

Project suggestions



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Project suggestions

- Model impacts of emission variability on ozone formation
- Examine regional impacts of varying fate of N_2O_5
- Examine regional impacts of chlorine radical production
- Examine claim that there has been little change in mobile source emissions since 2000

N-S Transect on Battleground road Aug 31.
On Aug 31 & Sep 14 the measurements vary
between 200-2000 kg/h) (upsets, flares?)

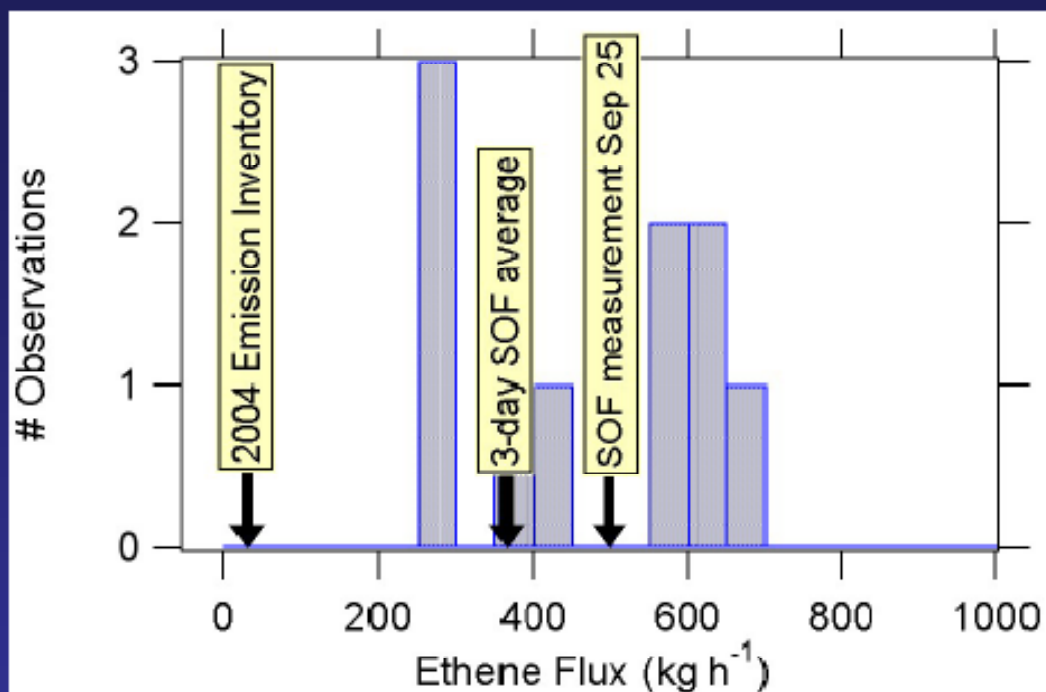


propene 2000 kg/h

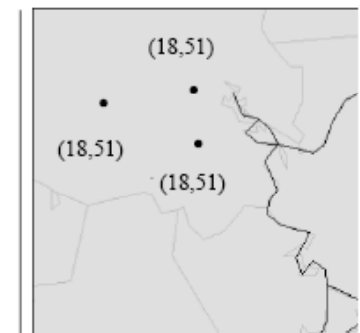
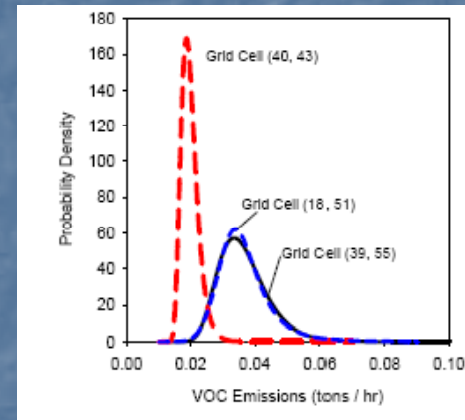
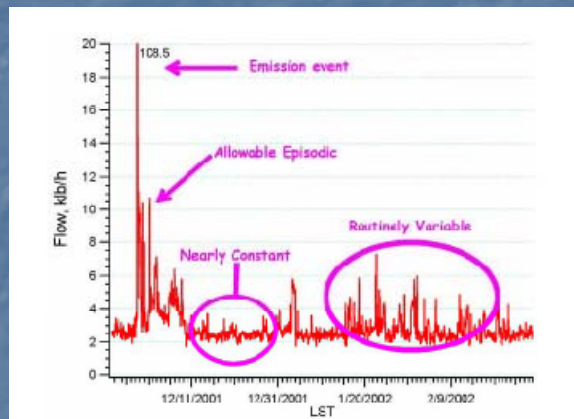


