

October 13, 2004

SAC meeting

Gregg Cooke –Dallas has substantial problems with the model for the 1 hour ozone standard. This makes resolving the 8 hour issues difficult as well. Are there pathways to move forward on the DFW modeling? Mike Eastland states that we need to identify why this model is not working. If we can't make it work then we will have to model another time period – which will take lots of time.

The environmental community has initiated a lawsuit because the 1 hour SIP was not finalized due to the transport issues. EPA said it could not be finalized due to litigation over an unmet obligation in the SIP.

Making the 8 hour standard/model work would be best for everyone.

Ramon Alvarez – Environmental Defense is not part of the litigation, but the environmental groups involved are not concerned over progress over the one hour standard per se, their concern is over making any progress at all. Texas has taken path of least resistance. Very little new is occurring. Environmental groups needed something to catalyze something to happen.

Erik Gribbon for Candy Garrett and David Schaunbacher

Reviewed Texas Near and non-attainment areas (NAAs). NAAs are working on steps to keep them out of non-attainment areas. There are both challenges and accomplishments with regards to BPA, DFW and HGB and attainment of the 8 hr standard. Many actions are in place for achieving attainment and preventing non-attainment. Texas will be challenged to find feasible control measures for 8 hour attainment. We have already gotten all of the low hanging fruit.

Session I

1. What Modeling/transport issues should be addressed in the context of TexAQS II?

A question was raised about HT1 as to whether or not we are on the right track. Jay Olaguer responded that HT1 has been approved by the SAC and the Board, and is not part of the \$476,000 available for future projects.

In the presentations on transport there was not any discussion about Louisiana sugar cane burnings and their impact on HGB or DFW.

John Nielsen-Gammon – a lot of the planned monitoring is for the east Texas in general though not specifically Louisiana.

Is any thought being given to international border transport?

Jim Price – there is thought about transport of regional haze from Mexico and the Gulf. Some may be US haze that flows out and back in. There are monitoring sites along the border. Also the BRAVO report has recently come out and discusses the issues.

How big a domain is important for HT1? We could use the whole continent to include many impacts, but how can we bring in real time emissions to incorporate that info into the system? The modeling input parameters are there.

Is use of satellite data useful?

For fires satellites data is available. If you want quantitative data you need to do a lot of work to translate it into emissions.

In ICARTT two models integrated tracer information - and the models did a nice job predicting the outcome.

HT1 is a conglomeration of several projects. The model will be run in real time mode for field study, and separately for evaluation of transport for 8hr ozone to gain a retrospective for the VOC apportionment study. They are two systems. There is no linkage to satellites at this time, but may be a factor, however there is limited funding. USDA and NASA data need to be brought in – we still need to negotiate with them to bring in their satellite data and forest fire data.

The approved level of funding is \$760K. Is this enough?

There are other funded projects underway that represent a parallel effort.

In the regional domain, where we are specifying or trying to find the contribution of various components, what is the biggest unknown, chemistry, emissions, met?

Current SIP models tend to ignore processes in free troposphere. We have asked Environ if we are characterizing this well enough for 8 hour transport.

Most lightning NO_x is deposited in free troposphere and this contribution needs to be considered.

There are uncertainties in many parts of modeling. We are biased low in the amount of transport in emissions coming to Texas. Greg Yarwood doesn't know what the biggest uncertainty is, but it is not likely the met issue.

East US has positive biases, but east Texas is lower bias. Why?

Greg Yarwood - model formulation makes a difference.

Pete Breitenbach – Texas is expanding the domain but we have not expanded it out to continental yet. We may need support to do this.

Jim Thomas – there may be a problem with one element that is off, but gets fixed. Will Daewon Byun’s work be adjusted for this?

Daewon Byun – the emission inventory will set up before the met is, then the met goes into the model. There is a feed back between the two.

Met or boundary conditions, etc. depend on the specific episode that is causing the bias. When wind speeds get really light it changes the local concentration. Pete Breitenbach showed the model is still biased high in terms of wind speed. The relative area is fairly high. The difference in wind speed could cause a significant error in local emissions. Getting wind speeds right is an issue.

John Nielsen-Gammon – In TexAQS II we can do with models more than what could be done with individual cases. Background contributions can be looked at as a function of met. Over time the random errors will be nulled out. We can get beyond the episode issues by gathering data over time.

