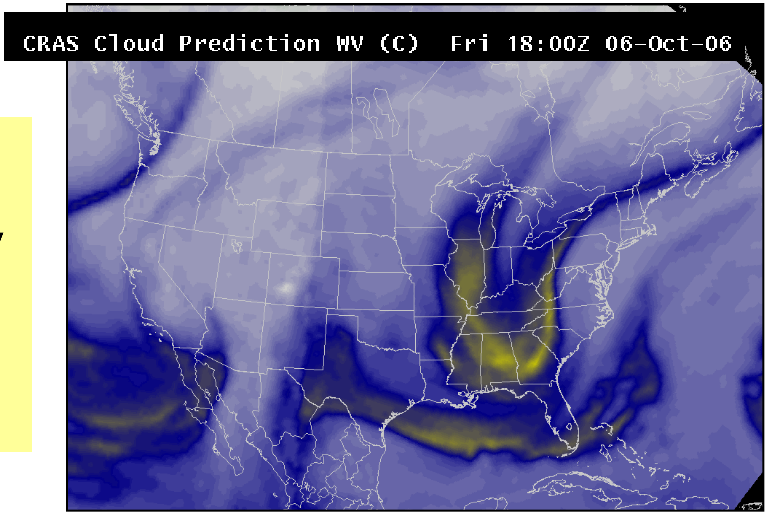


McIDAS display on web {18 UT 05 Oct 2006}

OR



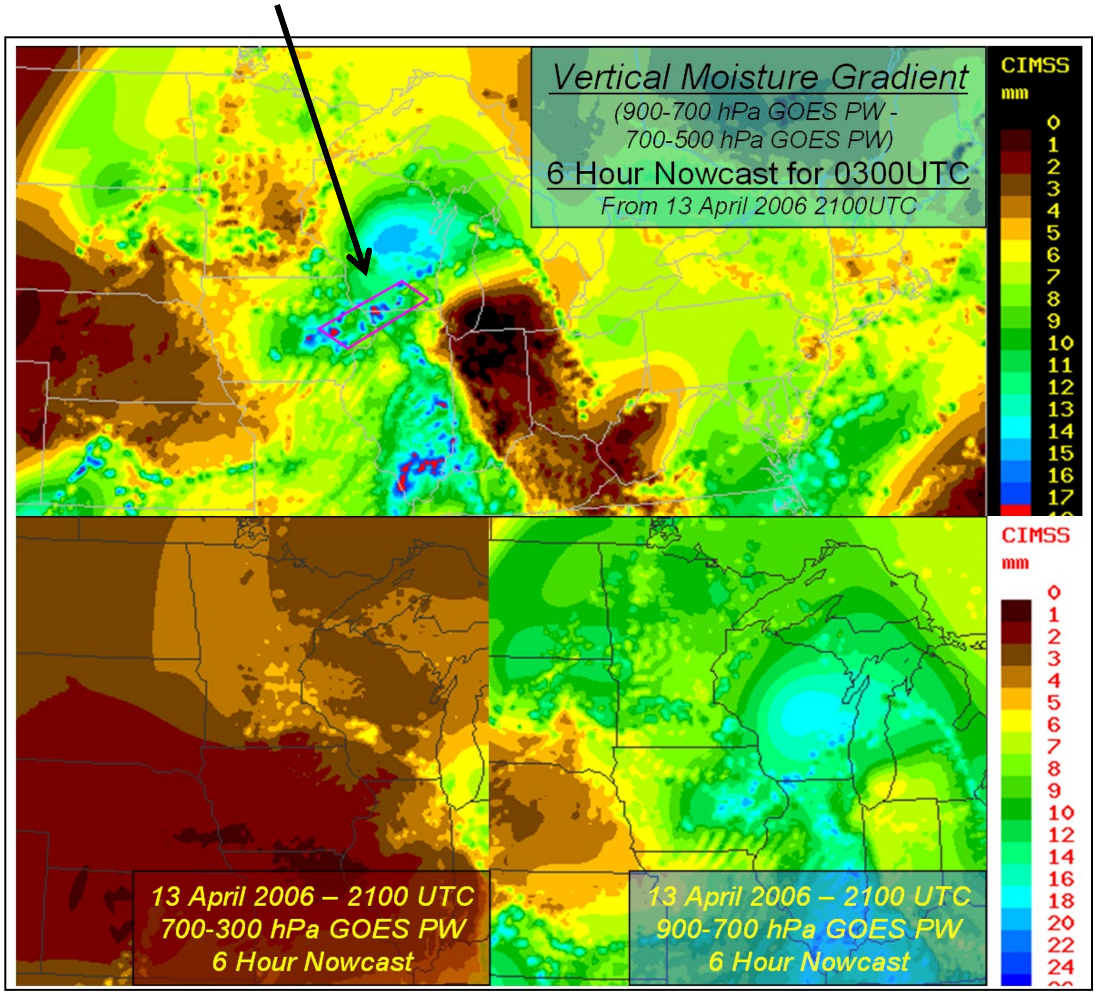
On AWIPS, comparing GOES observed imagery with CRAS forecast imagery, both valid at the same time.



{18 UT 06 Oct 2006}

Exploiting the temporal advantage of the GOES Sounder in a dynamic nowcasting system

Recall the significant hail storm, previously described, across southern Wisconsin on the evening of 13 Apr 2006; note this objective nowcast of maximum vertical moisture gradient.

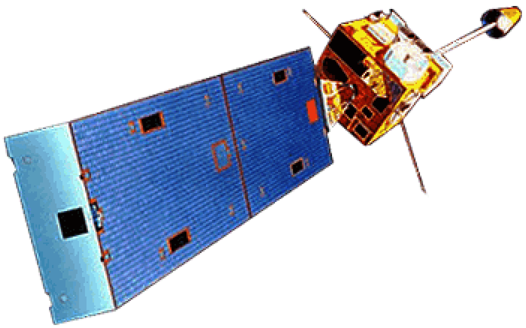


Using hourly fields of two modestly broad layers of moisture from GOES Sounder retrievals, future movement of GOES DPI pixels is predicted using forward trajectories initialized with RUC winds and heights.

The trajectory approach retains GOES moisture gradients, and by employing the dynamically changing winds, can spread the moisture information into cloudy areas.

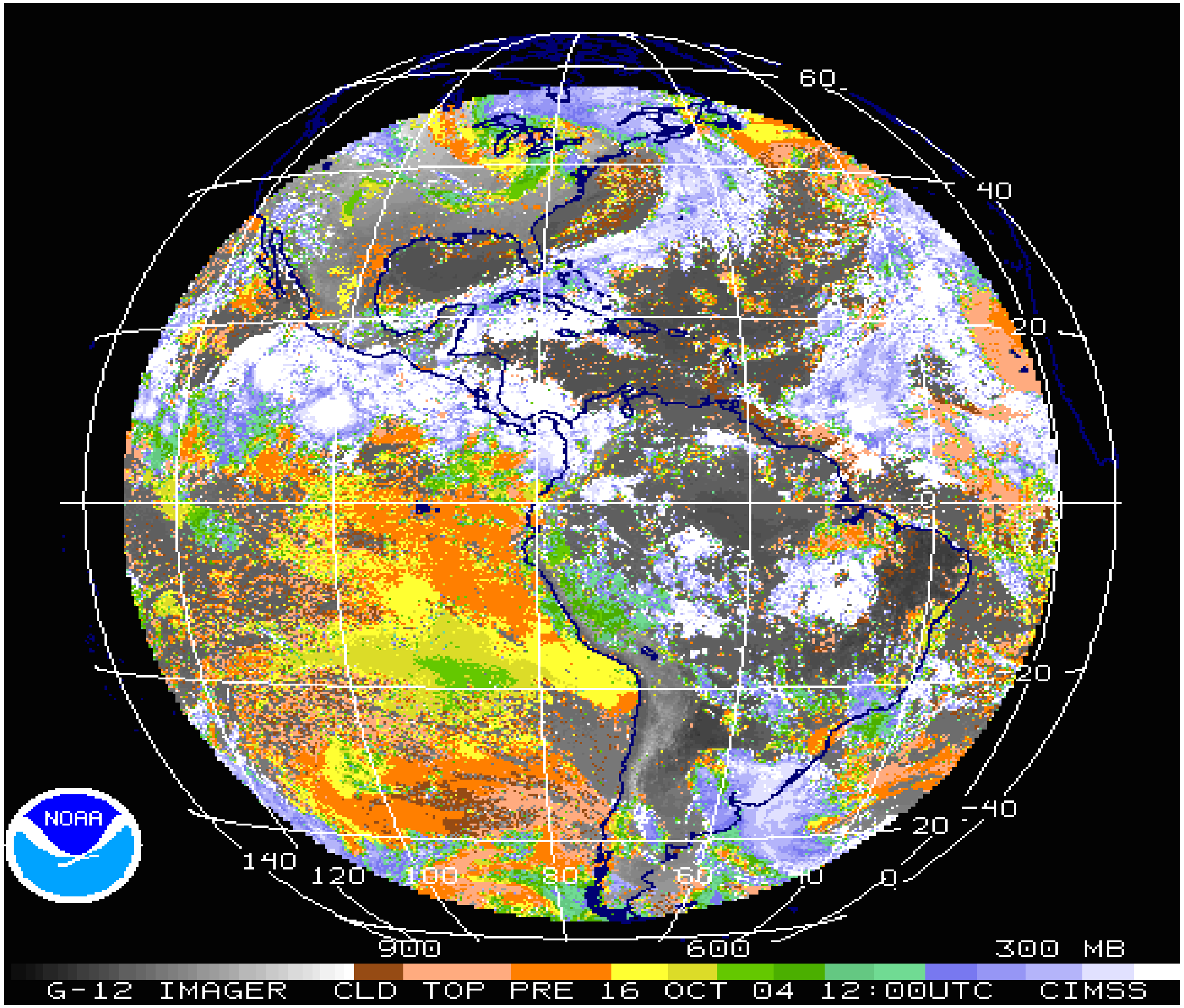
{Displays generously provided by R. Petersen (CIMSS) and R. M. Aune (ASPB).}

Overview



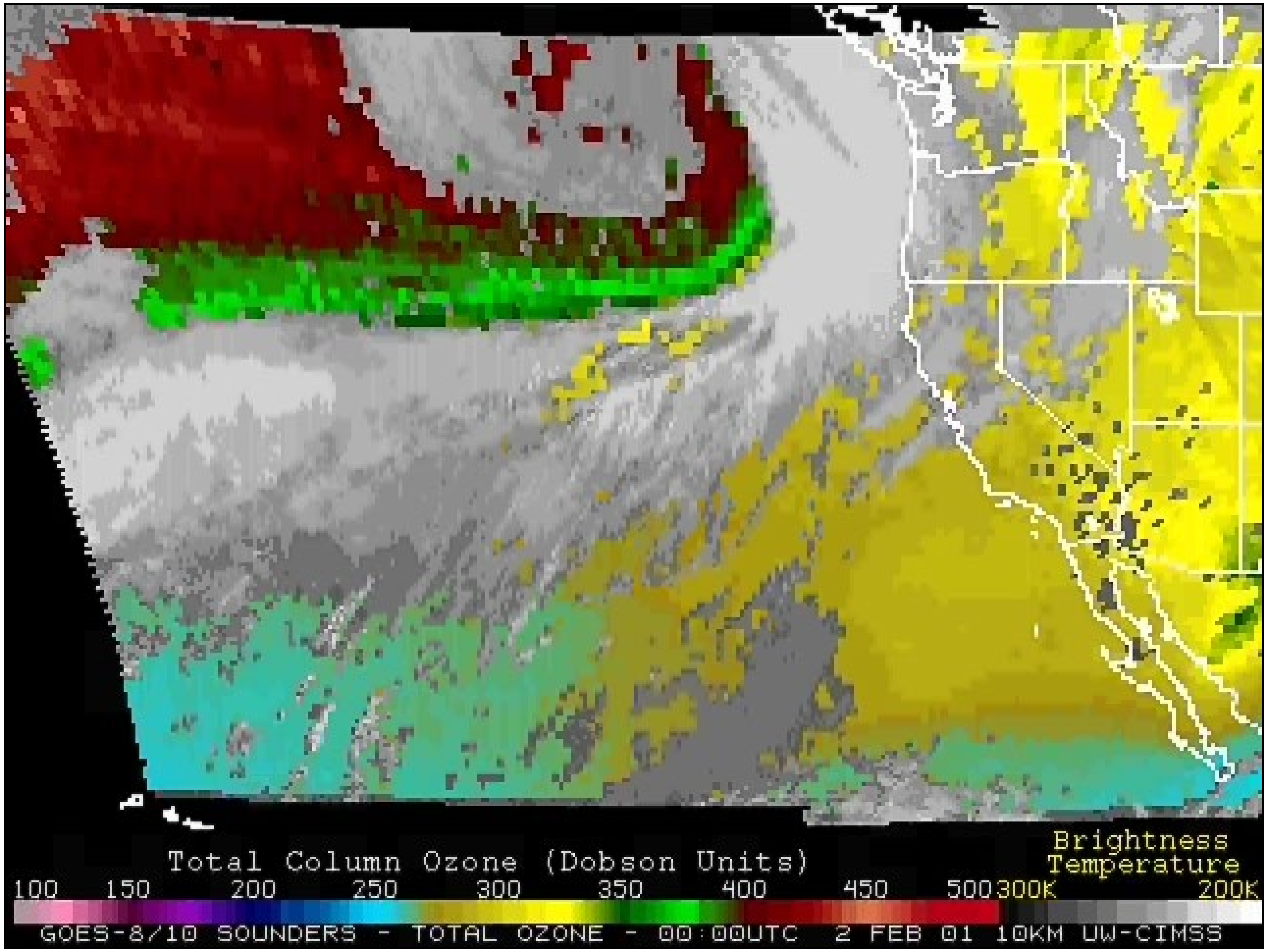
- Profile retrieval input
  - radiances, first-guess
- Profile retrieval processing
- Retrieved products (DPI)
  - moisture, stability
- DPI applications
  - monitor, numerically forecast, “nearcast”
- Other retrievals
  - cloud, O_3, SO_2
- Better profiles… more promotion

