HURRICANE STUDIES FROM SINGLE FOOTPRINT ALL-SKY RETRIEVALS : V3

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Section 1

# Hurricane Irma

Changes to hurricane code since last time

- Perturb surface pressure a distance r away from the eye by $p0exp^{-r/100}$ as well as troposphere pressure levels (psurf to 200 mb) in a similar fashion (size of perturbation decreases with height)

- been much more careful with cloud microphysical parameter initialization for the DCC

- not a code change per se, but also looking at column ozone over and around hurricane, as well as total water between TOA and 70 mb (to see if hurricane "wetted" the UT/LS)

- Only will show 2017/09/06 Hurricane Irma, but checked these results are robust for eg H. Florence, T. Neoguri

- Most x-axis incorrectly labeled as Longitude .. should be E-W distance from eye center in km

BT 1231 and retrieved T(x) as a function of longitude
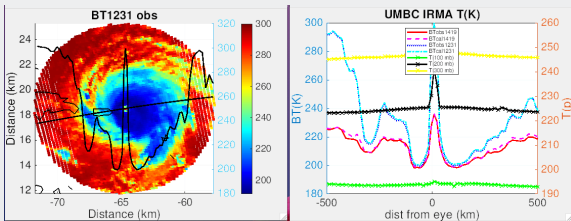
AIRS L2   BT 1231   T(x,z) and BT1231,BT1419
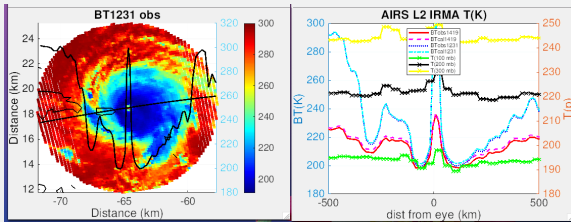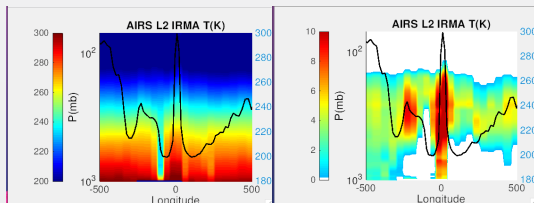

UMBC   BT 1231   T(x,z) and BT1231,BT1419

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T(x,z) retrieved and anomaly as a function of longitude

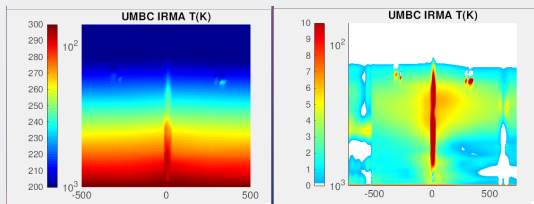$$T_{anom}(x, z) = T(x, z) - <T_{clim}(x, z)>$$
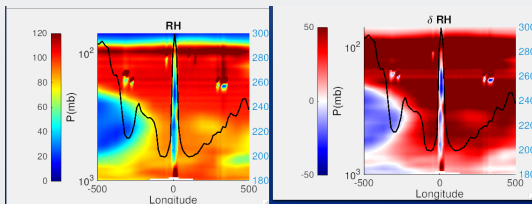
AIRS L2   T(x,z)   Anomaly T(x,z)

UMBC   T(x,z)   Anomaly T(x,z)

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RH(x,z) retrieved and anomaly as a function of longitude

$$RH_{anom}(x, z) = RH(x, z) - < RH_{clim}(x, z) >$$

AIRS L2   RH(x,z)   Anomaly RH(x,z)
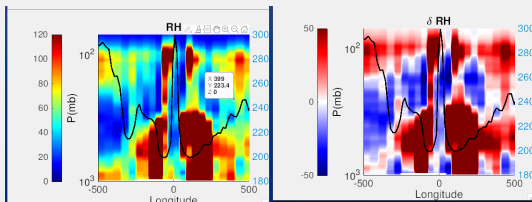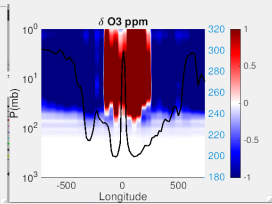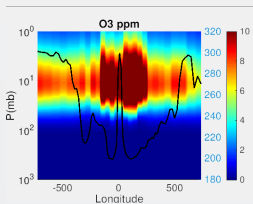