Dick McNider – we need to get the met right, and putting the emphasis on that makes a lot of sense. It is a very important area. W/o met, chemical mechanisms don’t work.

Pete Breitenbach - there is little data to verify emissions.

3. What is an appropriate strategy for developing a new 8-hour SIP model? Episode? Configuration? Timing?

Pete Breitenbach – the state is constrained by EPA on what is acceptable. Pete feels the current episode/model is adequate to do the job. Selecting a new one sets us back 2 years.

Jay Olaguer – H12.8HRB – impacted the EPA’s view on what is being done.

Pete Breitenbach – Texas is the beta test for modeling.

Jim Thomas – Near NAAs asked if they should proceed with the 8hr or start over. They decided to go with what they have and that turned out to be good. Recommends staying with the same episode/model.

Ileana Isern-Flecha – Agrees with Jim Thomas’s comments.

Daewon Byun – is concerned – may need to understand the conceptual model that showed a spring hump and a summer hump.

Pete Breitenbach – the big hump is in summer – that’s when we choose the episode.

Greg Yarwood – peaks shift from year to year. Both peaks were similar even though they occurred at different time.

Noor Gillani – the spring peak is related to tropopause folding events. Even though MM5 shows the dynamics of the events, it doesn't bring any ozone down. Need to use the modeling to help.

John Nielsen-Gammon – what we've done so far shows the met is similar for spring and summer episodes, the difference is in the nature of the ozone.

EPA – In converting from MM5 to CAMx there are some shortcuts that are being done. This is an area that needs to be addressed

Greg Yarwood – we can do a one to one mapping to everything except vertical mixing. We can interface with all the schemes. Certainly the Kv area is the most problematic and needs to be dealt with.

Jay Olaguer – should we be considering using ensemble techniques for regulatory purposes?

Greg Yarwood – you learn more when you apply multiple models, but how do you focus your efforts?

Robin Dennis – There are very important ozone blobs at 8-10 km, and handling the free troposphere is important. It will add ppb's of ozone to surface.

Jim Lester – is there a recommendation to extending the top. Is that okay?

Greg Yarwood – there is no barrier.

Noor Gillani – I am looking at what is shaping the free troposphere and looking at how that will impact ozone. East US is in the study area including east TX.

Daewon Byun – There is a big gap in the vertical transport area, there is no mechanism to cause the upper troposphere and PBL to exchange well.

4. What special issues need to be considered for the DFW 8 hour SIP? Transport? Dead zones? Biogenics?

Bill Carter – bias raises a flag. Maybe it's due to emissions or met. If emissions, then it could give incorrect control strategies. If it is met, it is less of a concern than if it is emissions.

Greg Yarwood – there are emission reduction sensitivities in DFW, but they are not raising emissions issues like HRVOCs in HGB.

Dick McNider– if you do have a bias in the wind speed in the model that is high, then you'll underestimate the sensitivity to surface emissions. The model will become less sensitive. Emission reductions will be different.

Robin Dennis – what is being done to assess the VOC/NO_x ratios and the OVOC's. Under prediction throughout the urban area looked like something chemical and not just transport. TexAQS II needs to be collecting the chemical information.

Daewon Byun - UH/Lamar tested regional emissions with CMAQ and we see the same low bias of emissions. There is a hint that there is a VOC bias. The 99 National EI gave low numbers.

Greg Carmichael – all models show that HC's are under estimated.

Dave Allen – across the U.S.

Greg Yarwood – EI is always an issue, but we need some evidence before we change the EI.

Pete Breitenbach – there is no mixing heights for 99.

Jim Meagher – when mixing heights are too high they give concentrations that are too low. Catalysis rates can be low giving low ozone. Hopefully TexAQS II data will give better wind data.

Pete Breitenbach – Plans are to incorporate more data.

Jim Thomas – will there be aircraft flights between Houston and Dallas? Any flights in that part of Texas might give some inferences about transport.

Ron Parry – my general impression is that EI and the lack of info in the air gives problems for air quality modeling, making air modeling useless.

Melanie Sattler – what would it take from a regulatory authority perspective to move away from a 40 ppb background? Is there a study that can use 60 ppb?

Pete Breitenbach – there is a study where we are trying to do that. We think 60 ppb background is true for Texas, but we don't have solid data to do that.

Melanie Sattler – will the project provide that solid evidence?

Jim Price – don't know how solid that will be.