Satellite cloud products



http://cimss.ssec.wisc.edu/goes/realtime/grtmain.html#imgrcld

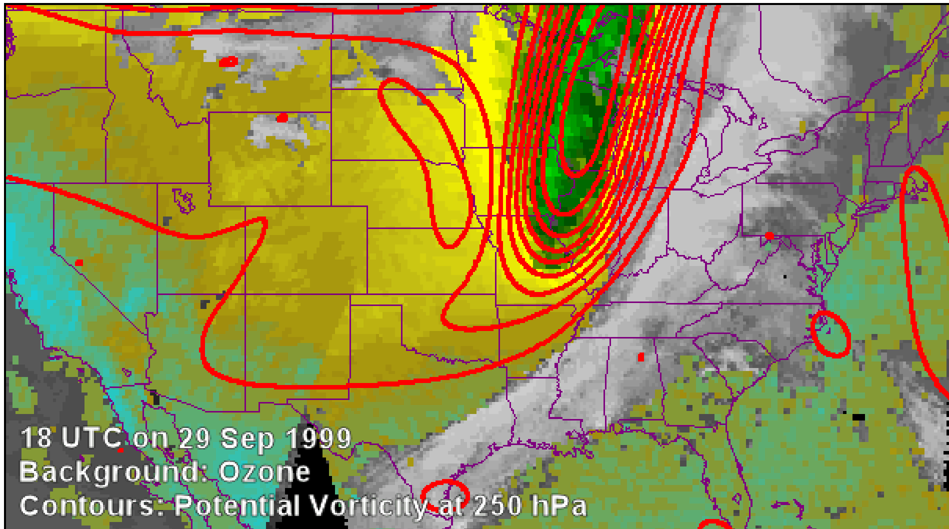
Satellite derived total ozone

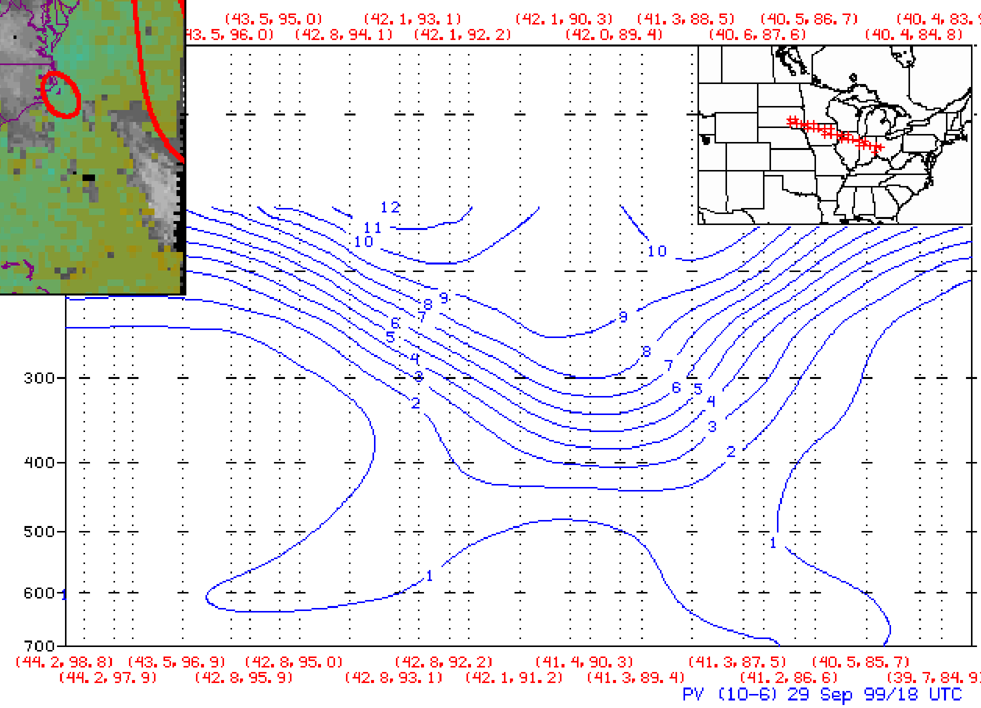


GOES Sounder (02-06 Feb 2001)

http://cimss.ssec.wisc.edu/goes/realtime/grtmain.html#ozone

Upper level dynamics inferred from satellite total ozone determination





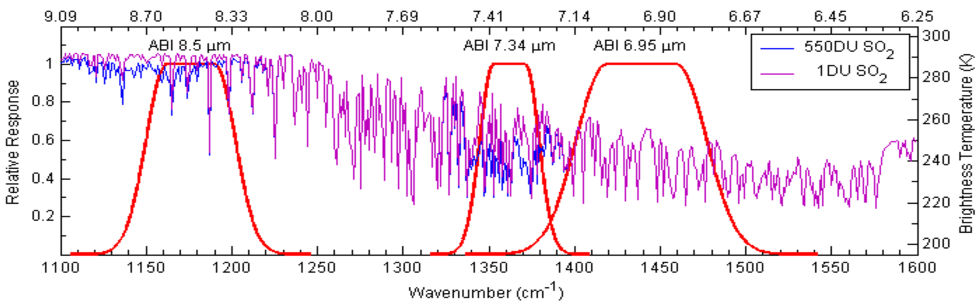
A tropopause fold is clearly evident in GOES ozone imagery and in potential vorticity (PV) derived from the ETA model on 29 September 1999 at 18 UTC. Ozone and PV show high correlation in this case.

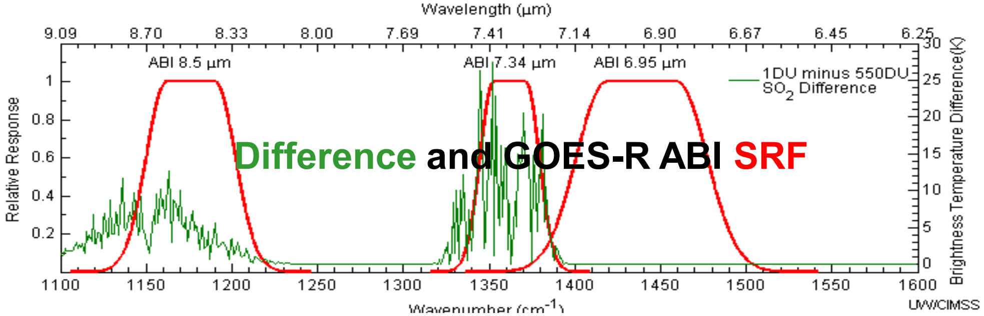
USING GOES-R TO HELP MONITOR UPPER LEVEL SO_2

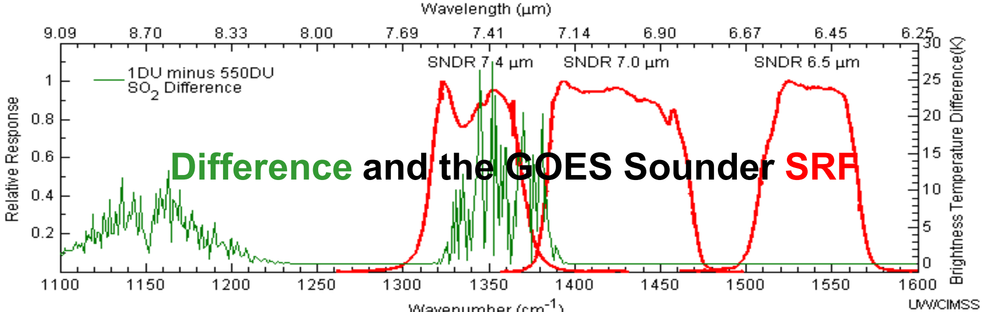
Anthony J. Schreiner*, Timothy J. Schmit#, Jun Li*, Gary P. Ellrod#, Mat Gunshor*

***CIMSS** **#NOAA/NESDIS**

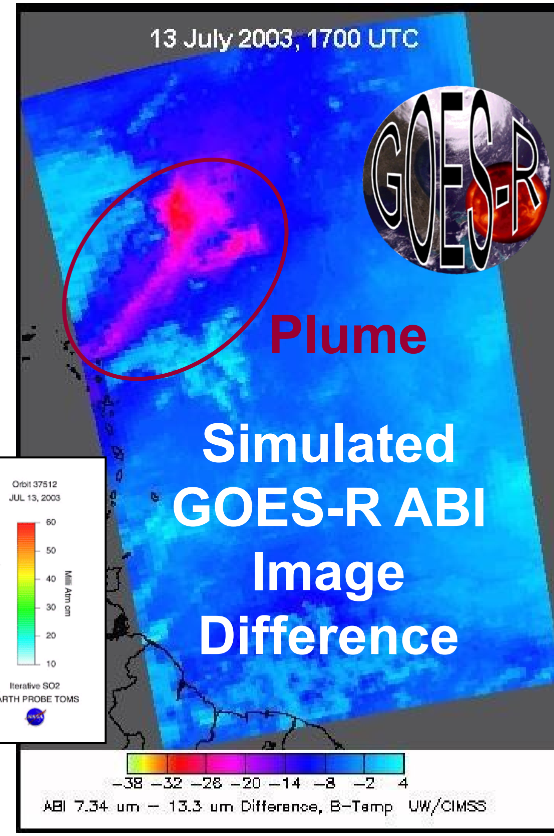
Simulated IR spectrums for "normal" and "SO_2 enriched" atmosphere and spectral response functions

