convective transport breakout session:

discussion leader: Gretchen Mullendore rapporteur: Becky Hornbrook

TOPIC AREAS

- A -entrainment/detrainment profiles
- B -magnitude and depth of transport
- C -variability due to regime and storm morphology

subareas: passive tracers, reactive tracers, water vapor, aerosols reactions at convective time-scale

Discussion:

are we missing any categories? D -model parameterization of convective transport

INFLOW/OUTFLOW

linking/air parcel tracing - the boundary layer variability is huge - how are we going to decide what is inflow and what is not? how to characterize the airflow in the convection itself?

we need to determine what we are looking for to determine how to identify the inflow and outflow. i.e. are we looking for the mean, or individual cases? there are people interested in the storm and the mechanics of the storm, and others are more interested in what the storm is doing. parameterized convection is already in the models, and can we improve on that?

temporal versus spatial scale

it would be useful to have a marker of when we "intended" to be in the inflow and outflow.

Cameron's movies generate 3D views of the storm progression. http://catalog1.eol.ucar.edu/cgi-bin/dc3_2012/research/prod_browse?platfo rm=NEXRAD&prod=flight_track_movie&howmany=All&start=Start+Date&e nd=End+Date&submit=retrieve+products the background meteorology is important to keep us aware of storms we aren't intentionally sampling.

multiple products are useful... (archive/field catalog)

from a chemical perspective, cloud data may give the boundaries. (maybe not in one case in CO). Good chemical tracers for IDing aged cases. Individual aged downwind studies almost need to be approached on a case by case basis. Criteria changes from one case to another.

How do we link the BL tracers to the outflow?

What data do we have that characterize the inflow?

one philosophy - take all boundary layer data, and look at the distribution. The tighter the distribution, the more confidence we can have.

Vertical distribution, what proportion of the vertical distribution is entrained - this is not a new issue, you can use different tracer to determine what levels of tracers are being entrained.

ubiquitous fires - affecting the outflows

the modeling should help to determine how much and what is being entrained.

the DC8 (and the GV a little) did spirals, so we do have continuous tracer data at times.

re: vertical distribution: can dual doppler help? they can analyze different depths. cloud base? (some CO storms had very high cloud bases).

Inflow flags would be *really* useful. Who's going to volunteer?

Back trajectories from outflow to inflow - is that something that can be generated? yes, but with uncertainties.

Easier would be to see what goes into the updraft.

this might only be doable for a handful of storms, and some storms have less information than others.

- Ratio method - what goes in v. what comes out. Is this too simplified? It could be considered alongside the other methodology.

STORM VARIABILITY

- from proposal, question regarding: did storms vary between different

regions?

- Back to basic consideration: 1) there are tracers reaching the UT, 2) the BL make-up is different in the different regions. 3) is convective more effective in one region than the others? 4) why?

Can we pick one storm from each regime that is particularly useful to determine the dynamics?

OK - 29-May (links well to the downwind flight), 19-May (TX-OK) CO - 2-Jun, and 22-Jun (smoke - special case - looking at mid-level entrainment.)

AL - 21-May

we need to consult with the ground facilities to determine when there was good radar data

2. (partial) list of potential papers

Peroxides as a diagnosis for convective transport - O'Sullivan and co. WRF-Chem - Bela, Barth, Pickering Entrainment, BB plume - Ryerson a/c measurements - Cohen inflow/outflow ratios - Blake et al. inflow/outflow ratios, convective transport efficiency - Apel et al. tracer transport (Falcon) - Huntrieser convective transport/radar - Mullendore transport efficiency of aerosol tracers - Jost (and others!) effect of convection on vertical distribution of BC- Markovic & NOAA SP2 group HCHO as tracer of convective transport and HCHO source characterization in three DC3 regions- Arkinson, Hanisco, Fried, et al.

Plans/To do:

create a discussion group/listserv to discuss what we are working on... (preliminary findings) take advantage of the catalog listing for potential papers make an inflow flag for both aircraft - Mary and Jack (could be based on intent and flight plan) pick focus cases for intercomparison of methods for characterizing convective transport (dynamical, chemical, etc.) --identify doppler coverage (times it is possible) --analyze doppler data for one flight, and then add cases flights - one from each location

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3. Gaps?

lightning NOx and convection... outflow max might not match, how important is NOx v. the convective material? constraining the LNOx production requires a good handle on convective transport.