Aircraft data also indicate underestimate of emissions, although concentrations lower than in 2000

Variability in Ethene Fluxes from Mt. Belvieu



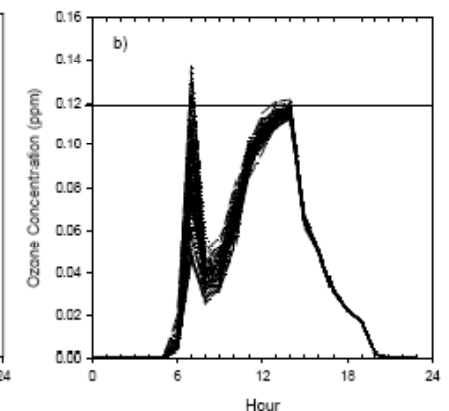
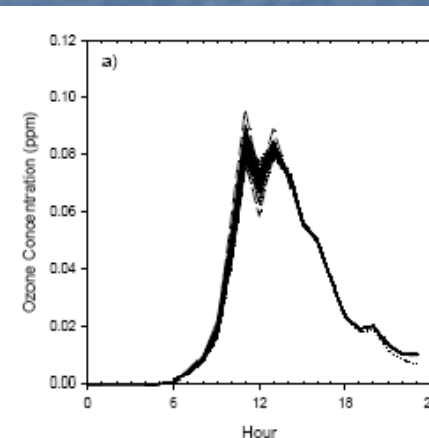
Modeling impacts of variability in flare emissions