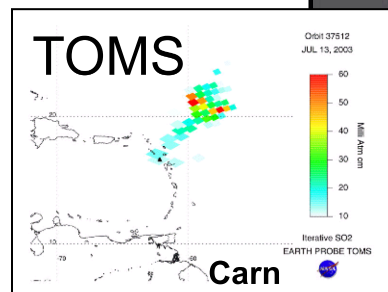


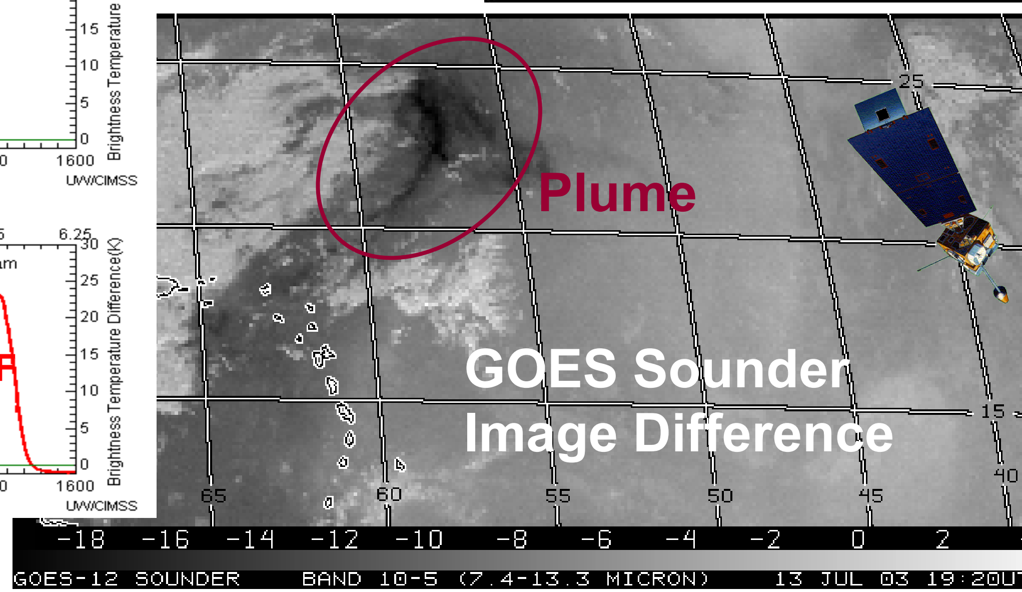




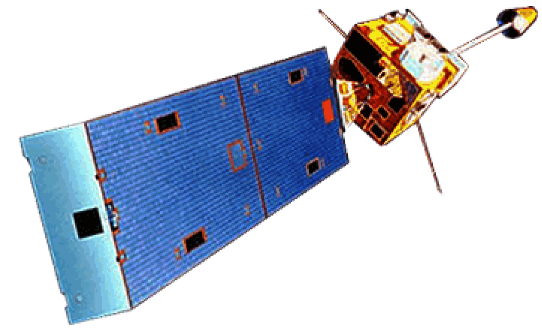
Detection of volcanic plumes







Overview



- Profile retrieval input
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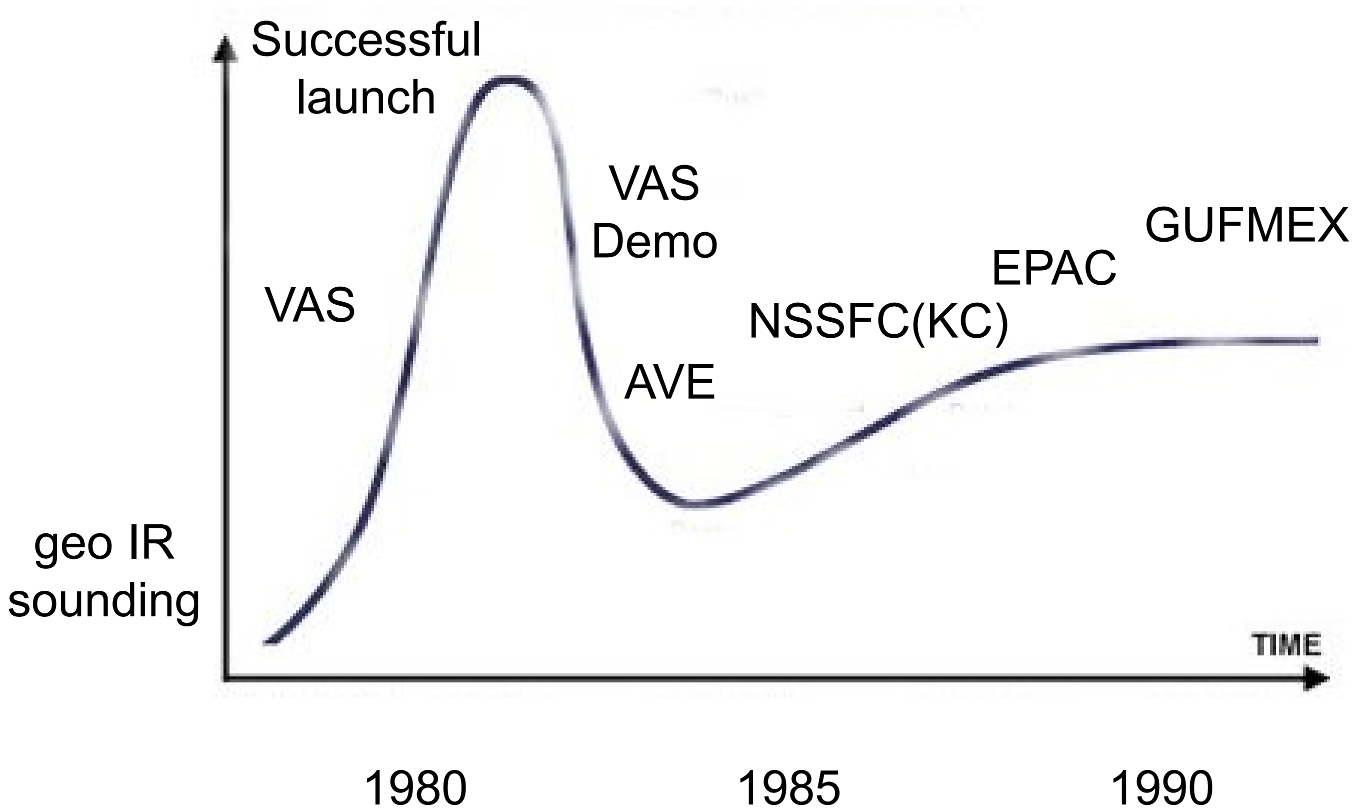
- Other retrievals
  - cloud, O_3, SO_2
- Better profiles… more promotion

The Ups and Downs of Satellite Advances



Future concerns and improvements for geostationary sounding

circa 2000

The DPI values are only as good as the retrievals.

• Improve vertical resolution with interferometers (more and better data)

• Improve the retrieval methods (better able to deviate (correctly) from the first-guess)

• Add microwave capability (profiling within cloudy regions)

• Make DPI readily accessible by more users (especially as part of the NWS AWIPS data stream, building on recent interest following the NWS GOES Sounder Assessment Period during summer 1999)

View real-time data and follow the latest improvements to GOES Sounder DPI and other product applications at

- http://cimss.ssec.wisc.edu/goes/realtime/realtime.html -

UW-Madison

Activities for focus, following the NWA 2004 Annual Meeting satellite workshops

Develop satellite products for the NWS gridded world (of IFPS)

- improve *forecast imagery* (CRAS) with more RTE consideration
- include satellite products (eg, sky cover) in generating "analysis of record" data sets
- provide unified and consistent SFOV *GOES Sounder DPI* for AWIPS environment
- expose AWIPS users to unique satellite data (eg MODIS) with application to future systems

Educate forecaster community about above efforts by incorporating into and utilizing existing COMET and VISIT venues

Can there be a quantum step in GOES Sounder retrieval development?

GIMPAP funded research: GOES Retrieval Science team at CIMSS
(Directed by Dr. Jun Li – summer 2004)

Foci of new approaches for retrieval improvement:

- **Time continuity** (take advantage of high temporal resolution)
- **Spatial filtering** (reduce noise of upper level channels)
- **Model independent first-guess** (realistically characterizing surface emissivity as well as optimally using radiances to improve the first-guess)

Design and implement the needed algorithm modifications, followed by validation study of impact on retrieved temperature/moisture fields.

Where are we on the road with utilizing derived products from the GOES Sounders?

Foundation remains solid (Nominal Sounders with GOES-10 through 12).

In November 2005, Single Field-Of-View (SFOV) retrieval processing was implemented and provided to NWS AWIPS.

Beyond the simple improvement to better horizontal resolution, a double effort continues:

(1) to develop more use of the (unique) information from the retrieved products,

(2) as well as, to retrieve more accurate profiles.

Continuing development of the current GOES Sounder retrieval algorithm

Under direction of Jun Li, the CIMSS GOES Retrieval Science group is working on implementation of a number of enhancements to the geo sounding algorithm.

- Better first-guess determination from combination of regression and forecast use (by Zhenglong Li); to be transferred into CIMSS daily processing suite for more evaluation (Nov 2006)
- Time and space continuity constraints within the algorithm
- Re-writing of the retrieval code for much faster processing, by a much more efficient IO approach
- A new ozone algorithm
- Better surface emissivity determination
- Inverted cone filtering (for more effective SFOV processing)

Temperature and Water Vapor IR Sounder Staircase

Spectral Resolving Power (λ/Δ λ)

~Resolving Power @ 14 μm

{*GOES-R* (?2014-)}

(1200) *HES*(?) (201?)

(1200) *GIFTS* (?2009-)

(1200/2800) **CrIS / IASI** (2006-)

(1200) **AIRS** (2002-)

(30) *GOES Sounder* (1994-) – **(3-Axis)**

(30) *VAS* (1980-) – **1st Geo Sounder (Spin-Scan)**

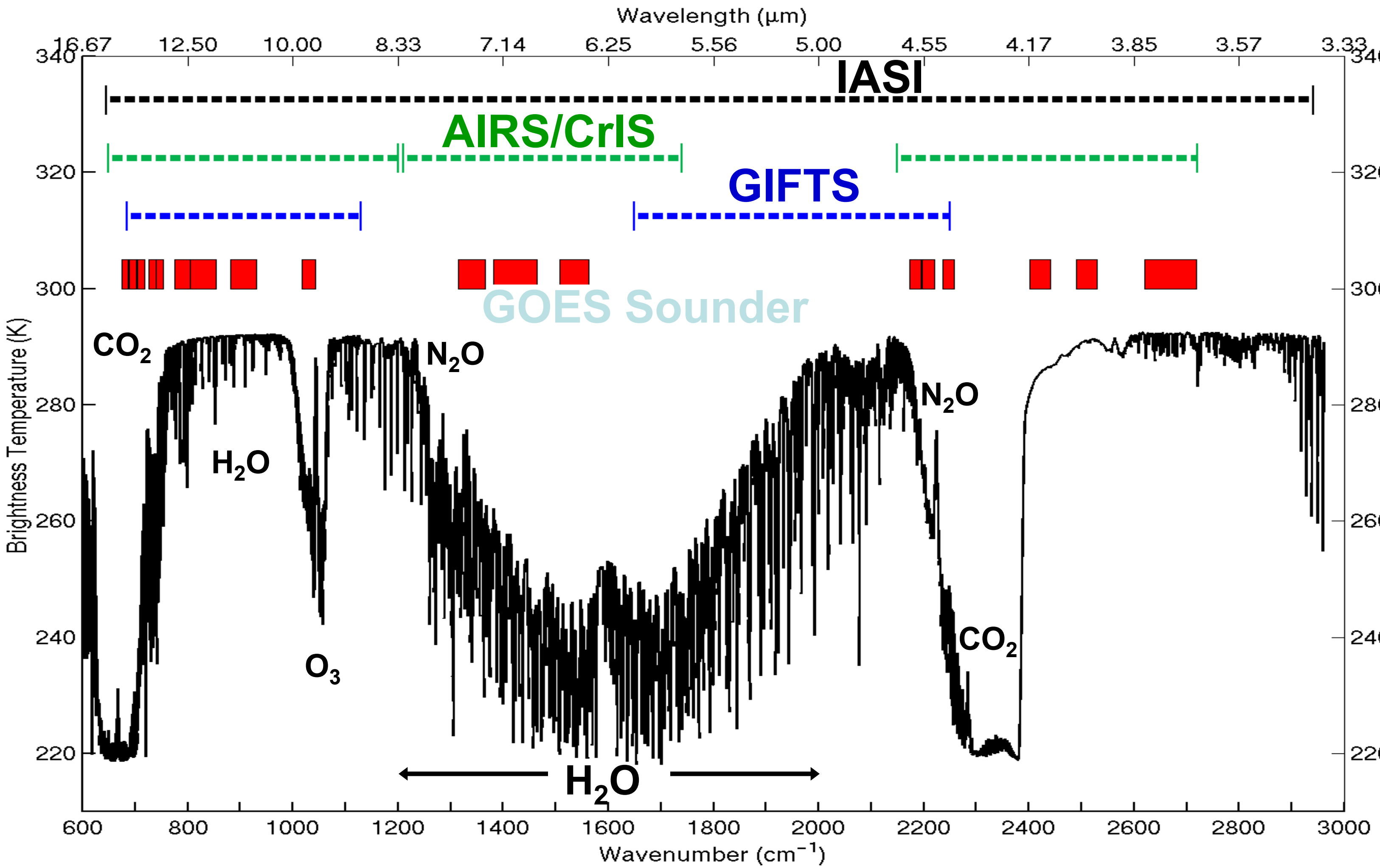
(30) **ITPR,VTPR** (1972) / **HIRS** (1978-)

