UT Dynamics
a.k.a: Convective Transport and STE by Thunderstorms

1. **Convective Injection of Water Vapor into the Lower Stratosphere**
2. **Tropospheric Ozone Enhancement by Thunderstorms**

Breakout UT Dynamics

- **Convective Injection of Water Vapor into the Lower Stratosphere (and other species?)**
  - Question: What is going on in background H2O and microphysics for the studies? Comment: This is challenging, previously attempted, and important investigation.
  - Comment: Discussions on model scales –on vertical (high resolution ~200m) needed and horizontal on storm scales.
  - Comment: Higher altitude levels (GV) had little-to-no signatures of BL tracers.
  - Radar images movies available. A function of height and plan view simultaneously are also being made by Cameron/Laura. Clouds images from satellite not integrated. Are these going to be produced?
  - Tropopause height from GFS in Data Archive (timestamp, lat, lon) are archived now and the general assessment (compared to sondes) is good.
  - DIAL Tropopause Heights based on ozone profiles – specific to cases of interested parties, might be difficult in some cases due to variability in ozone distribution.
  - May 30th & May 19th are specific cases looked at by Cameron/Laura.
  - Question: We do not have a good values or methods on the T-S injection. Asked if STM have any ideas (chemical tracers) and collaborating – difficult but important.
    - mass exchange is difficult for T-S but indicators of transport are likely.

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- **Tropospheric Ozone Enhancement by Thunderstorms**
  - H. Huntrieser – Has indication of increased ozone near the edge of the anvil. Quite common event.
  - We should look at other flights for a similar identification found by Heidi.
  - Comment: MMS team to review data on DC-8 to look indications for transport dyanmics
    - Interested in seeing if MMS can indicate when downward transport occurs. Need to composite list.
  - Limited studies published on the STE around convective storms (Dickerson, Barth, Poulida papers)
  - Vertical resolution is critical in modeling and capturing the downward transport at the edge.
  - Barts's paper discusses stratospheric tracers in horizontal.
  - Comment: A very important contribution for DC3 will be to analyzing in-situ data to assess the photochemical production (i.e. for 21 June case) and then analyze the relative contributions to transport from STE (what the is fraction PC and STE).
  - 30 May case clearly shows transport in front of MCS. Question: Have not seen (or seen) indications of entrainment within the cloud.
  - Challenges: Fact that there are few vertical profiles near the edges of the storms makes identification of 'wrapping' and 'shedding' more difficult.

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- Research Findings:

  1. Injection of H20 into stratosphere – DC3 data offers at least two cases for investigation.

  2. Transport around convective storms, 'wrapping' and 'shedding' from convective storms have been clearly observed with the DC3 data.

- Issues/gaps or needs:
  - Comment: Difference in scales (magnitude) from discrete storms v. MCS
  - Need to look at cloud base height to see if there are differences in exchange processes
  - Flag (product) for identifying strat. Influence regions – chemical tracers. Ozone and CO has been used. Not easy to do with automated algorithm.
  - Look at impact the vertical resolution on the models.
- Publications:
  1. Cameron – H2O injection
  2. Pan – Transport around convective storms
  3. Heidi H. – DLR Falcon cases noted in previous presentations.

My Inference from discussion: The STM (outside Laura Pan and her team) has an interest in looking DC3 data for investigations on exchange processes from the troposphere and stratosphere but has not been a focus. Breakout spurred more thinking on these processes.

Blessed are the brief… for they shall be the ones invited back.