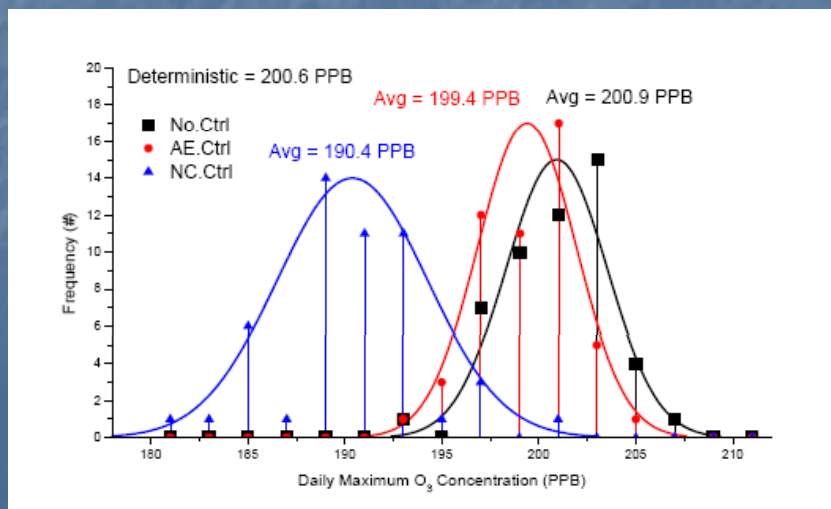
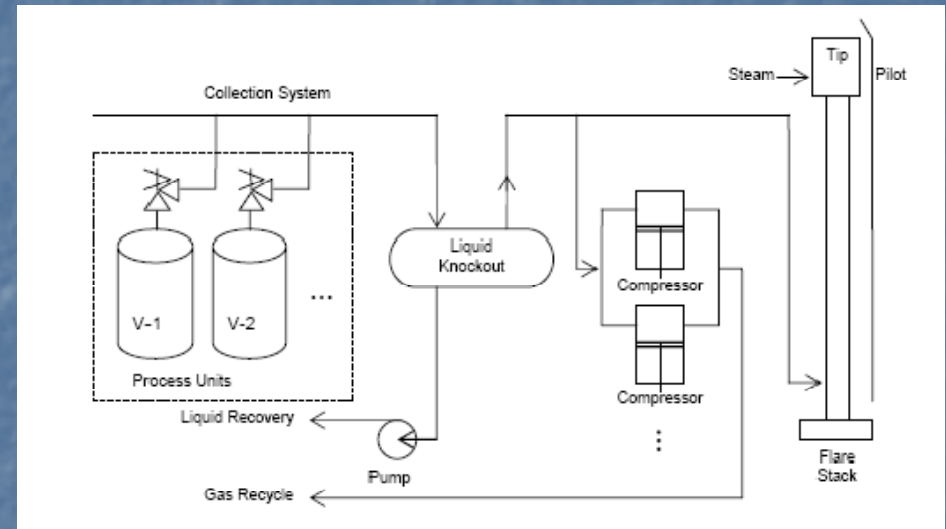
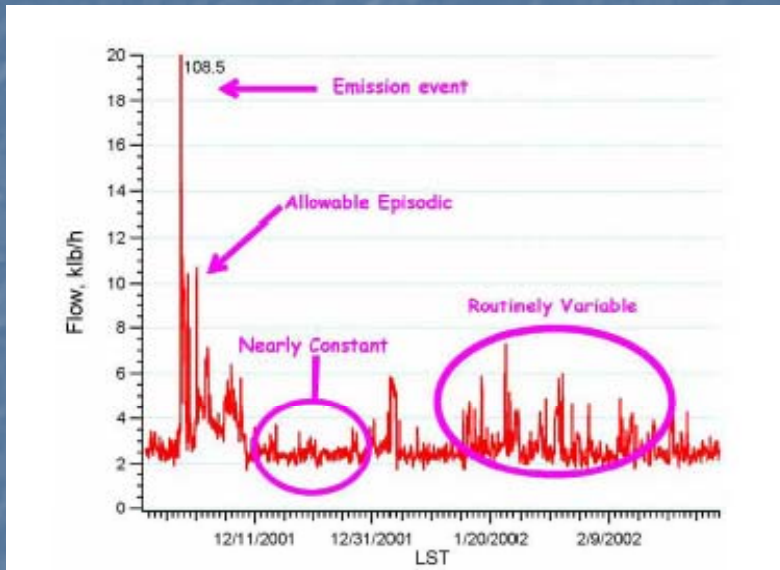
Flare emissions have documented temporal variability

Assign that variability to all flares in the region

Consider a stochastic inventory – 50 distinct daily snapshots considered



Modeling impacts of variability in flare emissions



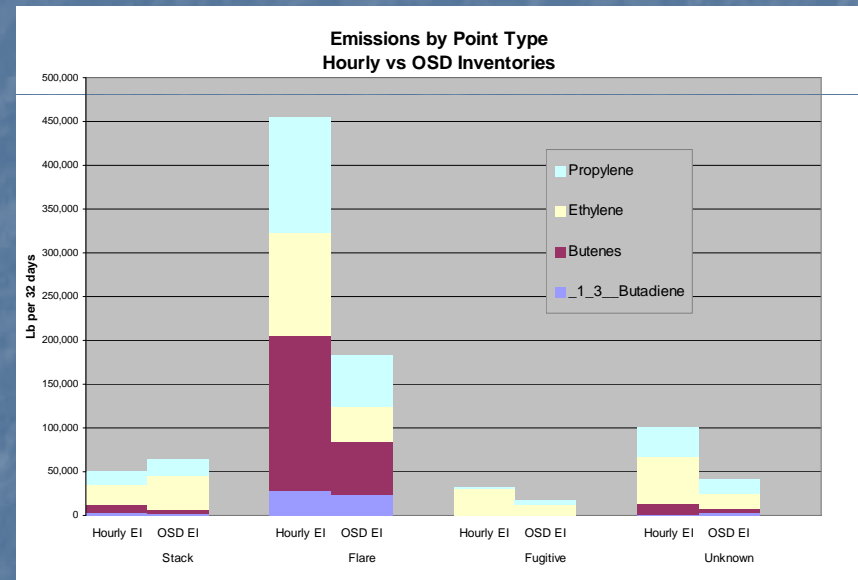
What if flare gases were recompressed and recycled to a fuel gas system?

What if flare gases could be temporarily stored?

Average ozone reduction per ton of emissions reduced is a factor of 5-10 greater than a similar analysis using fixed inventories

Modeling impacts of emission variability

- Use updated hourly inventory to consider impacts of emission variability from flares on ozone formation
- Analyze variability to develop updated predictive models for flare emissions



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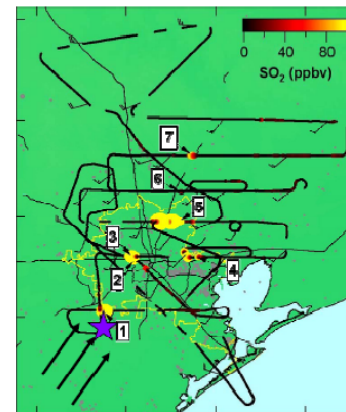
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Chemical processing: P-3 team suggests little N_2O_5 conversion to nitric acid at night

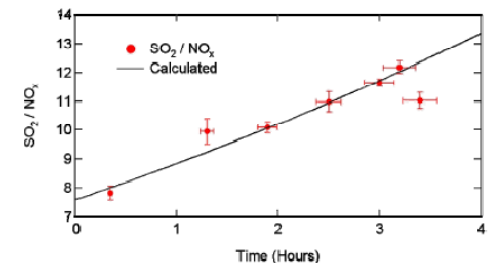
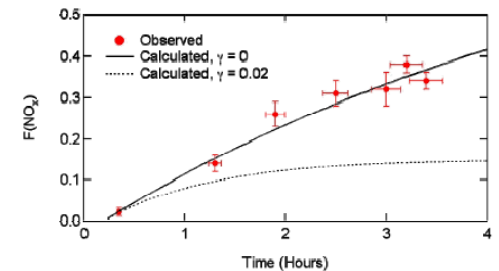
- In current modeling most NO_x is processed overnight, through N_2O_5 to nitric acid, becoming inactive
- If this pathway is less effective than previously thought, more NO_x and radicals may be available at sunrise