(150-300) **IRIS / SIRS** (1969-70) – **1st Sounders**

BLUE = Leo ***Red = Geo***

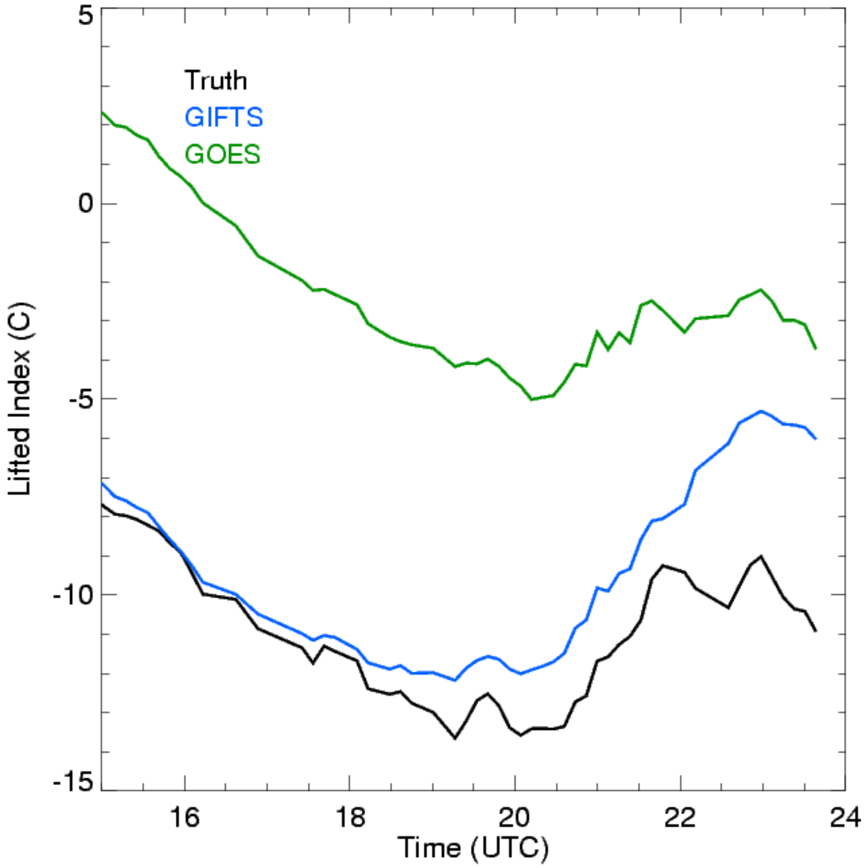
New Era: Spaceborne High-resolution IR

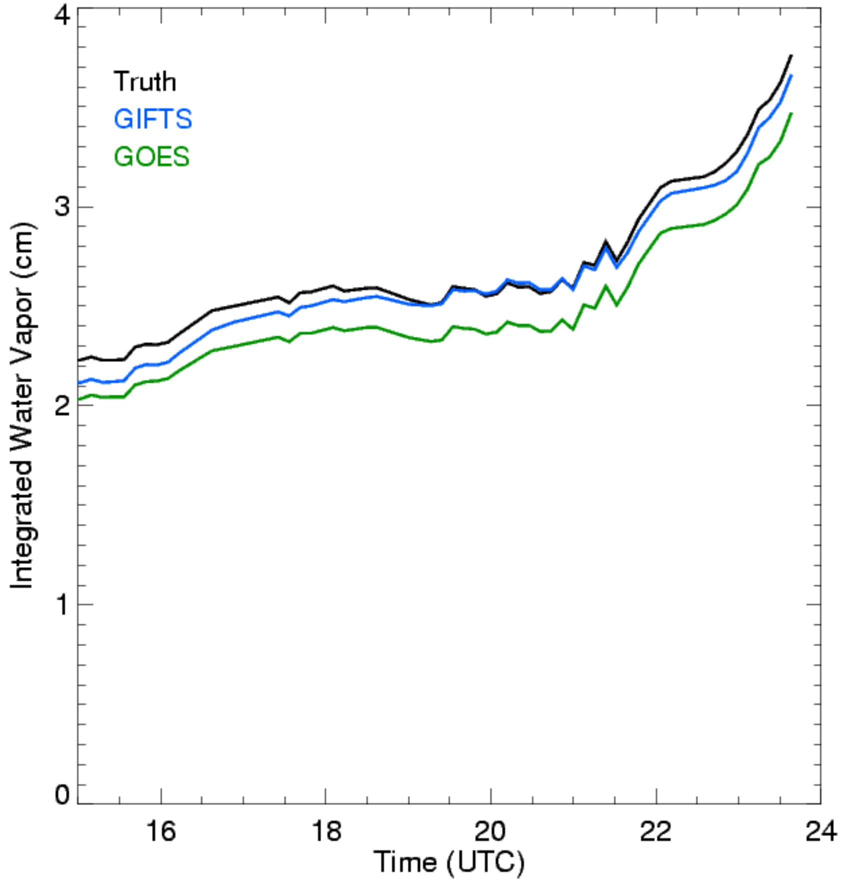
AIRS/IASI/CrIS (LEO) to GIFTS/HES (GEO)



The future lies in high-spectral resolution!

3 May 1999 -- Oklahoma/Kansas tornado outbreak

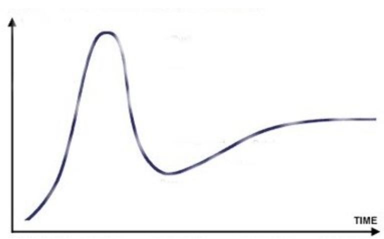




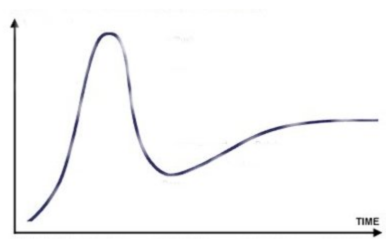
All three solutions show rapid atmospheric destabilization (decreasing LI) between 14 and 20 UTC. GIFTS better depicts the absolute values and tendencies compared to GOES. The total precipitable water (TPW) increases through the period. Both current and future sounding measurements capture the correct trends.

UW-Madison/CIMSS

Expectations and reality



GOES-4 +



GOES-8 +

GOES-R +

1980 → 1994 → 2014

VISIT Training from COMET

VISIT

VISIT Training Sessions

Training Sessions

The VISIT Program

VISIT People

FAQ

Links / Tutorials

RAMSDIS Online

VISIT training sessions are offered as teletraining sessions as well as web-page versions. The teletraining sessions utilize the VISITview software where a PC with an internet connection is required. A conference call is used for the instructor and students to interact. The toll-free phone number is provided by email along with signup instructions.

VISITview Quick Startup for VISIT Training.
(need help with VISITview right away? Send email to: visitview@ssec.wisc.edu)

1. Student Guides for Teletraining Sessions (Teletraining Calendar, Signup and Installation)

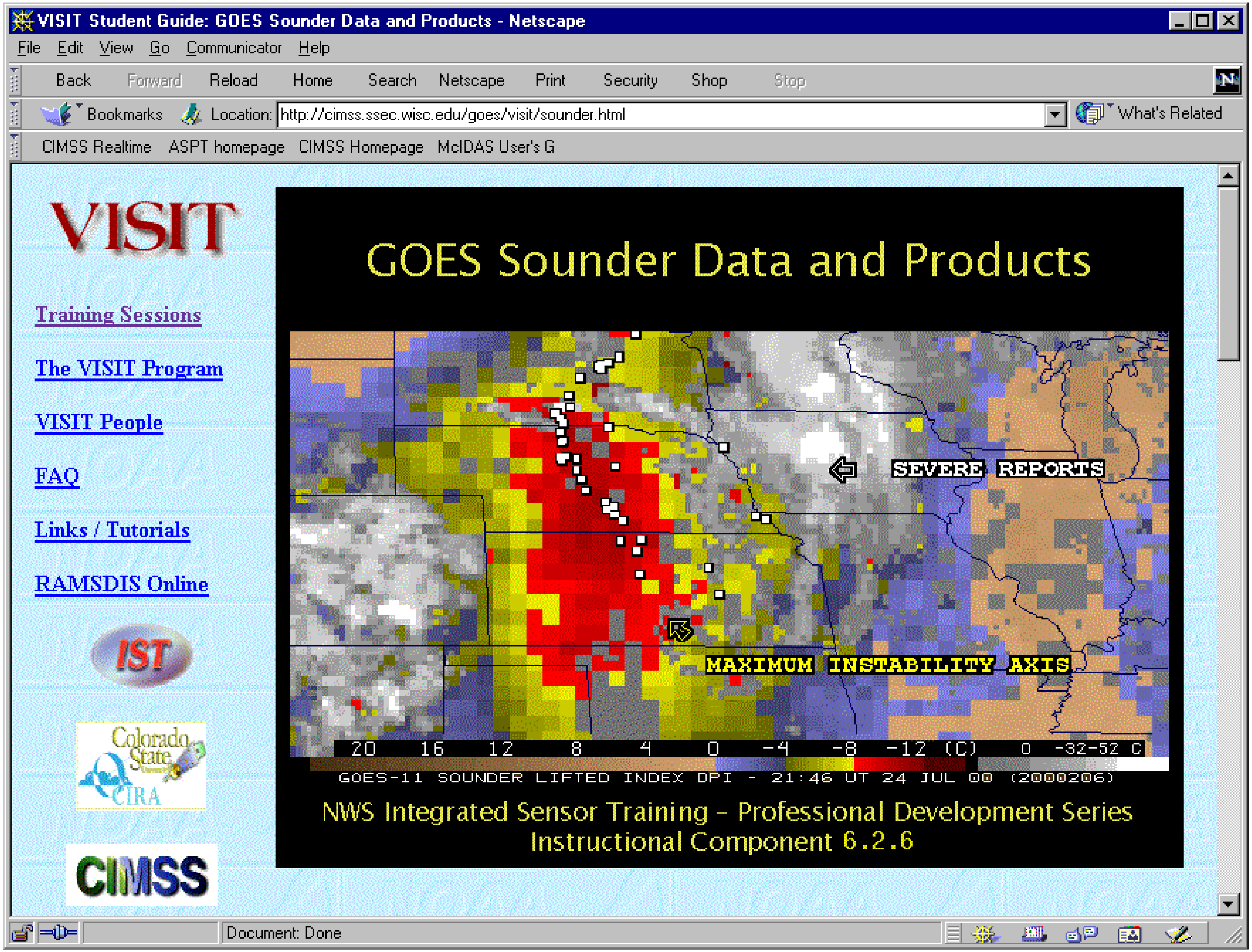
Note: Microphone denotes that audio playback version of the session is available. For an example of an audio playback version click here

- DGEX: Its uses and limitations
- Modern Severe Weather Parameters
- Forecasting Convective Downburst Potential Using GOES Sounder Derived Products
- QuikSCAT winds
- Interactive Cloud Height Algorithm and GOES Sounder Point Retrievals in AWIPS
- Applying the Ten Principles of Climate Monitoring in NWS Field Operations
- Mesoscale Convective Vortices
- NOAA Seasonal Atlantic Hurricane Outlooks
- Water Vapor Channel Satellite Imagery
- Use of GOES/RSO imagery with other Remote Sensor Data for Diagnosing Severe Weather across the CONUS (RSO 3)
- Navigating the Climate Prediction Center's Website
- Introducing GOES-12
- Wildland Fire Detection using Satellite Imagery
- The Satellite Rainfall Hydro-Estimator

Modules are readily accessible and many are on satellite applications.

http://www.cira.colostate.edu/ramm/visit/ts.html

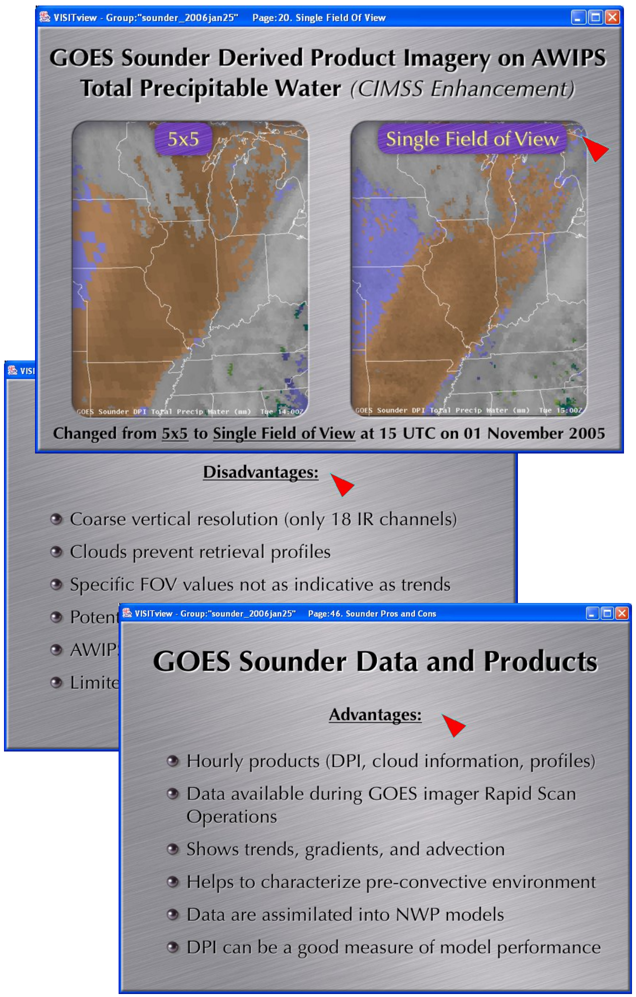
VISIT tele-training sessions in 2001 promote GOES Sounder use in NWS offices