Dick McNider – We're looking at the 2000 period model performance, and comparing real observations to modeled numbers. Ted is working on the case of the DFW 99

episode, and while there was not an intensive period in TX, there was in Atlanta, and we may be able to bring in that data.

Dave Allen – Need to do modeling that extends the boundary to the Atlantic – to give the best indicator.

Peter Daum – predicted water concentrations were lower than actual by about 25%

Pete Breitenbach – we also had robust mixing. Moisture drives met models.

Pete Daum – moisture is a radical source.

Jim Smith – We need to try to use the ensemble technique for the SIP if there is support for that. There are several issues that can affect the results. The ensemble approach improves the results without having to identify and optimize a particular model. The question is, is it feasible?

Jim Thomas – is there any data from satellites from MODIS that can be used to evaluate model performance?

Greg Carmichael – GOME data – gives information that can be useful. It remains to be shown how quantitative, but in 2006 it will give data on speciated VOC's. Unique solutions to models are data problems. We need to identify where the data needs are. The satellite data will help. 99 data is available but not good.

Dave Souten – in San Francisco – a study by Rob Harley did a EI from a fuel based approach.

Session 2

What are appropriate research questions and strategies for addressing OVOC's?

Dave Allen -Comparing the HRVOC's and OVOC's is not at all straight-forward. The ratio of VOC/NOx changes at different heights, making it difficult to impute in the model. There are a number of models being used for HRVOC and VOC. CMAQ and CAMx.

Noor Gillani – spatial resolution is a large source of uncertainty in the model.

Dave Allen – there are problems even if you go to the 1 km grid.

Dick McNider – it may be useful to have LES to understand what the time averaging is actually doing. Big plumes of isoprene going up get limited by the chemistry. LES can't do as many cases as the larger model.

Emission inventory as it relates to DFW

Dave Allen – biogenics inventory through out east Texas becomes significant for DFW transport of ozone formed as a result of HC reactivity from isoprene.

Jay Olaguer – we funded top down research. Is there opportunity to do that in DFW? E.g. can we do it with satellite data?

Greg Carmichael – formaldehyde columns give us an idea compared to in-situ measurements. Once you have formaldehyde –and constrain it on a regional scale you have valuable information on hydrocarbons. Inverse modeling is an important tool but is reliant on the information available.

Jim Price – Power plant NOx available on an hourly basis has uncertainty.

Robin Dennis – Power plant numbers are covered by CEMS.

Peter Daum – is skeptical about inverse modeling.

Greg Carmichael – we’ve done inventory work in Asia. Same tools building bottom-up inventory. We looked at an inverse modeling of CO, and came back with underestimate of inventory of 30-40%.

Daewon Byun – Before going to inverse modeling, I’m more interested in the data assimilation part. For weather forecasting – 4dvar has idealistic – w/o using nudging/data for assimilation. Should we use 4dvar first?

Greg Carmichael/John Nielson-Gammon – are working on ensemble instead of nudging because it is better.

Dick McNider – you are making the assumption that the wind is correct. To make 4dvar work you need to adjust the chemistry and the met at the same time.

Greg Carmichael – it’s a coupled system. The goal should be to get an optimal analysis. Produce fields that are more consistent with met than not. With chemistry, we don’t have the data to do that. We are going to put these tools into WRF Chem, but we’re not there yet. There is not enough to tell us about the deficiencies of models. We need test beds to design the tools for the next decade. We can take more fancy measurements, but often the model isn’t talking to the data in any significant way.

Jay Olaguer – what is the experience of ICARTT or other studies with the adaptive modeling measurements?

Fred Fehsenfeld – we need to identify goals for measurements and modeling goals. Then develop a game plan. How will you address the met or other questions to answer? Then dry run the whole thing. Need to pre-study to successfully operate in the field.

Robin Dennis – EPA is doing inverse modeling and finds it useful to identify information needs, because we lack the information. Healthy skepticism is useful because in inverse modeling you are effectively balancing the model. We have to be careful about that, but we're asking the right questions by doing the inverse modeling. Need to begin to explore inverse modeling, but don't rely on it. We have been using inverse modeling on ammonia and it has been helpful in developing a model to make correct predictions.

Jay Olaguer – I focused on uncertainty. We recognize there are different sources of uncertainty to address the inverse modeling. The ensemble method starts to get us there.

Robin Dennis – need more measurements.

