GMU Conference notes:

Tianfeng Chai- NOAA/ARL

- Using Transfer Coefficient Matrix Technique
- Volcanic ash
  - MODIS satellite observation cloud height and mass loading
- Cost function information from TCM source receptor sensitivities
  - Assimilating MODIS to get source term and matches ash cloud better
- Smoke forecasts
  - Operational NA smoke forecasts at NWS since 2007.
  - Using GOES AOD to get source term...compared to Blue Sky emissions results are compatible
- CAPTEX tracer experiment data
  - 1983

Summary:

HYSPLIT inverse modeling was applied to the Fukushima nuclear accident and the release estimation agrees well with others;

The HYSPLIT inverse system was also successfully applied to volcanic ash predictions using MODIS satellite retrievals;

Wildfire emission inversion has been built to assimilate GOES observations to estimate the smoke source terms;

Using CAPTEX data, the HYSPLIT inverse system is tested with "dynamic" model uncertainty terms. Improved results are obtained for both choices of metric variables;

A cost function normalization scheme is introduced to avoid spurious minimal source term solutions and proves to be effective;

At last, the system is tested for its capability to find a single source location as well as its source strength.

Chris Loughner.

Expand HYSPLIT with STILT routines

`` using 6 tracer release experiments from CAPTEX

- Using DATEM archive to evaluate changes
- Uses WRF 27 km 1980-current analysis

- Stochastic Time integrated Lagrangian. Trajectories
- Used for greenhouse emissions
- New mixed layer schemes, and time changing Lagrangian time scales
- Computes vertical velocity variances for LTS

Summary:

New features from STILT have been merged into HYSPLIT.

These new options can be chosen a-la-carte.

Evaluation covering six tracer release experiments from CAPTEX reveals that using a time and space varying vertical Lagrangian timescale and the more complex STILT transport scheme improves the simulation.

Meteorological datasets will be included in the DATEM for HYSPLIT benchmark runs for future testing of new model developments, other models, and inversion techniques.

By incorporating STILT features into HYSPLIT, this ensures that they will be maintained and kept up to date in the HYSPLIT repository.

Fantine Ngan

Sagebrush field campaign

- Vertical velocity variance. Models usually underestimate

Summary:

Dispersion simulations using different mixing options were conducted to simulation two controlled tracer experiments – PSB for sub-kilometer transport and CAPTEX for the regional transport.

The KC and EXCH mixing options produced a larger maximum of the vertical velocity variance and it occurred at an altitude of about 500 m, which is above the tower measurement available in the PSB1.

The BH's vertical velocity variance profile had a sharp increase from the surface to the height of the maximum values (about 200 m). The TKED case had a flat vertical velocity variance profile with the smallest variation with height.

The statistical rank for the dispersion result using the TKED option was slightly better than others while the BH mixing generated results with a roughly worse rank.

No mixing option always outperformed the other options. HYSPLIT users can select a mixing option according to their scenario and availability of meteorological fields, as well as use different mixing options to generate dispersion ensembles.

Chris Wamsley

- Hysplit can take 5-10 min to run and sent to the local official who needs to react within 30 min of incident
- Source typically unknown (80%+)
- IMAAC as a whole gets involved/activated when the state/local level needs help with an event that is becoming larger where enhanced modeling is needed/desired.
- Hysplit is more on the local level than federal level
- Deer park fire mar 16, 2019
- Usually HYSPLIT is the initial response

Question from audience: an exercise on the shipping channel event

IMAAC

- NOAA for water modeling as well
- 7 partners: DOD, NOAA, EPA, DOE, HHS, DTRA
- DTRA: IMAAC tech op hub:
- 30 minute response
- Exercises, training,

Question from audience: how to determine consensus—> ensemble?

Anthony: Lackawanna Steel fire HPAC

- EPA sensor data
- UDM 30 m plus building data
- GFS, NAM 12/4
- PM2.5 comparisons...NAM-12 and UDM were best but still low correlation

Question from audience: HPAC PBL. Josh Boden

- Uncertainty with ABL depth
- When is ABL most important
- GFS, 12 km NAM, 4 and 1 km WRF
- 12-19 Dec.n2018 00z evaluation
- Dec 17- mar 18
- Vs IAD using differential pot. Temp
- Scipuff outperformed swift abl...but positive bias
- Broader study: Medford had boundary layer depth and wind spike errors near sunset
- Error by stability class.
    - A: look at CMAQ PM error by stability

Summary:

Know information: HYSPIT worked well and coordination was good.