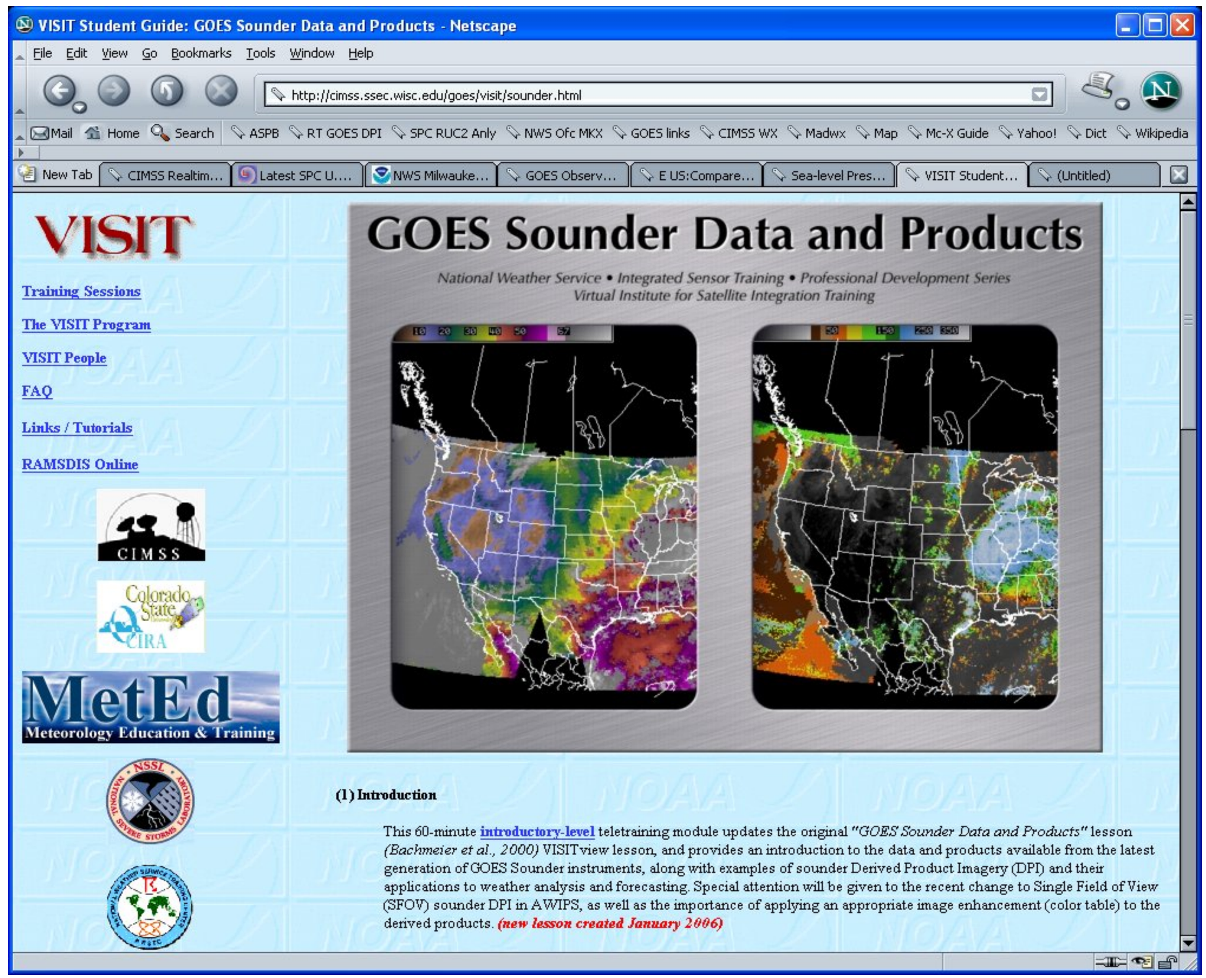


From April through July 2001, CIMSS has taught the Sounder lesson in about **70 NWS offices.**

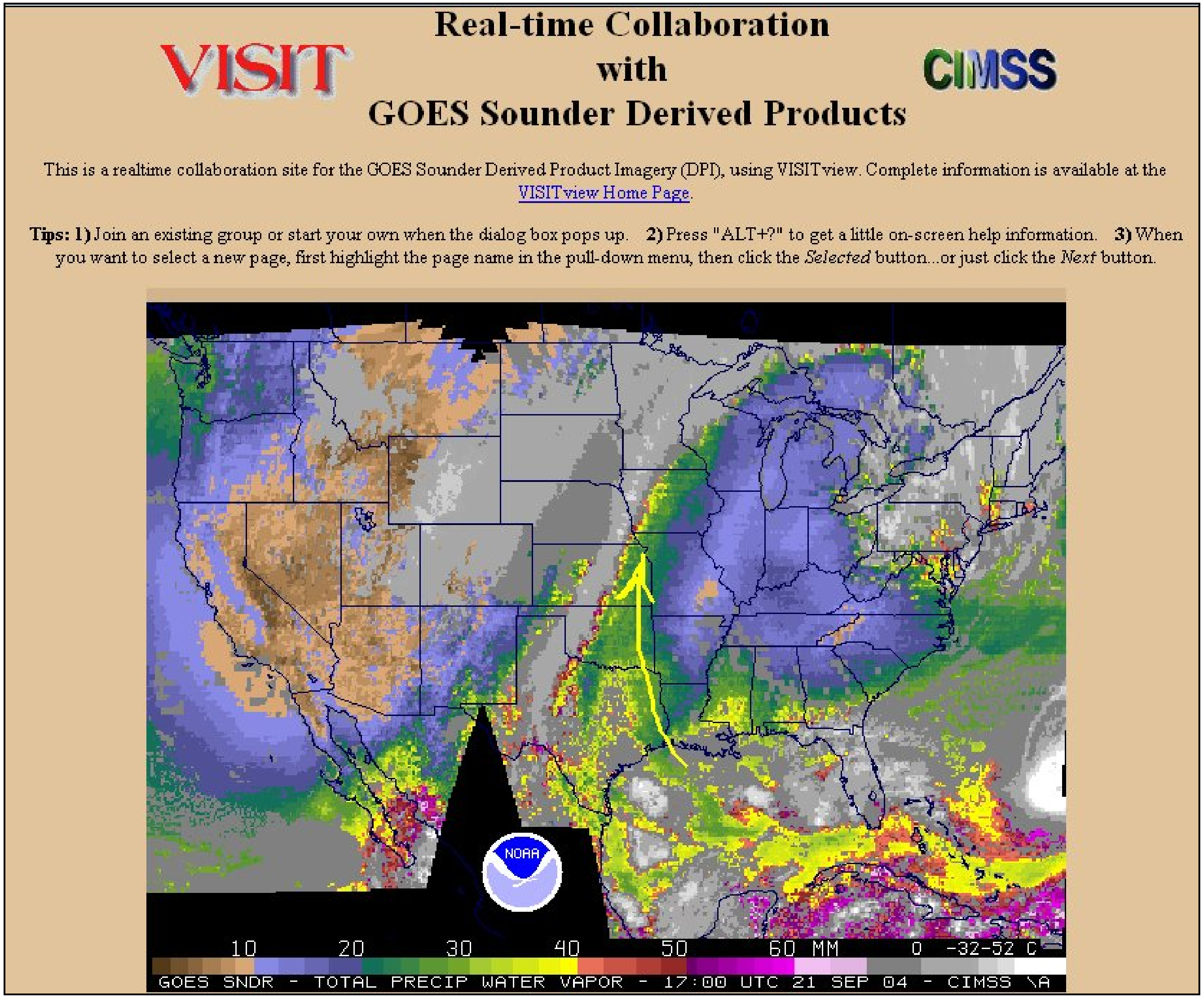
Updating the VISIT lesson on the GOES Sounder

In response to provision of the Single Field-of-View (SFOV) resolution Derived Product Imagery (DPI) from the GOES Sounders into the AWIPS data stream in late fall of 2005, the VISITview training module on the Sounder and its products was updated for its NWS audience.





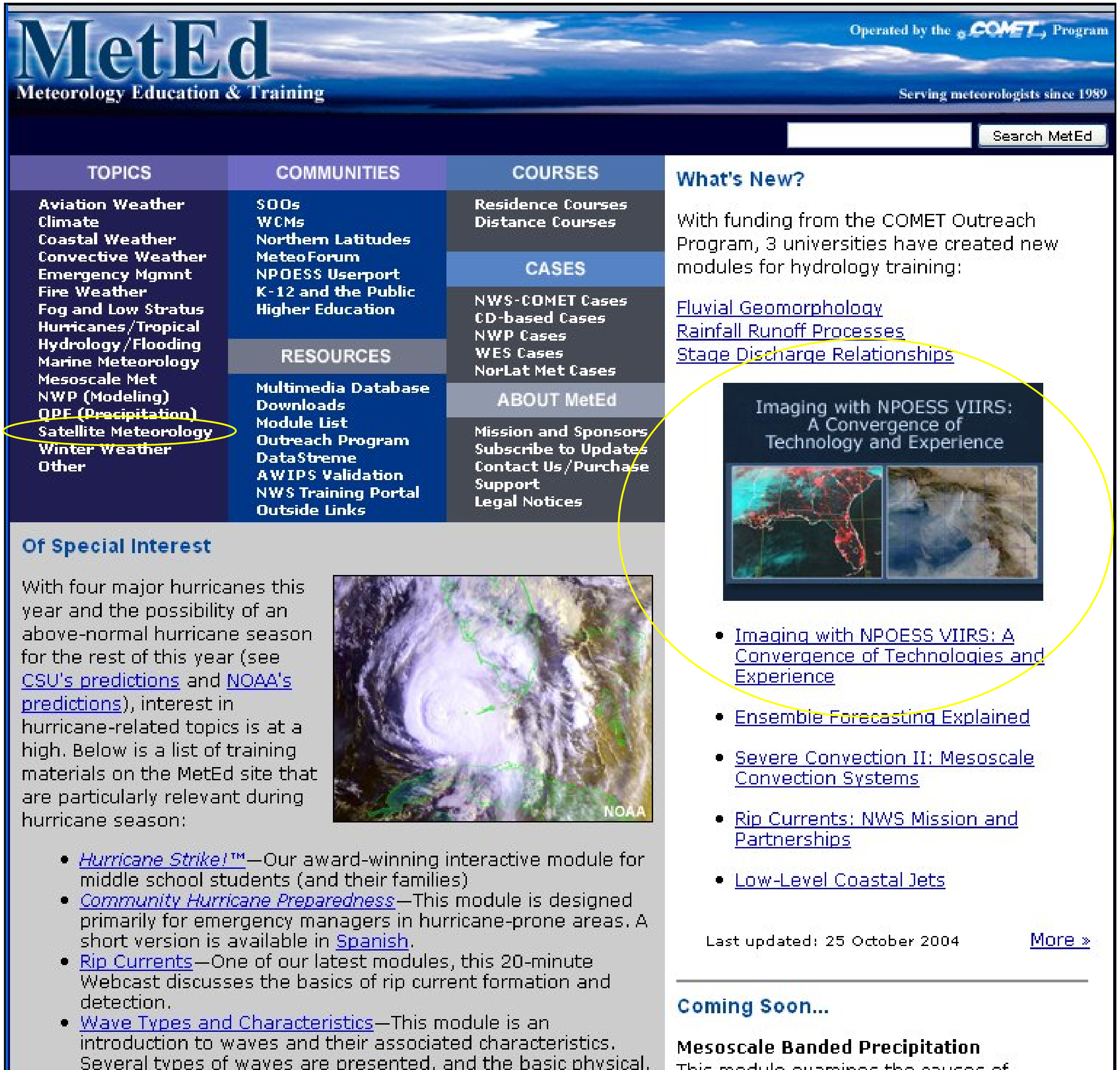
Using VISITview for training



Use real-time collaborations or build your own modules.