UMBC   RH(x,z)   Anomaly RH(x,z)

O3(x,z) retrieved and anomaly as a function of longitude

$$O3_{anom}(x,z) = O3(x,z) - <O3_{clim}(x,z)>$$
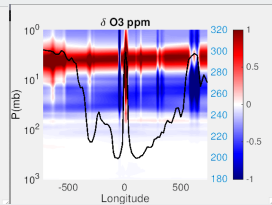
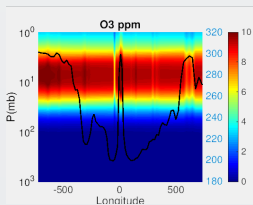AIRS L2   O3(x,z)   Anomaly O3(x,z)

UMBC   O3(x,z)   Anomaly O3(x,z)

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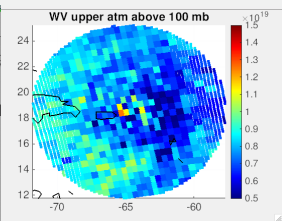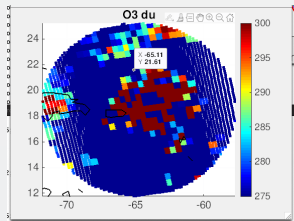# Column O3 (du) and UT/LS WV column (molecules/cm2)

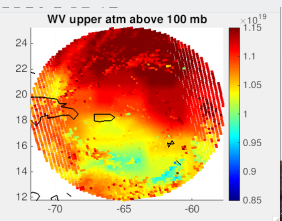AIRS L2   Col O3(y,x)   UTLS WV (x,y)
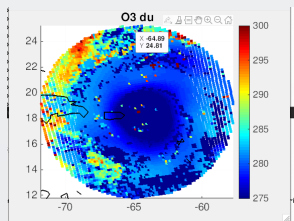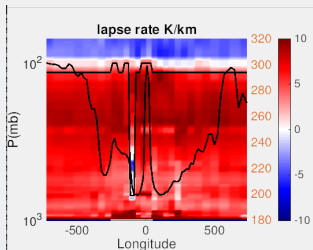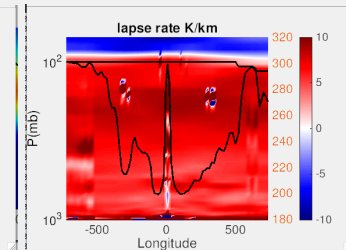

UMBC   Col O3(y,x)   UTLS WV (x,y)

Tropospheric and lower stratospheric lapse rate
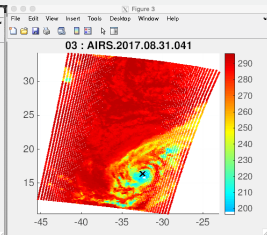
AIRS L2

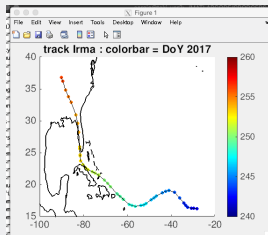UMBC

H. Irma at different times

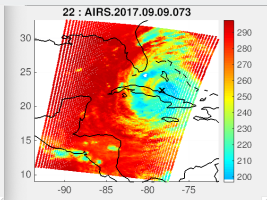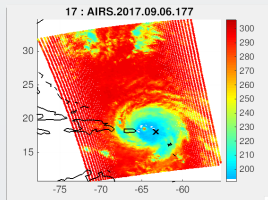AIRS L1C   Eye center   2017/08/31 0400 UTC

AIRS L1C   2017/09/06 1742 UTC   2017/09/09 0718 UTC

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Discussion : More ideas that can be worked on