John Nielsen-Gammon – observations are not keeping up with modeling.

Jim Lester – what's the problem with SAPRC and CBIV?

Bill Carter – CBIV is slower than SAPRC, and SAPRC is slower than reality. Work is being done to update both models. The CBIV does what is designed to do wrt efficiency but has biases wrt ozone.

Ron Parry– What is in the category for addressing OVOC's?

Dave Allen – The basic issues with OVOC's (industrial sources of VOC's other than the HRVOC's). If you're going to say we've underpredicted HRVOC's, we've likely underpredicted the OVOC's. Do the controls on the HRVOC's create a bias since the OVOC's aren't controlled? We're going to put in control strategies for HRVOC's, will we get ancillary benefits from controlling other VOC's?

Greg Carmichael – when you do 4dvar you find out what the sensitivities of VOC's are.

Bill Carter – based on that you get how important they are in your model.

Melanie Sattler – Found that alkanes were grossly underestimated.

Greg Yarwood – Oklahoma propane emissions had minimal impact on regional ozone.

Jim Meagher – OVOC's – are more important in the 8hr standard and we need to worry about long range transport.

Ron Parry – OVOC's have various reactivities.

Greg Carmichael– when we know there are errors it takes a long time to correct. When we try to inverse or use ratios, etc, and the errors propagate, it is difficult to infer things.

Jay Olaguer – is it possible to combine methods, with PMF, inverse modeling on CO, and can you deduce information on other compounds?

Peter Daum – you need to have substantial improvements in the biogenics area in DFW. Inverse modeling can be a valuable tool for figuring what is going on but you should not place too much confidence in the emissions you get out of them.

Bill Carter - relative reactivities and 1hr vs 8hr, were basically the same. The difference in reactivity, HRVOC has much more impact on ozone. Butadiene may be gone in a few hours, but the ozone is not. It gets carried on. So the difference is not that great. Compared to aromatic chemistry we know isoprene very well. How important are the remaining uncertainties?

?? – There are lots of uncertainties.

Dave Allen – What could be done consistent with the DFW timelines that would improve the understanding of the SIP? Important items that could be addressed in the short term:

1. Boundary Conditions
2. Oil and Gas issue emissions could be quantitatively addressed
3. Sensitivity around biogenics issues

Dick McNider – define wind speeds, add profilers, etc.

Pete Breitenbach – Process analysis, VOC, weekend, weekday accounts.

Jim Meagher – consider looking at CO.

Dave Allen – what Houston inventory is in the DFW model?

Pete Breitenbach/Greg Yarwood – there is no VOC imputation in the DFW model.

Dave Allen – what if you assumed the same imputation in Louisiana, etc.?

Ramon Alvarez – the VOC cap doesn't address fugitives. The underestimation of emissions issue does not go away.

Session 3

Summer 2005 Tetroon Campaign

Carl Berkowitz – Proposes to use the 2005 campaign to demonstrate capability. Launch about 10 balloons targeted towards nighttime issues with chase airplane to address chemistry issues. There are a number of balloon configurations to look at different issues. Use a small suite of instruments in attempt to prepare for a 2006. (May consider using day time runs as well).

Noor Gillani– if we want to look at nighttime chemistry then we need to look at an aged plume.

Carl Berkowitz – release configuration height for transport at nighttime is at the convective daytime layer, where low level jet tends to form.

Paul Voss – it is a balance between costs and the minimum amount you need. 2-3 is much better than a single point. Use continuous sounding to look at depth and not just at one altitude.

Carl Berkowitz – low level jet, nighttime dispersion, model performance at night isn't good sometimes, and getting vertical wind fields is problematic. However getting sea breeze reversals for a daytime release would be good.

Peter Daum – Will you release this in conjunction with some source?

Carl Berkowitz – We've talked about that. We're considering it, but it hasn't been finalized. One could conceive releasing 1-2 balloons at a known source, and ask the receptor modelers what they think and compare results.

George Beatty – what scientific question are you trying to answer in DFW and Houston?

Jay Olaguer – one aspect to look at is how much pollution is transport from Houston to Dallas.

George Beatty – we would be too stretched to release at both Houston and Dallas.

Jim Meagher – Will tetroons follow some unique path? What about the dispersion that comes? Seems like you have to use many balloons? Is this technology developed enough?

Carl Berkowitz – What technology would be best to tag an air volume? Nature tends to spread things apart and this could help find that with many balloons.