http://www.ssec.wisc.edu/visit/dpi.html

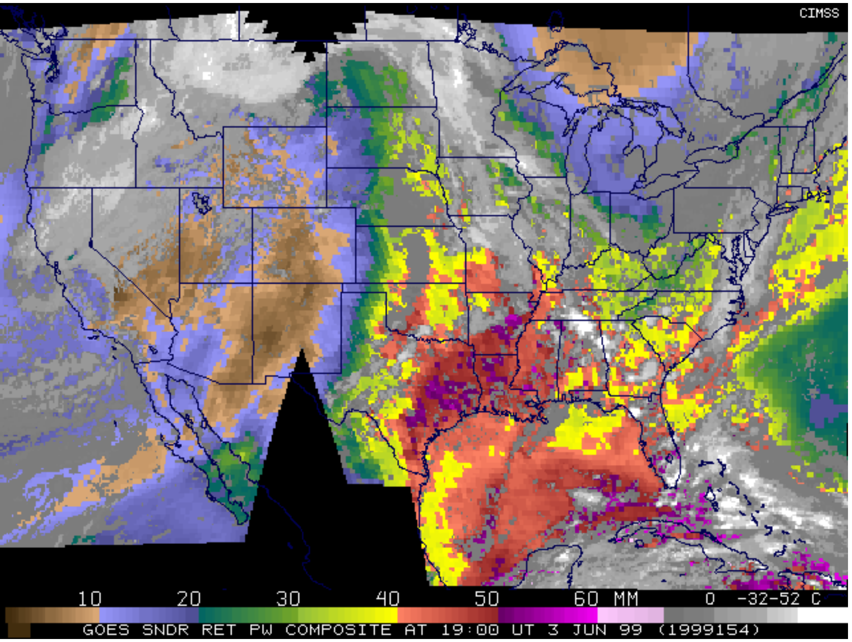
The COMET MetEd training program



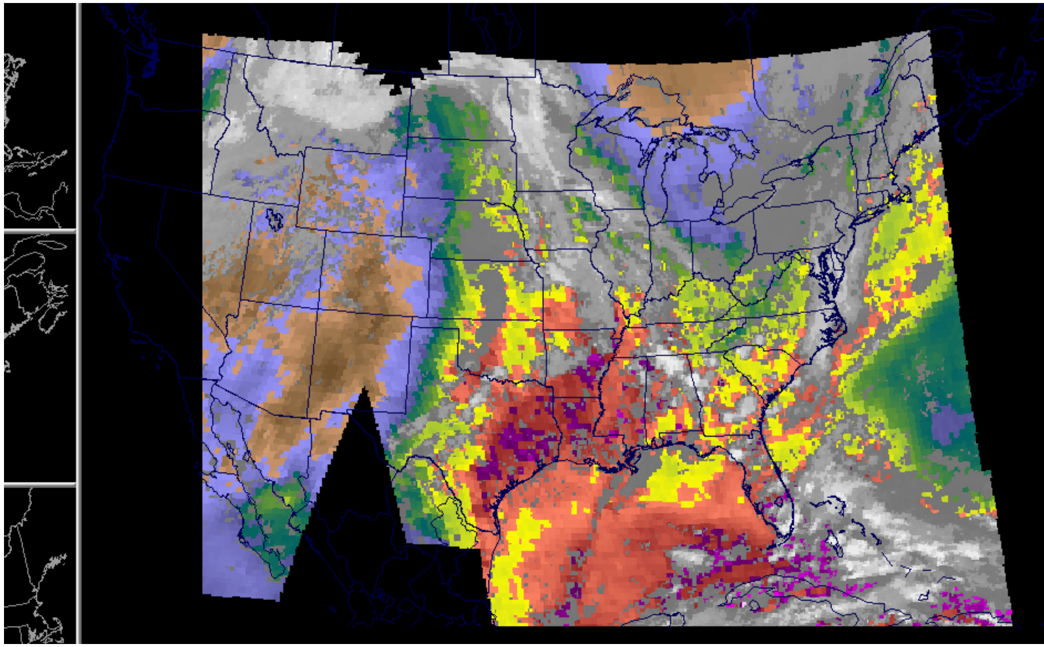
http://www.meted.ucar.edu

GOES Sounder DPI made AWIPS compatible

GOES Sounder DPI, originally generated on McIDAS and in McIDAS "AREA" format, can be re-mapped to AWIPS sector specifics, re-formatted to NetCDF, and made available via an LDM server. The "default" color enhancement can also be replicated on AWIPS. (PW example from 3 June 1999)