- almost ready to do runs for the H. irma track (about 10 days, 20 day/night looks
  - Can see how col O3 and ice cloud amount changes as a function of time
  - Can see after about 2017/09/06 the hurricane gets bigger and more asymmetric ...
- Steve, can you
  - suggest a better T(z) perturbation at eye of the hurricane, based on surf pressure? Or is what I have good enough
  - suggest modeling studies you can do to support my retrievals (or vice versa)
  - suggest hurricane sonde data to support retrievals
  - not sure what you meant by "fourier transform" but as I said above, observed hurricane becomes much more asymmetric
- I presume we can do some sort of hurricane intensification studies from this?

Section 2

PyCb 2017 British Columbia

PyCb 2017 British Columbia

- Results are not clear cut, probably suggests I need to be more careful with T vs CO2 during the retrieval
- The T(z,lat,lon) anomaly is more clearly seen using climatology as an initialization, since ERA assimilates the data and produced really good initial conditions
- I notice there is an AMTD paper on the PyCB event which suggest 50 mb heights, but transported much faster than the Science paper? Das, S., Colarco, P. R., Oman, L. D., Taha, G., and Torres, O.: Pyrocumulonimbus Events over British Columbia in 2017: The Long-term Transport and Radiative Impacts of Smoke Aerosols in the Stratosphere, Atmos. Chem. Phys. Discuss. [preprint], https://doi.org/10.5194/acp-2020-1240, in review, 2020.https://acp.copernicus.org/preprints/acp-2020-1240/