Dick McNider – models can make trajectories fine, but they can't get the wind fields right. Seems like you're using the tetroon to measure one small set of winds over this area. Will this help us relative to having more profilers? What I am interested in is the soundings by tetroons.

Carl Berkowitz – tetroons vs. profilers? We're starting to evaluate trajectories outside the areas from where the profilers and sodars are.

Paul Voss – Soundings are important. Ensembles of balloons are important. There is some reliability to the transport. ICARTT showed that models and tetroons agreed pretty well. We don't look at balloon trajectory itself.

Dave Allen – has anyone released a molecular tracer concurrent with the tetroon? What information does the tetroon give you that the tracer does not?

Carl Berkowitz – it gives a signal instead of searching for the signal.

Pete Breitenbach – we have high background. We don't know where the nighttime chemistry is. This is a scoping study the first year to validate our modeling performance, especially the wind field modeling. In the second year we sample the air mass and identify where it goes over to the next day. The first year is a test drive.

John Wilson – what about modeling performance over Galveston bay?

Carl Berkowitz - what column of air are we talking about in the sea breeze reversal? The convergence where the two fronts get together? – needs more thought.

Dave Allen – what are the FAA restrictions?

Carl Berkowitz – FAA won't be an issue for releasing Houston to Dallas. We released tetroons elsewhere because they are small units with a big aluminum reflector that shines like a star for the air traffic controllers.

Jim Price – with HEAT study scheduled next summer with overlapping Doppler radars – would it be a good place to have an experiment?

Pete Breitenbach – look at where ozone maximum is during 6 pm and release tetroon there.

John Nielsen-Gammon – how much wind shear develops at night?

Dick McNider – we could use profilers to give a virtual atmosphere to get an idea of how much spread is there, which might give an idea of how robust a single or multiple releases would be.

NE Texas Aircraft Campaign

Noor Gillani – LES would be useful only if we're talking about following an emission from its' earlier source. If we're looking at longer range we should use the Lagrangian model.

Ramon Alvarez – we're operating in a regime of limited funding, and the tetroon study seems expensive. Is this the best use of money? Need to consider the trade-offs.

Jim Thomas – I share that concern, considering the other projects that need to be done. Some kind of prioritization needs to occur. Need to address from the highest priority down.

Jay Olaguer – we did go through a prioritization process with the roadmap team. Few resources have been put into the tetroon study impact on east Texas vs. other things.

Jim Thomas – but your prioritization needs to be in sync with others.

Joe Scire – the tetraon experiment offers unique results.

Fred Fehsenfeld – nighttime chemistry and transport is important. We need to consider the best approach. Need to step back a bit and see what gives the best understanding of the problem that we're trying to address in Houston or Dallas. A more organized approach needs to be done.

Peter Daum – the most valuable thing we've done is to identify an issue: nighttime transport. Tetraons are one way to address the issue but there may be others to do it.

Robin Dennis – I like using profilers and using Renyi's instruments to trace out what the aircraft is doing.

Ron Parry – I am most concerned about health effects. What is the best way to get to reduction? What's the fastest way to do it? We need to identify what is the science we need to do to get pollution down to acceptable levels.

Noor Gillani – if we make profiler measurement – we might not be able to track a nighttime path with aircraft.

Pete Breitenbach – San Antonio and Austin/central Texas also has issues. They are NA too.

Bill Carter - Nighttime chemistry – need more measurements than you can have on a balloon. Get measurements of other species.

Ileana Isern-Flesha – we need to look at the best solution fast with best return on investment wrt Dallas – there is a committee looking at what the needs are.

Jim Lester – there are certain things for which we need to move quickly.

Jim Thomas – the SCC will help define what goes on in the next couple of days. No one has mentioned going back to Williams tower.

John Nielsen-Gammon – space at Williams tower is still unoccupied

Recommendations from Dave Allen and Peter Breitenbach wrt what could be done consistent with the DFW timelines that would improve the understanding of the SIP. Important items that could be addressed in the short term:

1. Boundary Conditions
2. Oil and Gas issue emissions could be quantitatively addressed

3. Sensitivity around biogenics issues
4. Weekday/Weekend Analysis
5. Upwind/downwind studies
6. Non-road emissions/activity studies
7. Evaluate VOC/NO_x ratios
8. Track major NO_x plumes with aircraft