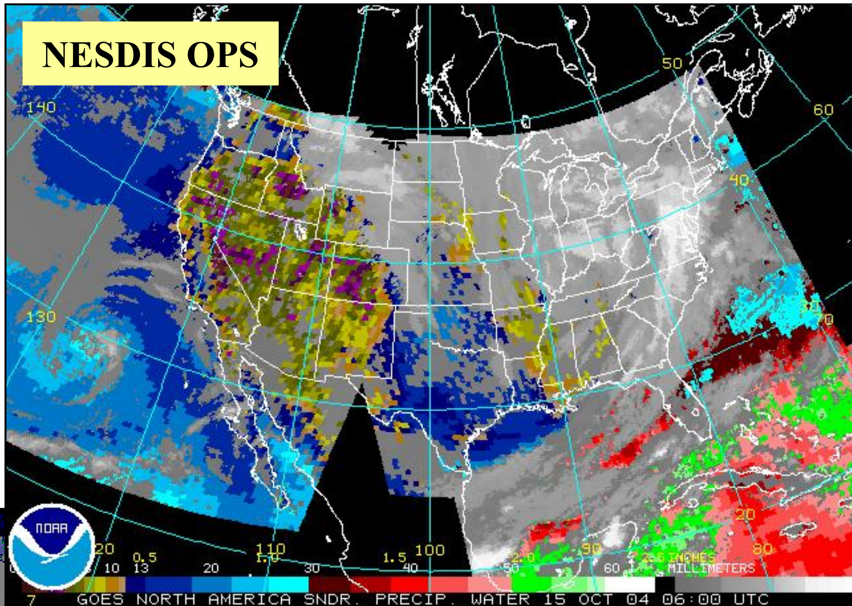


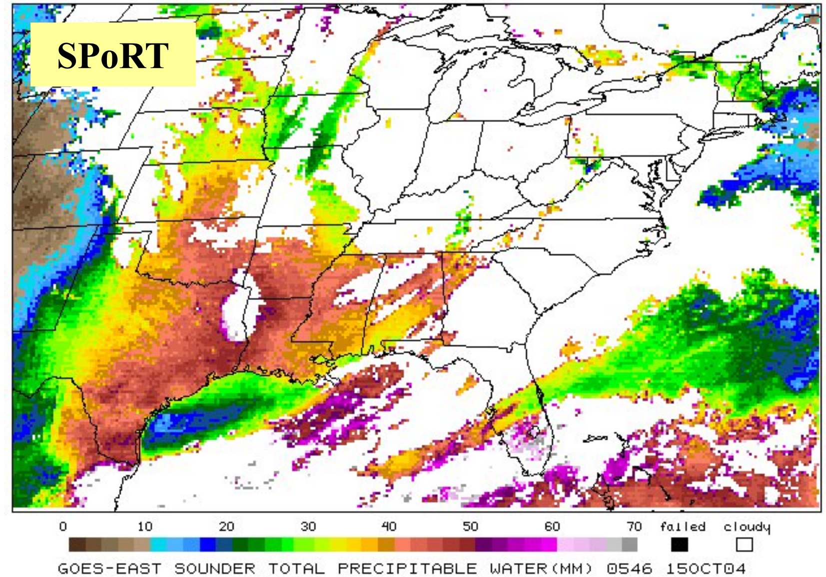
McIDAS

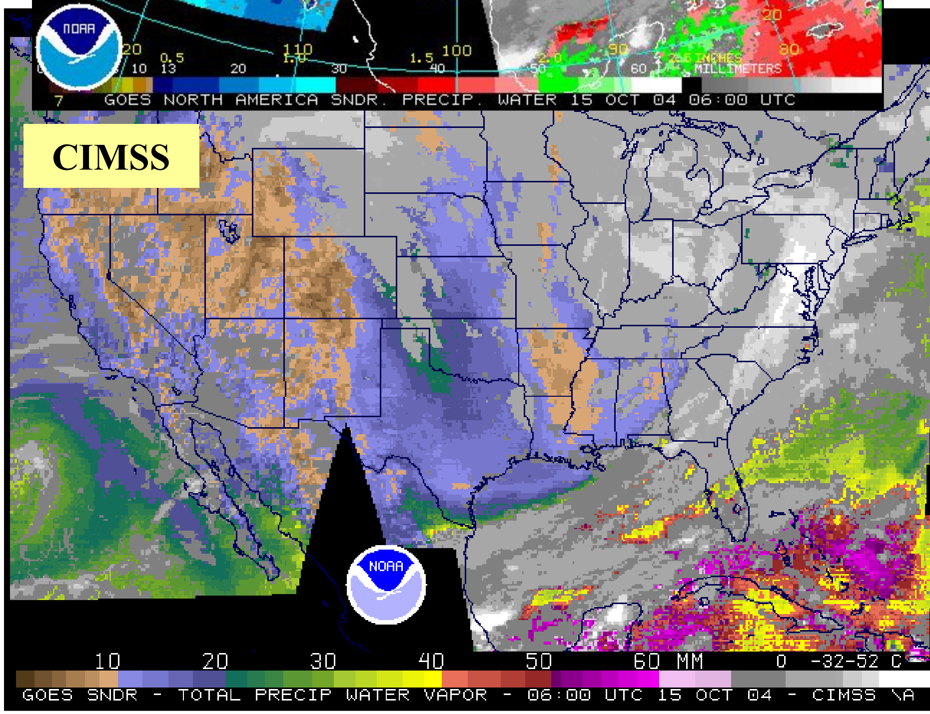


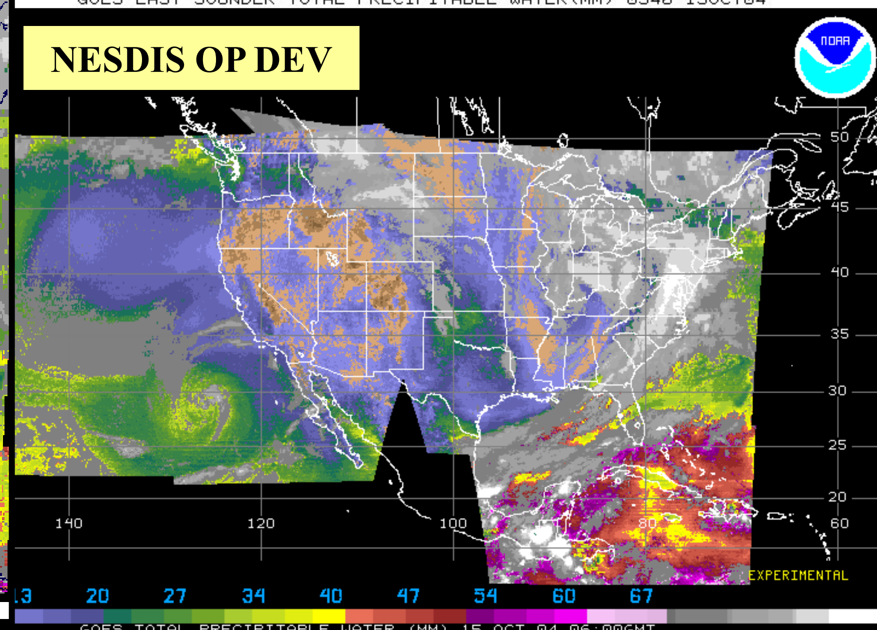
AWIPS

Contrasting available current GOES TPW DPI …





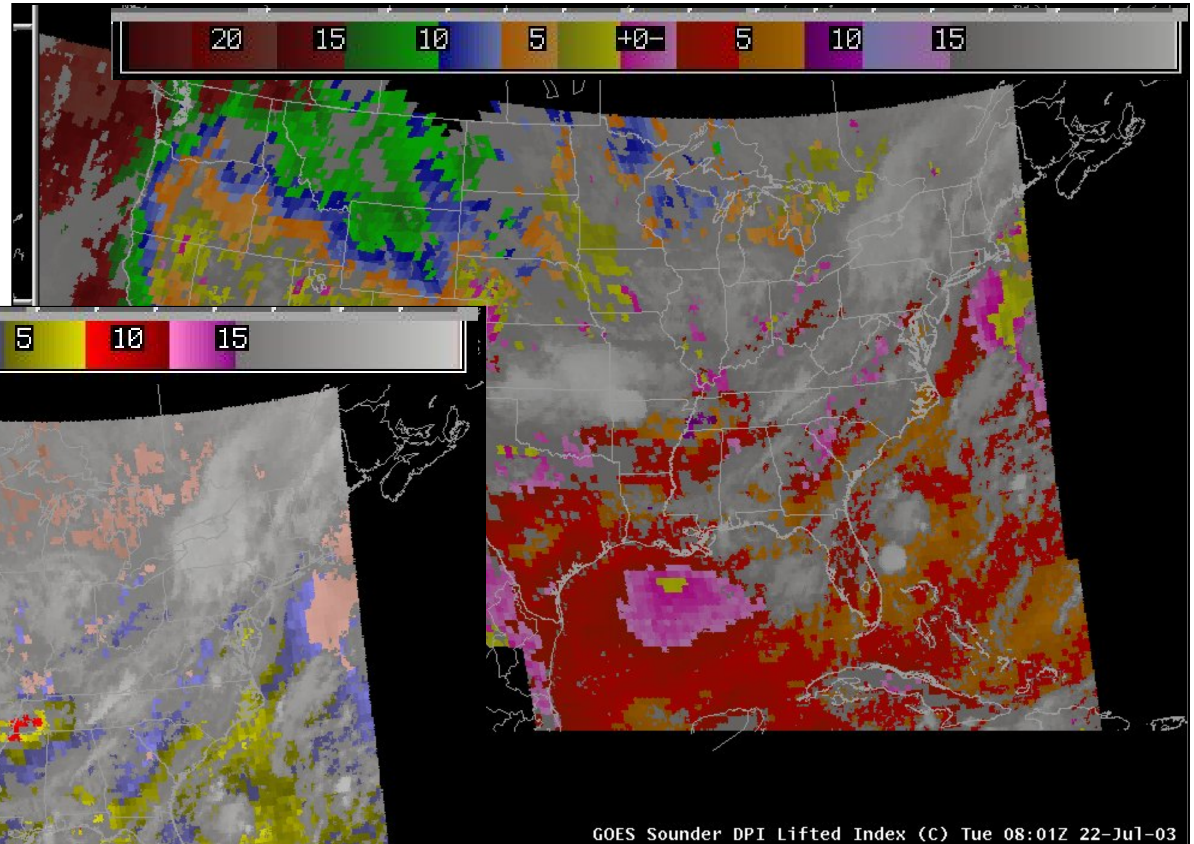


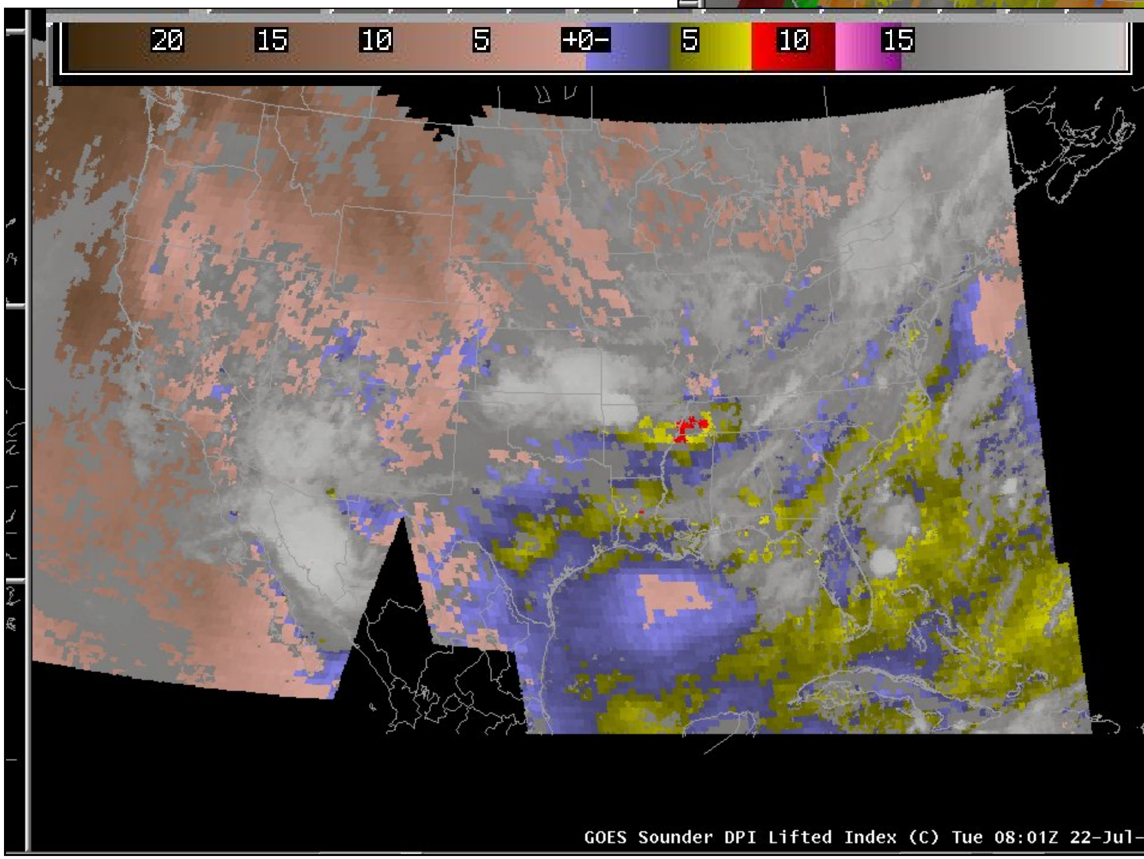


NESDIS ops - http://www.ssd.noaa.gov/PS/PCPN/pcpn-na.html#SNDR

Appearing in NWS offices: GOES Sounder DPI

Note enhancement tables for Lifted Index



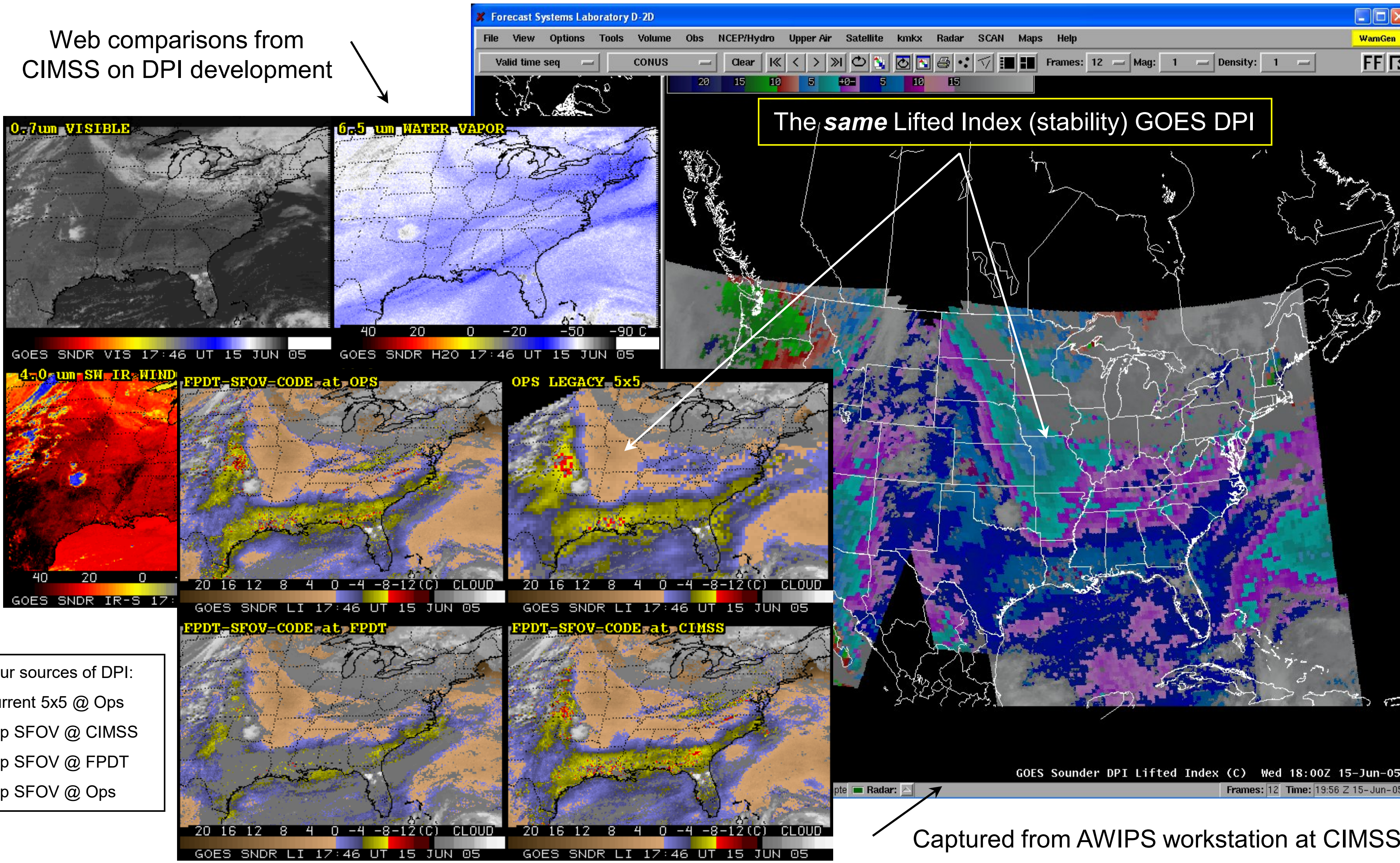


Memphis Derecho case
(08 UTC 22 Jul 2003)

http://cimss.ssec.wisc.edu/goes/visit/sounder_enhancements.html

Providing access at CIMSS to real-time data in the National Weather Service (NWS) Advanced Weather Interactive Processing System (AWIPS) for monitoring and training of NESDIS satellite products, such as the GOES Sounder Derived Product Imagery (DPI)

Web comparisons from CIMSS on DPI development



Four sources of DPI:

Current 5x5 @ Ops

Exp SFOV @ CIMSS

Exp SFOV @ FPDT

Exp SFOV @ Ops

Captured from AWIPS workstation at CIMSS

2005

Total precipitable water vapor from MODIS and GOES

MODIS regr MODIS phys GOES phys

02 Jun 2001

17-18 UT

05-06 UT

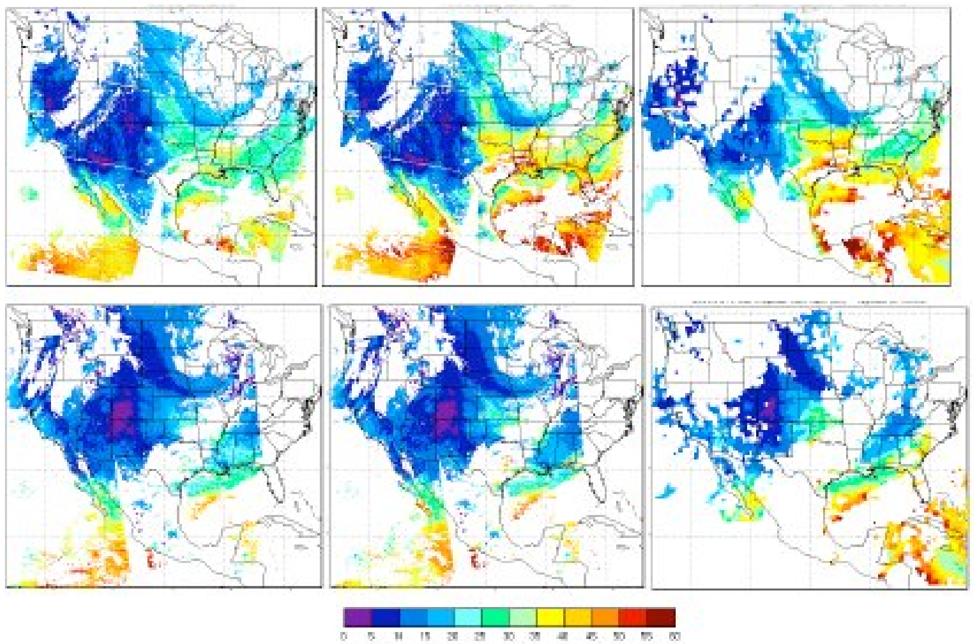
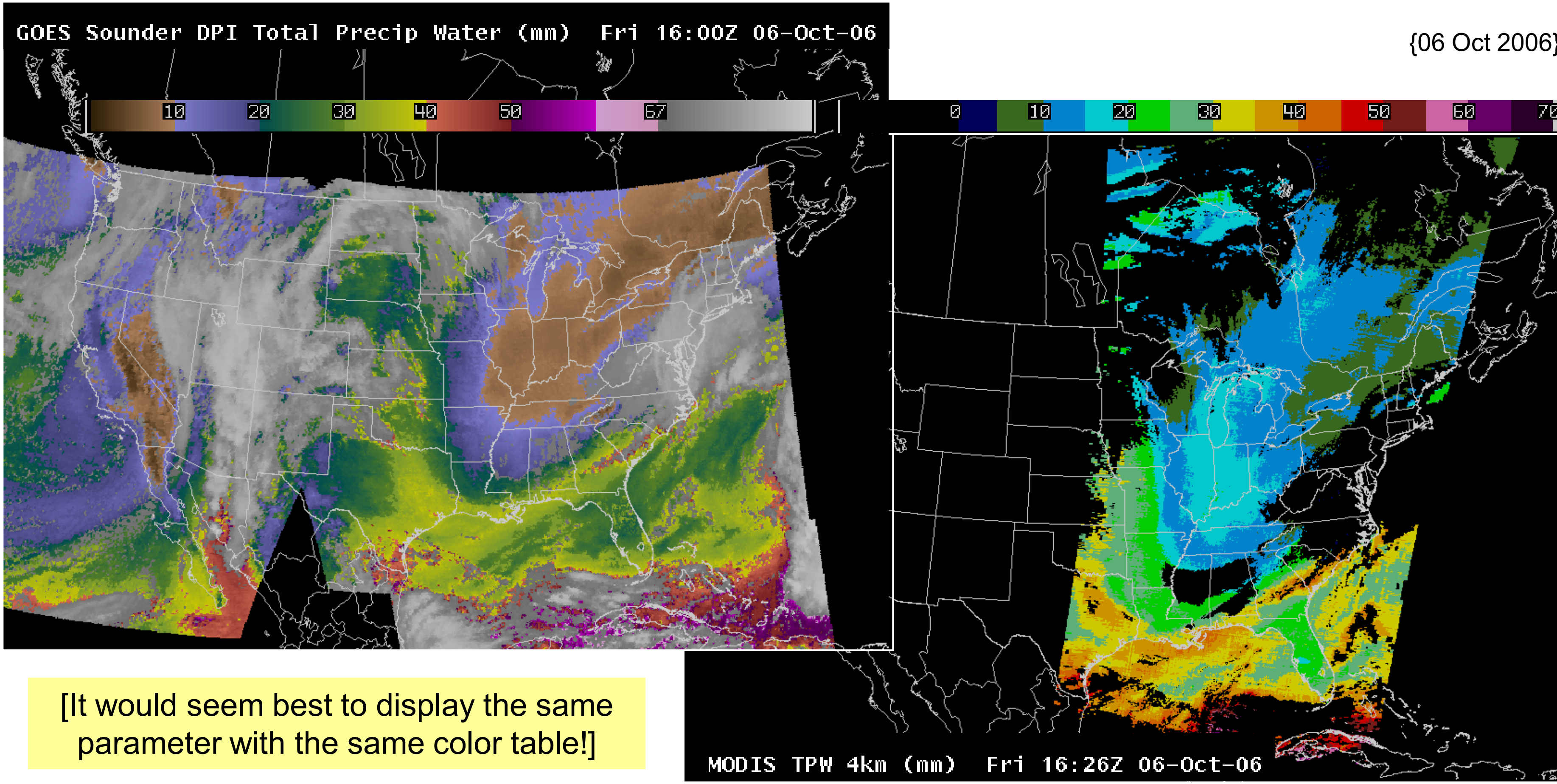