PyCb 2017 British Columbia : AIRS L2 vs UMBC

- You will see couple of slides showing absolute T(z) for AIRS L2, and UMBC, at 4 pressures (50, 100, 150, 200 mb)
- Then a sequence of slides showing time series of UMBC anomaly = T(t)-<T(11,12 August)> for Aug 12-Aug 21, 2017
- Finally the Aug 21, 2017 AIRS L2 anomaly
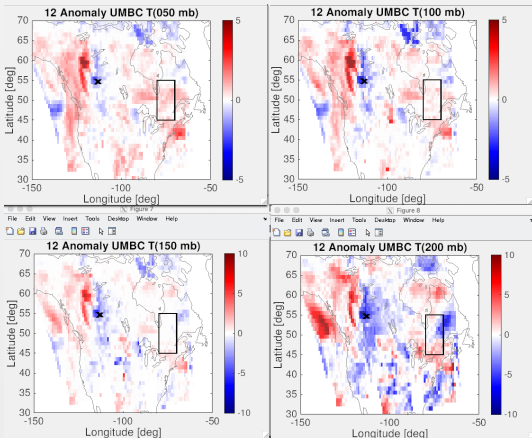- You will see patterns are similar, though numbers are different in magnitude
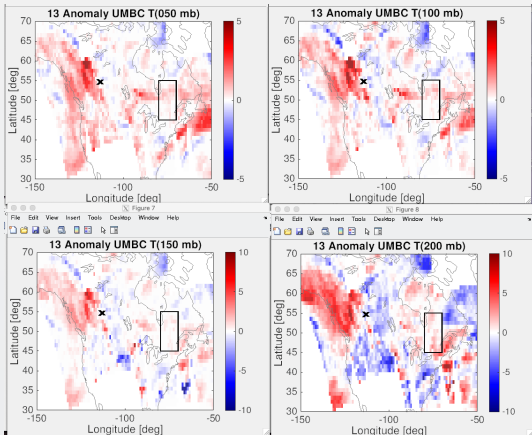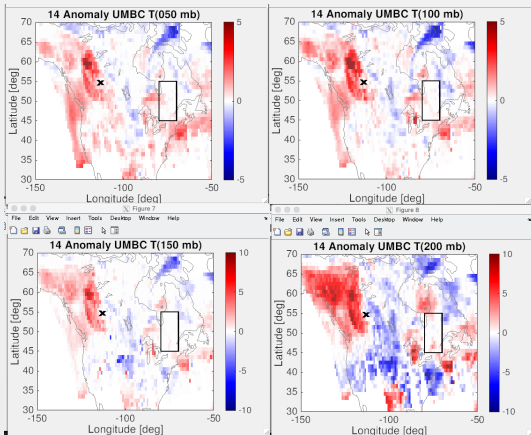
AIRS L2 Aug 21, 2017
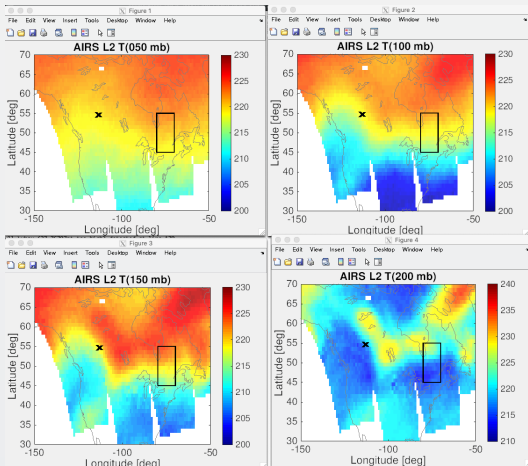
UMBC Aug 21, 2017