Chia Wei Tsia. Downwash from drones

NCAR SOM data: Jonathon Vogel

- Use wind climatology to drive HPAC
- Use historical weather
- Self-organizing map analysis for typical weather days
    - Clustering technique
    - Winds plus
    - Tested for Buffalo for November
    - Worst, best and ensemble case
    - Run with time lagging and compute a freq. type rose

DTRA Joshua Boiden - Comparisons of HPAC Transport and Dispersion Model Predictions of Atmospheric Boundary Layer Depth

- This study used HPAC (Hazard Prediction Assessment Capability), the DoD's principal hazard prediction software.
- SWIFT and SciPuff can use NWP terrain or HPAC native terrain.

Summary:

SciPuff produced less ABL depth error, more 40m hits, but more bias than SWIFT at 00hr lead. At 12hr lead time, the difference decreased, but likely more to do with NWP error.

The minor ABL adjustments made by HPAC wind solvers can significantly alter plumes, particularly in near neutral stability.

Terrain did not have much impact on ABL depth results.

ABL depth errors/bias comparable to broader study, adds confidence that recent results are meaningful.

Broader study shows NWP performance variability. Challenges surrounding 00z sunset were consistent in the West.

Stability breakdown highlights higher resolution NWP skill in stable atmospheres, lower resolution NWP skill in unstable atmospheres.

DTRA Hazard Dispersion via Unmanned Aerial Vehicles: Considerations in Modeling Downwash

- Scenario: sprayer on drone
- Model: Hazard Prediction and Assessment Capabilities (HPAC)
- Objectives: Determine how agent dispersion is affected in modeling
- Model release from rotary wing aircraft

Summary

The addition of an air term as a way to model downwash captured some of the effects of downwash

Accounting for downwash can lead to higher concentration of material in an earlier time; overall affected area is about the same

DTRA - Jonathan M. Vogel -The Use of NCAR SOM Data for DTRA Reach back Planning Products

- HPAC Fixed Wind Weather
  - Use climatological average values for a given location and time of year.
  - Surface data input into HPAC.
  - Mostly used if the requestor desires the plume going in a specific direction rather than for climatological norms.
- The HPAC Historical Weather is provided by the Air Force Combat Climatology Center (AFCCC) and represents the actual weather on the 15th and 16th day of each month in 1990.

Summary

MERRA2 and the NCEP/NCAR reanalysis datasets are available for running in HPAC.

DTRA: Leann Anthony- HPAC 6.5 Model Validation: A look into EPA Sensor Data collected during the Lackawanna Steel Fire

- 24/7 Subject Matter Expertise to CBRNE
- New version of HPAC 6.5 software

Summary:

UDM did very poorly: Unrealistic concentrations and horizontal plume extent with all NWP.

GFS runs (excluding UDM) displayed similar behaviors with regards to timing and concentration. Between NAM12 and NAM4, NAM4 showed more consistency.

Horizontal plume extent and thickness play a role in accuracy and timing of concentration measurements.

GFS runs showed secondary maximum in concentration (13-15 km away from fire) due to terrain influences. Horizontal extent within these runs were unrealistic (over-estimated). Significant improvements were shown in NAM runs.

Discussion David Chorney

Operators: IMAAC, HPAC, NARAC, HYSPLIT

Chris Walmsley: HYSPLIT: WFOs run...results in 10 minutes

DTRA: HPAC: can also run ALOHA/CAMEO: water born response, epidemiological

NARAC: nuclear, radioactive events: Use WRF ensembles, inverse modeling,

Questions:

Q: What happens if a huge event happens and there is large federal response requirement?

Q: Who are the leads?

Q: Do we need a new plan to describe what models are out there and who leads and when?

Q: Does the National Response Plan cover everything already?

Response: NRC leads radiological,

Q: Should we nationalize the IMAAC support plan? Use the IMAAC plan?

Q: Do we need a federal coordinating working group to put this together?

R: Andy Gross - DTRA

R: IMAAC is coordinating unit to White House

Summary:

OFCM will bring this subject up at the next ICMSSR nd propose the continuation of the WG-ATD.

The WG-ATD with get together with the operators and researchers to write a new plan using he IMAAC SOP as the base for a new plan.

The plan will include all the models the government could receive, with a description of each model.

The plan then then talk about the operational model of flow of information that would occur for different scenarios.