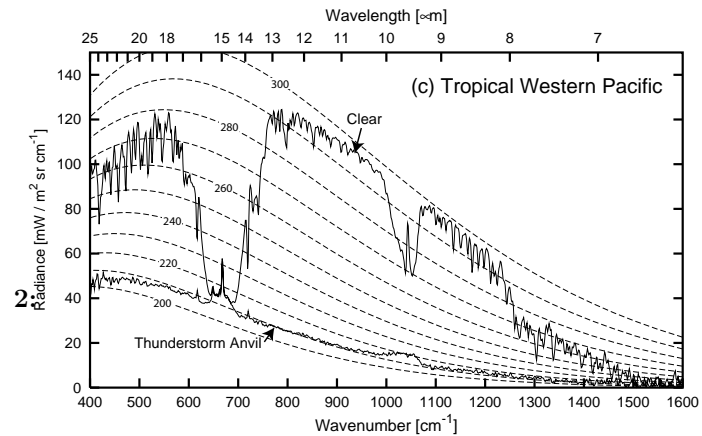


Clouds and Radiation

1:

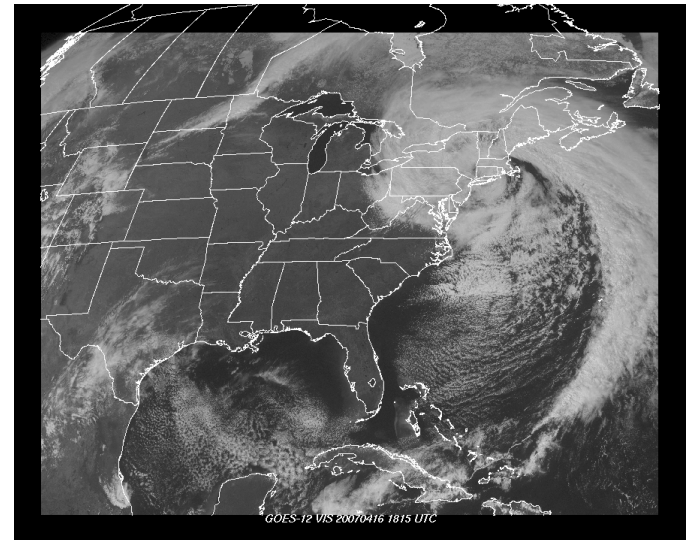
Lecture for Spring 2009
Prof. Brian H. Fiedler

School of Meteorology, University of Oklahoma

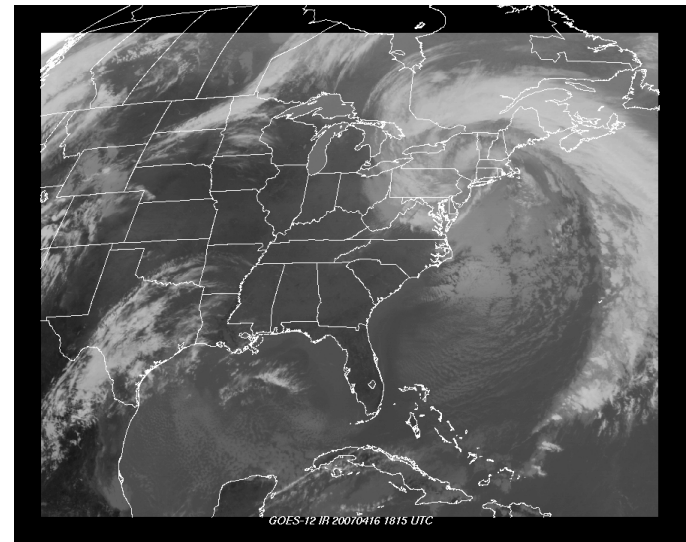


Satellite looking down. GOES has IR sensors at 11 microns and 6.9 microns.