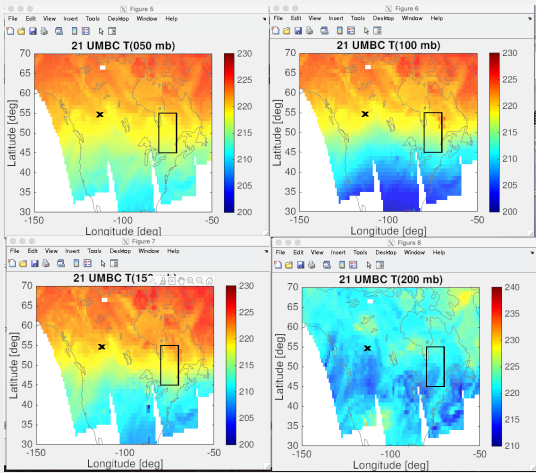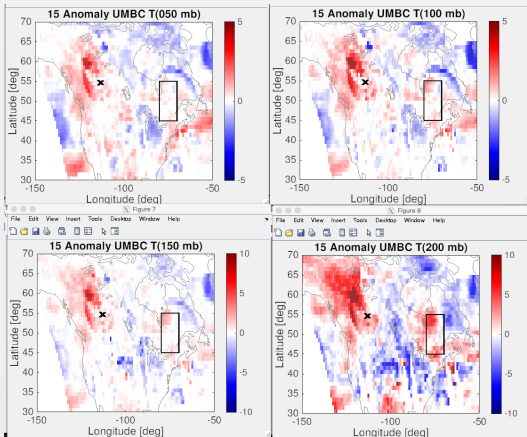
UMBC Anomaly Aug 12, 2017
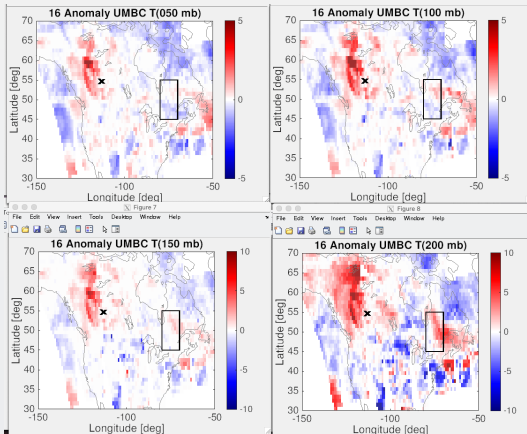
UMBC Anomaly Aug 13, 2017
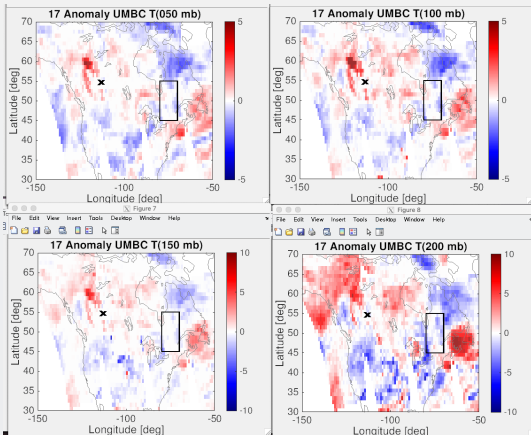
UMBC Anomaly Aug 14, 2017
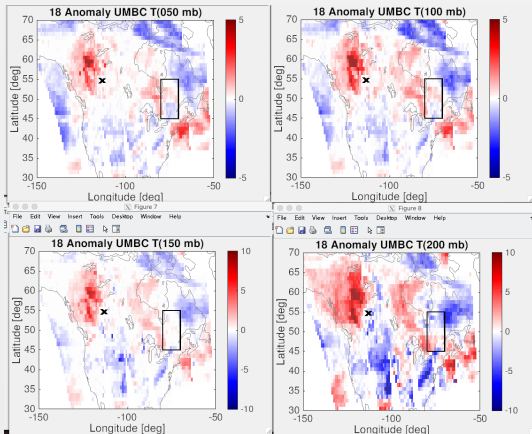
UMBC Anomaly Aug 15, 2017
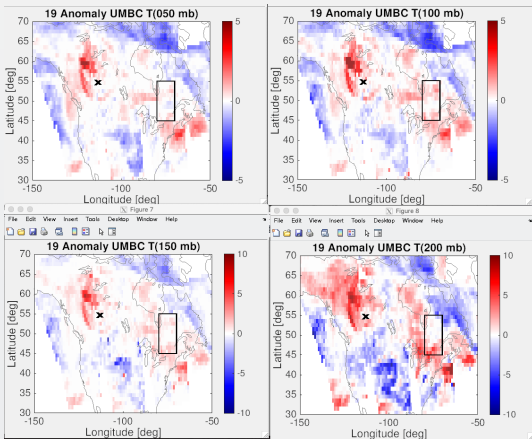
UMBC Anomaly Aug 16, 2017
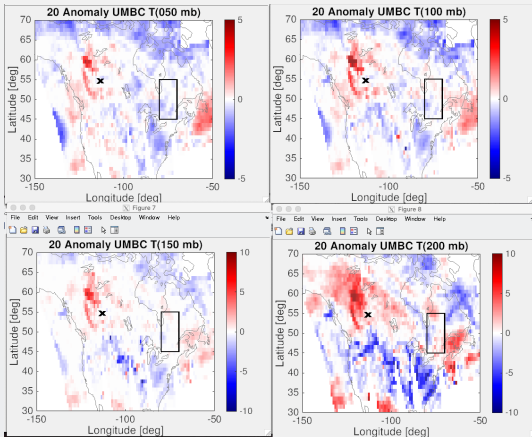
UMBC Anomaly Aug 17, 2017
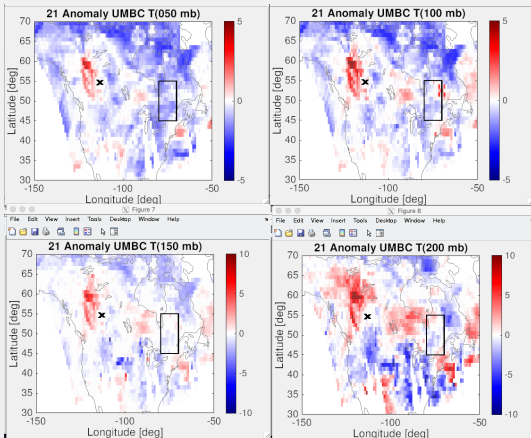
UMBC Anomaly Aug 18, 2017

UMBC Anomaly Aug 19, 2017

UMBC Anomaly Aug 20, 2017

UMBC Anomaly Aug 21, 2017

AIRS L2 Anomaly Aug 21, 2017