Alternative Modeling Protocols

There seems to be some confusion about why the Modeling Forum chose to proceed with the Models-3/CMAQ system. The following list is a summary, put together on 7/19, of alternatives that have been considered by the Modeling Forum and some of their pros and cons. There are obvious tradeoffs between different modeling systems. A system like Models-3/CMAQ will give us a “refined” answer, but with greater overhead in terms of time and resources. A system like REMSAD relies on simplifications and parameterizations of physical and chemical processes, but can potentially run somewhat faster. Aside from something like Speciated Rollback, there are common elements in all of the modeling systems that have been considered that will consume much of the time and resources. This includes formatting the meteorological fields for input to the model, processing and speciating the emission inventory for input to the model, comparing the model outputs to observations, going back and diagnosing why the model does or does not agree with the observations, and the inventory will have to be modified for future years and for each emission control scenario and run back through the model.

The modeling forum chose to proceed with the Models-3/CMAQ system because it was designed from the outset to streamline some of the above listed tasks and to share the information generated by those tasks among users. Furthermore, the analysis of the interaction of pollutants that affect haze will require a model that has a fairly rigorous treatment of the chemistry and physics of particle formation, transport, and removal. CMAQ has those qualities.

The Modeling Forum has not proposed that its products would provide one-stop-shopping for a SIP/TIP. The Modeling Forum has committed to providing a common regional analysis that can be refined by states and tribes for the development of their SIPs and TIPs. Furthermore, the choice of Models-3/CMAQ would facilitate that refinement. The framework should allow a regulatory agency to take the regional analysis and refine it for their own purposes. These refined analyses should than be able to be integrated to give a coherent analysis of the WRAP region, without infringing on any jurisdiction’s sovereignty.

Alternatives and pros and cons to Models-3/CMAQ:

1) Most alternatives have the same potential for problems that CMAQ has.
    a) No model has been demonstrated to work for PM across the west
    b) The other models may not give us the "refined" answer by 2003
    c) Anything more complicated than a rollback will be very time consuming as well
    d) All traditional air quality models (including CMAQ) will be affected by lack of emissions data from Mexico
2) Alternative models:
    a) REMSAD
        i) Can give us regional analysis

ii) May have same or worse performance problems as CMAQ (assuming CMAQ didn't perform)
iii) Past performance not good for Carbon & Nitrate
iv) Problems have been addressed
v) Latest chemical mechanism, micro-CBIV is proprietary
vi) Won't give us credible fine scale analysis

b) CALPUFF
i) Puff model not well suited for very long distance
ii) Puff model not well suited for large number of sources
iii) Very simplified chemistry
iv) Could provide solution for "near field" analysis
v) Readily available and a known quantity

c) Speciated Rollback
i) Recommended by NAS
ii) No specific source-receptor relationships
iii) Only for sites with monitoring data
iv) Have to assume some conversion rate for secondary species
v) Very Easy to run

d) CMB
i) Need monitoring data
ii) Easy to run
iii) Not good for secondary species, but can be fudged

e) UAM AERO
i) All of same problems as with CMAQ
ii) Not much experience

f) RADM
i) CMAQ is essentially new improved version of RADM

g) VERAD
i) Expensive to resurrect
ii) Required extensive “reconciliation” for the GCVTC
iii) Analysis by Modeling Forum Subcommittee suggested using REMSAD over VERAD, if simplified chemistry model to be used.

h) CAMx with Aerosols
i) May run faster than CMAQ
ii) Aerosols haven't been proven with model and may not be fully implemented
iii) Doesn't have framework (may turn out to be a plus)

3) Other Fallbacks using CMAQ if run-time becomes an issue
a) Don't analyze whole year - do "representative episodes"
b) Have contractor implement REMSAD-like chemistry in CMAQ, which runs faster
c) Hire a contractor to do it

4) Parallel Effort Possibilities (Would take extra money)
a) Run REMSAD
b) Have Contractor develop SMOKE interface for REMSAD so we're ready to go if need to
c) Contractor run CMAQ parallel to RTC

5) Contractor jump start

a) Has been discussed but rejected for now
b) RTC still has learning curve with model
c) RTC adds learning curve of contractors analysis
d) May get base analysis done faster
e) Takes money away from RTC and capability building