NO_x Transport - Parish Plume

$$F(NO_x) = \frac{NO_3 + 2N_2O_5}{NO_2 + NO_3 + 2N_2O_5}$$

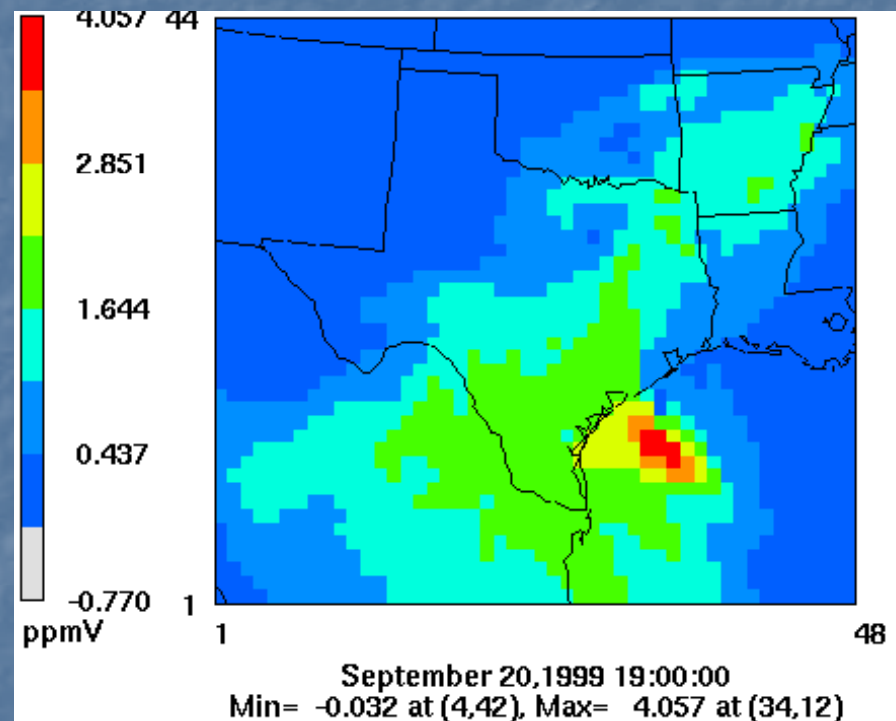


NO_x conserved within this plume
note: Low VOC case



Preliminary analyses of sensitivity to fate of N_2O_5

- Turn off heterogeneous hydrolysis pathway in CMAQ
- Examine differences in ozone concentrations on subsequent day
- Perform more detailed analyses using CAMx

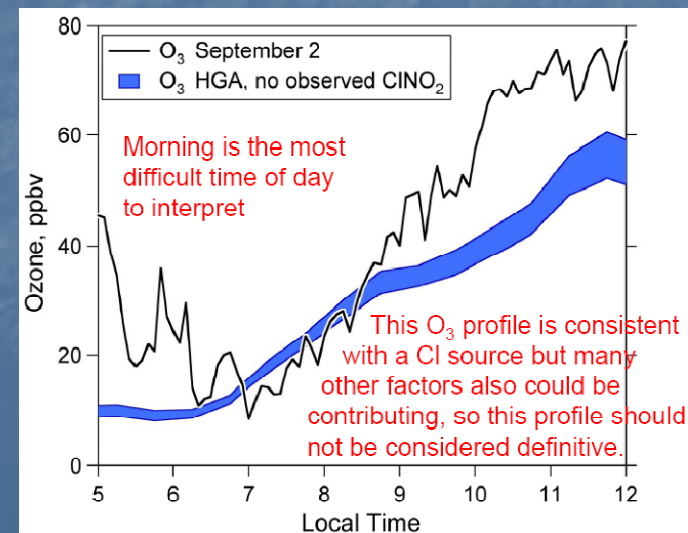
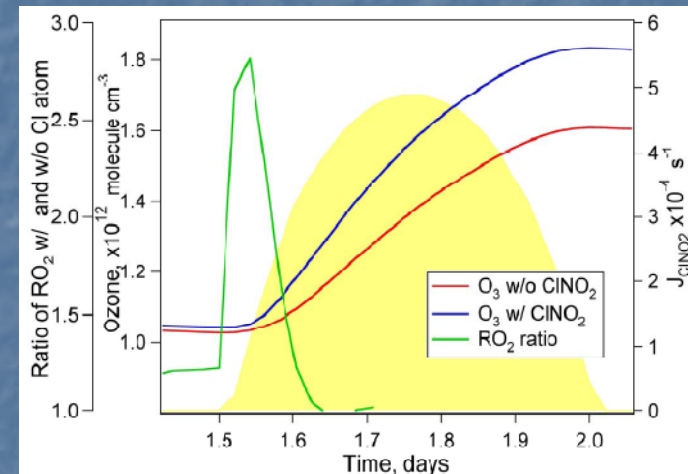