Figure 13: Total precipitable water (mm) for 02 June 2001 over North America retrieved by MODIS regression (left), MODIS physical (center), and GOES-8 and GOES-10 (combined, right). The top column shows daytime retrievals (4 MODIS granules from 1640, 1645, 1820, 1825 UTC; GOES at 1800UTC), and the bottom column nighttime (MODIS 0435, 0440, 0445, 0615, 0620 UTC; GOES 06 UTC).

A local, connected AWIPS environment to aid in satellite meteorology research

{06 Oct 2006}



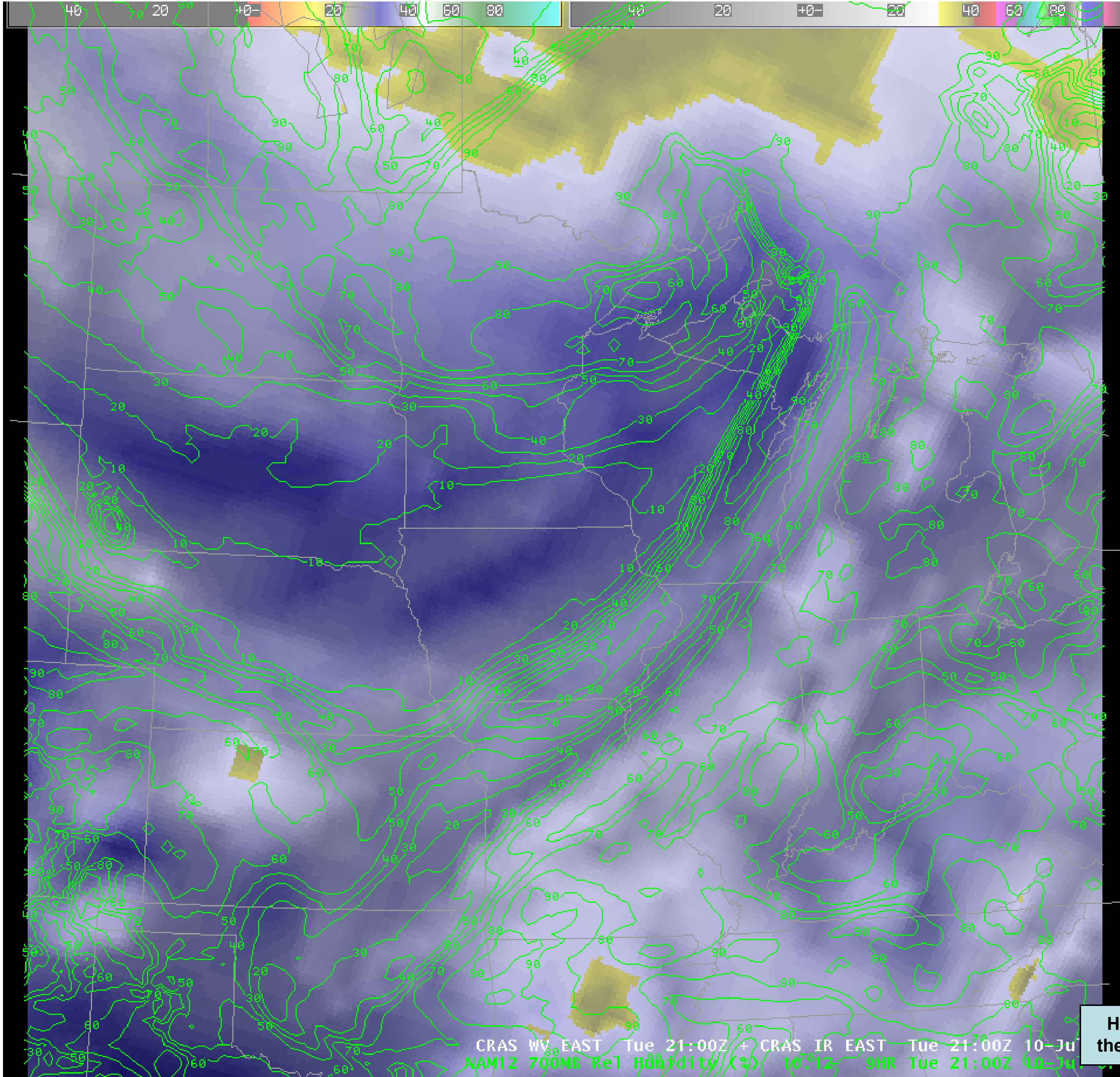
[It would seem best to display the same parameter with the same color table!]

Via real-time NOAAPORT ingestion and LDM distribution (as to NWS CR), CIMSS staff are able to more effectively interact with interested SOOs and forecasters as data and displays are presented in the NWS forecasters' native system.

Overview

- **About AWIPS**
  - **Intended usage**
  - **Key features**
- **AWIPS Development at CIMSS/SSEC**
  - **Examining AWIPS log files for answers**
  - **Guess and check, then wonder**
  - **Obtaining insider information**
- **Developing Imagery for AWIPS**
  - **Bandwidth considerations**

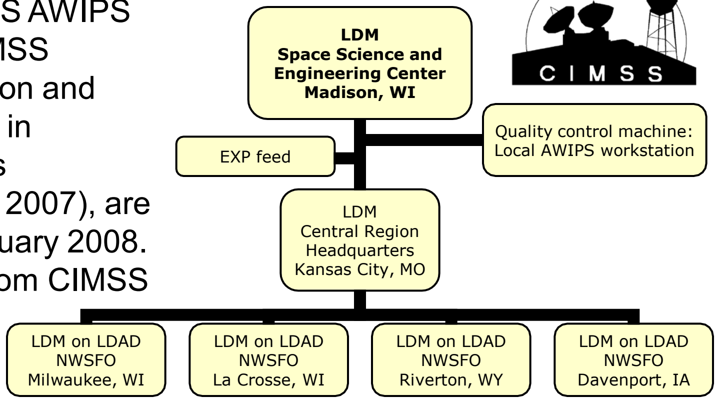
Steve Hentz


CRAS WV EAST Tue 21:00Z + CRAS IR EAST Tue 21:00Z 10-Jul
NAM12 700MB Rel Humidity (%) 10.12 9HR Tue 21:00Z 10-Ju

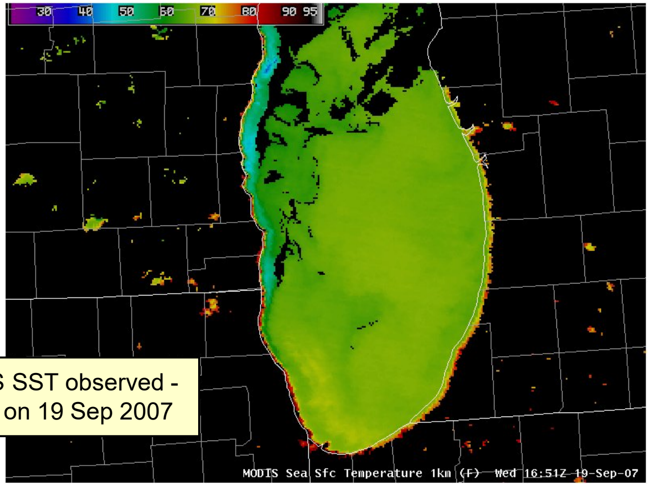

Have you seen the CRAS today?

Promoting new satellite applications within the AWIPS environment

Capitalizing on the development, in mid 2006, of the local capability at CIMSS (Cooperative Institute for Meteorological Satellite Studies) to inject data products into the NWS AWIPS (Advanced Weather Interactive Processing System) data stream, a team of CIMSS researchers is working with NWS forecast offices (FOs) to foster the incorporation and assessment of new satellite products from CIMSS at the FOs. Workshops held in Milwaukee-Sullivan, WI (MKX) and LaCrosse, WI (ARX) (early 2007), as well as participation in the NWS Great Lakes Operational Meteorology Workshop (later 2007), are continuing with a workshop visit to the NWS FO in Green Bay, WI (GRB) in January 2008. Via LDM (Unidata's Local Data Manager) internet transfers, satellite products from CIMSS are already being provided to interested offices outside the Central Region.

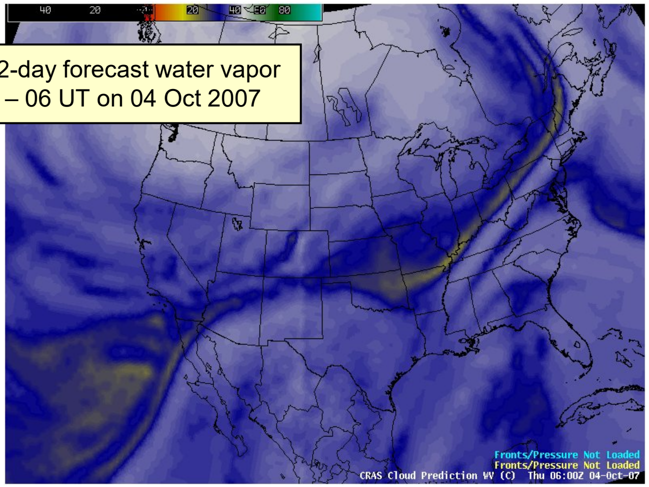


Some of the more unique satellite products from CIMSS, now possible in the AWIPS environment of NWS offices, include:



MODIS SST observed - 17 UT on 19 Sep 2007

- High res (1 km or less) imagery from the MODIS (MODerate resolution Imaging Spectroradiometer) onboard the NASA Terra and Aqua platforms, including visible and infrared imagery, and derived product imagery, such as for sea surface temperature (SST) and vegetation index (NDVI).



CRAS 2-day forecast water vapor valid – 06 UT on 04 Oct 2007

- Synthetic cloud and water vapor forecast imagery, from the CRAS (CIMSS Regional Assimilation System) numerical model, using assimilation of cloud top pressures and three layers of moisture as determined from the GOES (Geostationary Operational Environmental Satellite) Sounder.

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- at CIMSS: R. Aune (ASPB), R. Petersen

The views, opinions, and findings contained in this message are those of the author and should not be construed as an official National Oceanic and Atmospheric Administration or U.S. Government position, policy, or decision.

Any errors remain my responsibility; while any progress noted, is only possible by the cooperation and effort of my colleagues.

For more information