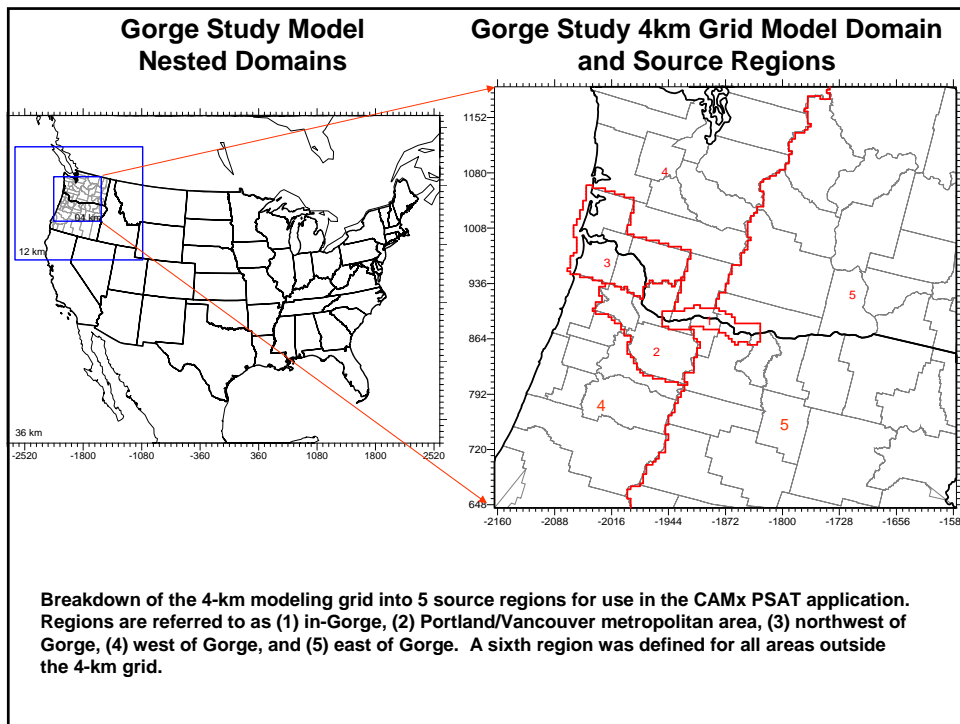


Review of Gorge Haze Project Conclusions

By Marc Pitchford & Mark Green
for the Gorge Science Day
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Review of Conclusions

- Results are based primarily on the air quality modeling using the 2004 and projected 2018 emission inventories, but are consistent with the measurement data
- All of the following slides were shown this morning



Conceptual Model of Gorge Haze in the Summer

- Wind is from the west with relatively dry conditions
- Large contributions from natural sources (~40% to ~60% from wildfire plus biogenic secondary organic PM)
- Western Gorge Haze
 - Portland ~20%
 - Beyond the 4-km model domain ~22%
 - Northwest of Gorge are responsible ~12%
 - In-Gorge ~6%
 - Secondary organic ~33%
- Eastern Gorge Haze
 - East of Gorge ~22%
 - Beyond the 4-km model domain ~23%
 - In-Gorge ~9%
 - Secondary organic ~32%

Conceptual Model of Gorge Haze in the Winter

- Wetter & colder means no wildfires & reduced biogenic emissions
- Natural contributions are relatively small, ~5% to ~12%
- Stagnation and fog responsible for rapid conversion of precursor gases emitted by numerous source in the region into sulfate and nitrate PM
- Worst Gorge haze is left when fog evaporates
- Western Gorge Haze
 - Portland ~28%
 - Outside of the domain ~19%
 - Within the Gorge and east of the Gorge regions ~13% each
 - ~75% sulfate and nitrate PM
 - ~9% organic and elemental carbon from residential heating and vehicular sources
- Eastern Gorge Haze
 - East of the Gorge ~57% with (half from electric utility emissions & most of the rest from vehicular sources)
 - Outside of the modeling domain ~23%
 - Within the Gorge were responsible ~10%

Conceptual Model of Gorge Haze

- Modeling of emission projections indicate that Gorge haze is likely to be reduced by 2018
 - Perhaps imperceptibly for summer episodes
 - Small but perceptibly for winter episodes
- Modeling of the two episodes indicates that regional (within Washington & Oregon) controls of man-made sources cannot eliminate Gorge haze
 - During the August episode as much as ~60% to ~80% of the haze is from natural and outside of the region emissions
 - During the November episode only ~30% of the haze is from natural and outside of the region emissions

**Computer Simulations of Hazes
Superimposed On a Gorge Photo
to Show How Much of the August
Haze is Beyond Regional Control**

August 2004 episode at
Mt. Zion (particle light
extinction = 36Mm^{-1})

August 2004 episode with
**only natural and distant
source** contributions to
haze (particle light
extinction = 22Mm^{-1})



**Computer Simulations of Hazes
Superimposed On a Gorge Photo
to Show How Much of the
November Haze is Beyond
Regional Control**

November 2004 episode at
Wishram (particle light
extinction = 190Mm^{-1})

November 2004 episode
at Wishram with **only
natural and distant
source** contributions to
haze (particle light
extinction = 54Mm^{-1})



Conclusions and Observations

1. Gorge Project met its objectives to
 - Monitor and assess haze conditions
 - Develop, evaluate, and demonstrate forecast tools
2. Winter haze episodes offer the best opportunity for future improvement
 - Worst haze conditions
 - Greatest contributions from manmade emission sources
 - Same man-made emissions contribute to haze throughout the year
3. Principal pollutants responsible for haze are sulfate and nitrate PM
 - Secondary pollutants from precursor gases (i.e. sulfur dioxide, nitrogen oxide and ammonia)
 - Emitted by a wide range of sources and activities in the region and beyond
4. Visibility improvement can only be accomplished by emission reductions
 - Controllable emissions are from manmade activities within regional jurisdiction (i.e. all except natural or beyond the U.S.)
 - Focus should be on improving those situations with the worst haze caused by controllable emissions

Conclusions and Observations

5. No simple or single action will provide meaningful reduction in haze
 - No single dominant source or source region is responsible for most of the haze
 - Haze reduction will result from the cumulative effect of numerous emission reduction activities, though each individually may make imperceptible increments
6. Additional technical work would provide more information
 - Continued ambient pollution and haze monitoring in the Gorge would allow us to track trends in haze levels, assess effectiveness of emission controls, and to evaluate and refine modeling
 - Updated emissions inventories and emissions projections would be useful to set priorities and for future model input
 - Air quality modeling could be expanded and repeated, as needed, when assessing priorities and effectiveness of emissions control options
 - Whether, when, and how to accomplish this additional work are beyond the scope of this scientific report
 - Current technical understanding is adequate to initiate policy development