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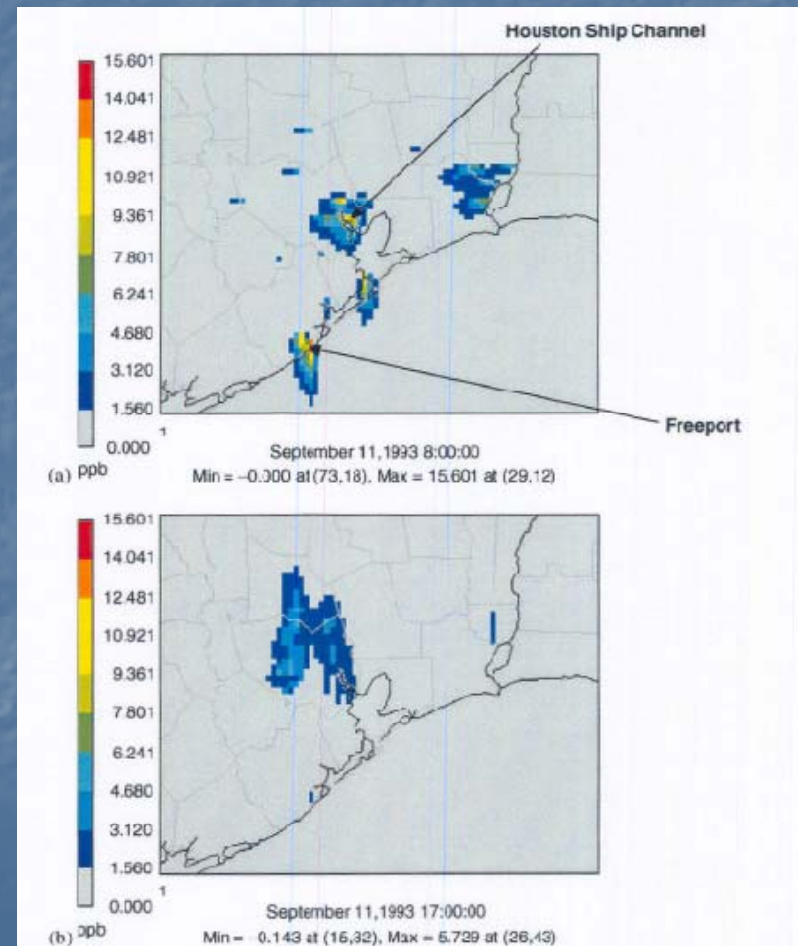
Chemical processing: Ron Brown team detects ClNO₂

- Observed concentrations of up to 1 ppb of ClNO₂
- Formed by reaction of N₂O₅ and a chlorine source (sea salt?)
- Source of free radicals at sunrise
- Not enough Cl to account for molecular markers observed in 2000



What is the impact of an atomic chlorine source on ozone formation?

- Incremental reactivity of chlorine is much higher than HRVOCs
- Can lead to localized ozone hot spots
- Propose using existing modeling framework to examine potential regional impact of ClNO_2



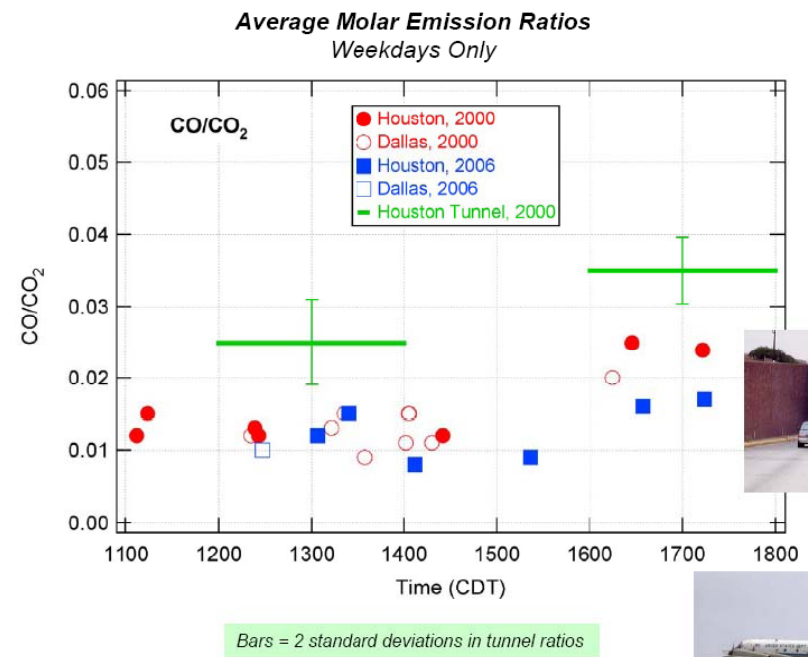
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Mobile and other urban sources

- NOAA reports little difference between fuel based emission factors in 2000 and 2006 – attributed to mobile sources

Mobile Emission Estimates from P-3 and Tunnel Observations



Expand Roadway Study

- Field program currently underway to measure fall-off of pollutant concentrations near 3 types of Texas roadways
- Study will produce CO/CO₂ and NO_x/CO₂ ratios
- Expand analysis to compare MOBILE and MOVES (?) predictions of emissions to concentration ratios and estimates of emissions

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