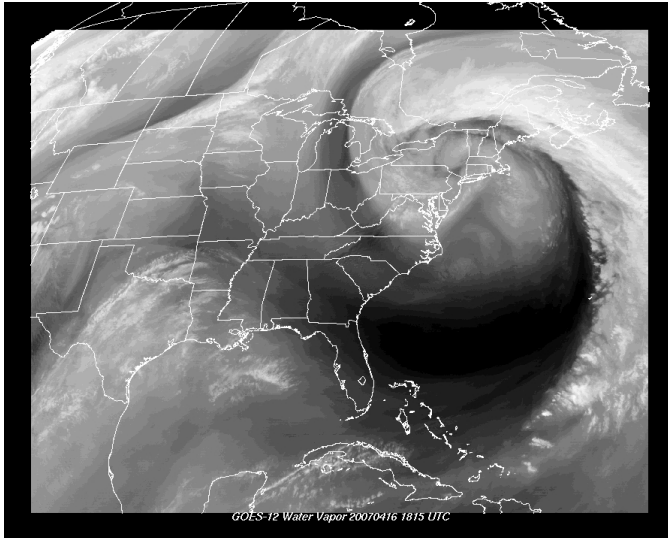
3:



4:



5:



For **low cloud** between 754 mb and 836 mb.

7:

LWP	0	0.1	1.0	10.	100.
LW up flux TOA	286.4	286.1	283.8	271.1	268.0
SW net flux TOA	575.5	573.3	554.28	440.9	241.6

Experiment # 5 from:

<http://www.mensch.org/xcrm/crm.cgi>

(1) Using for input **mls_cld.in** run CRM. Notice the cloud fraction of 1.0 and cloud LWP of 100 at level 14. Write

6: down the **LW up flux TOA** and **SW net flux TOA**.

(2) Then repeatedly using for input the above form, run the CRM after carefully editing the cloud LWP to 10.0, 1.0, 0.1, and 0. Write down the **LW up flux TOA** and **SW net flux TOA**.

(3) Calculate the difference in the fluxes from that for the model run with LWP=0.

8:

LWP	0	0.1	1.0	10.	100.
Δ LW up flux TOA	0.	-0.3	-2.6	-15.3	-18.4
Δ SW net flux TOA	0.	-2.2	-21.22	-134.6	-333.9

(4) The SW net flux is for daytime conditions, at night it would be zero. An average over 24 hours might be 1/2 of the SW values calculated. So now calculate $0.5 * (\Delta \text{SW net flux TOA}) - (\Delta \text{LW up flux TOA})$ to find the net inward flux (heating) caused by the presence of the

9: cloud.

LWP	0	0.1	1.0	10.	100.
Δ heating	0.	-0.8	-8.01	-52.	-148.55

(5) Repeat the above calculations, but with level 14 cloud frac set to 0.0 and cloud LWP set to 000.0, and at level 8 cloud frac set to 1.0 and using the various LWP at level 8.

10: (6) What principle do you deduce from the results?

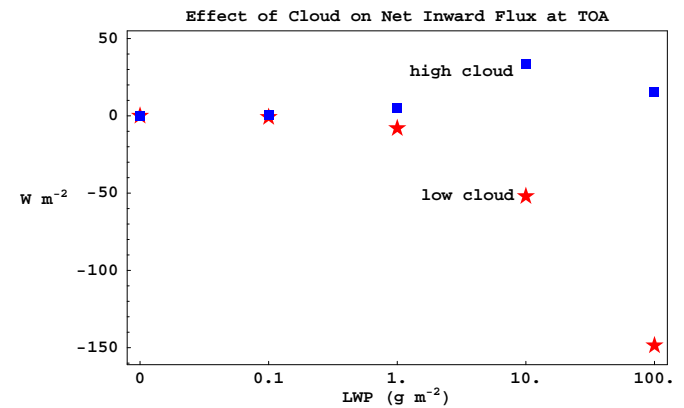
Note: (5) makes a **high cloud** between 198 mb and 279 mb

For **high cloud** between 198 mb and 279 mb.

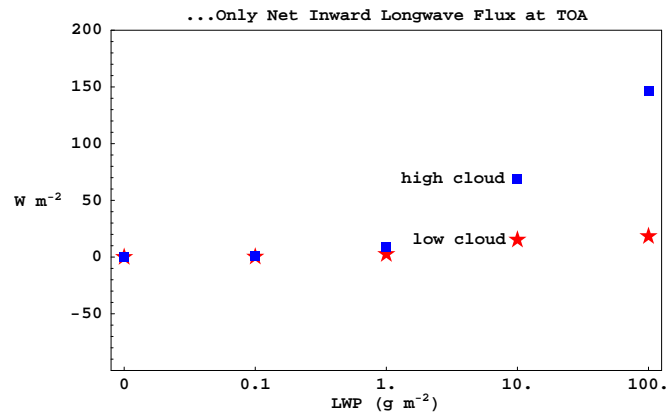
11:

LWP	0	0.1	1.0	10.	100.
LW up flux TOA	286.4	285.4	277.3	217.3	139.9
SW net flux TOA	575.5	574.7	566.9	504.9	313.1

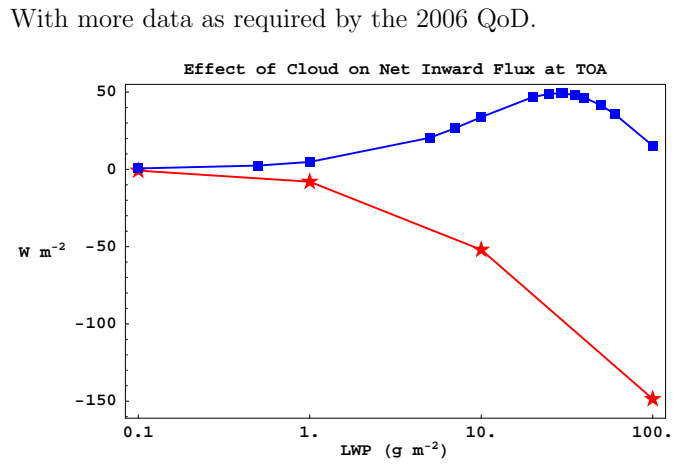
12:



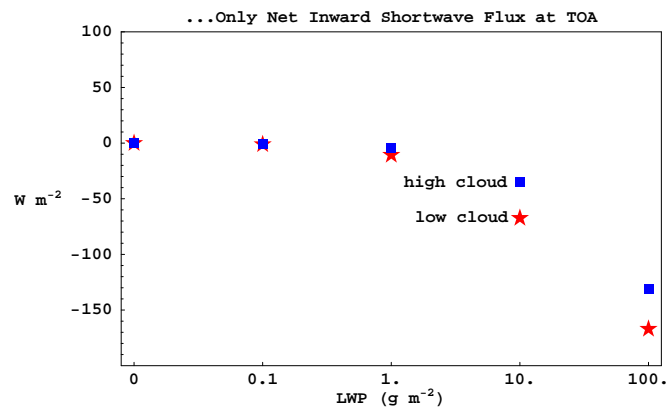
13:



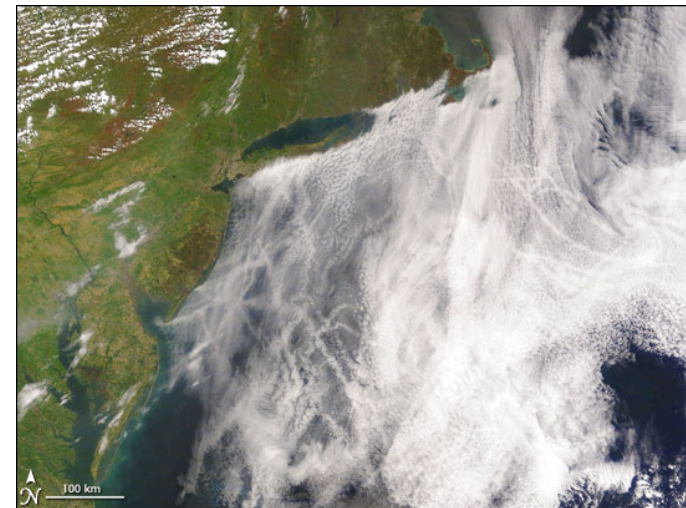
15:



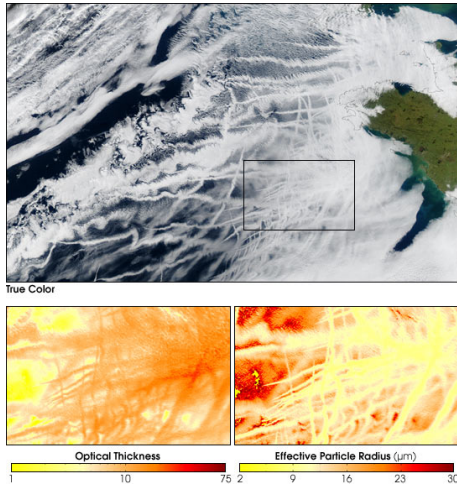
14:



16:



17:



18:

