

Emissions Inventory Studies for Victoria

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Sampling programs conducted in the Victoria area

VOC Canisters

- 2005, 2006, 2007 and 2008
- 1-hour ambient VOC concentrations

Surface mobile sampling

- 2006, 2007, 2008 and 2009
- Continuous ambient concentrations
 - SO₂, ozone, NO_x, methane and total non-methane hydrocarbons (TNMHC)
- VOC canisters (limited number)

Comparisons with EI

Selected data from these sampling projects was used to compare

- **actual emissions based on sampling to**
- **predicted concentrations from modeling using emissions reported in the Emissions Inventory (various versions used depending on specific project).**

Models used

- **Comprehensive Air Quality Model with Extensions (CAMx), photochemical grid model.**
- **Industrial Source Complex (ISC) model, Gaussian plume model.**

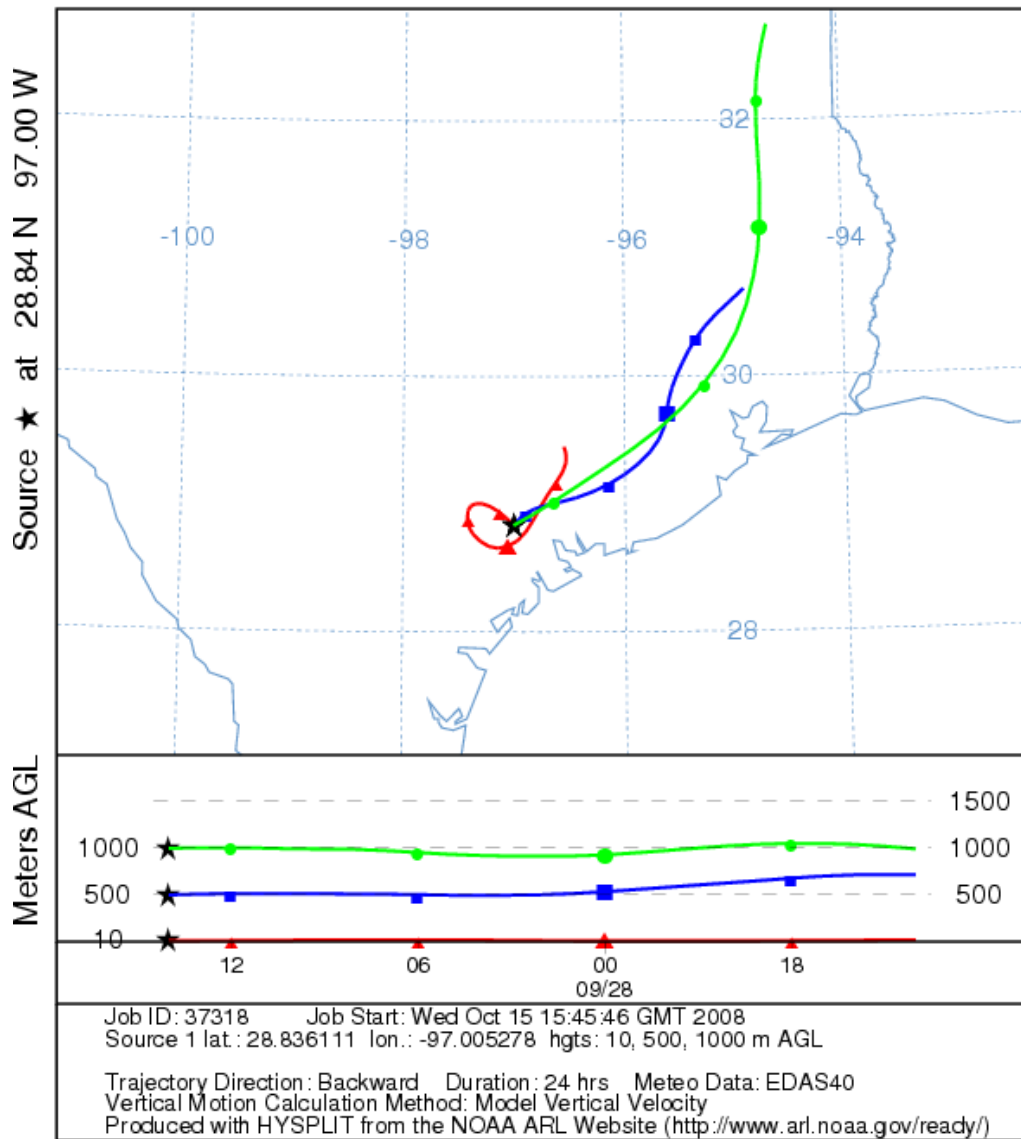
Oil and Gas Production

- VOC canister measured concentrations of ethane, propane, butane and isobutene were higher on September 27, 28, and 29, 2008 than on the other 11 days.

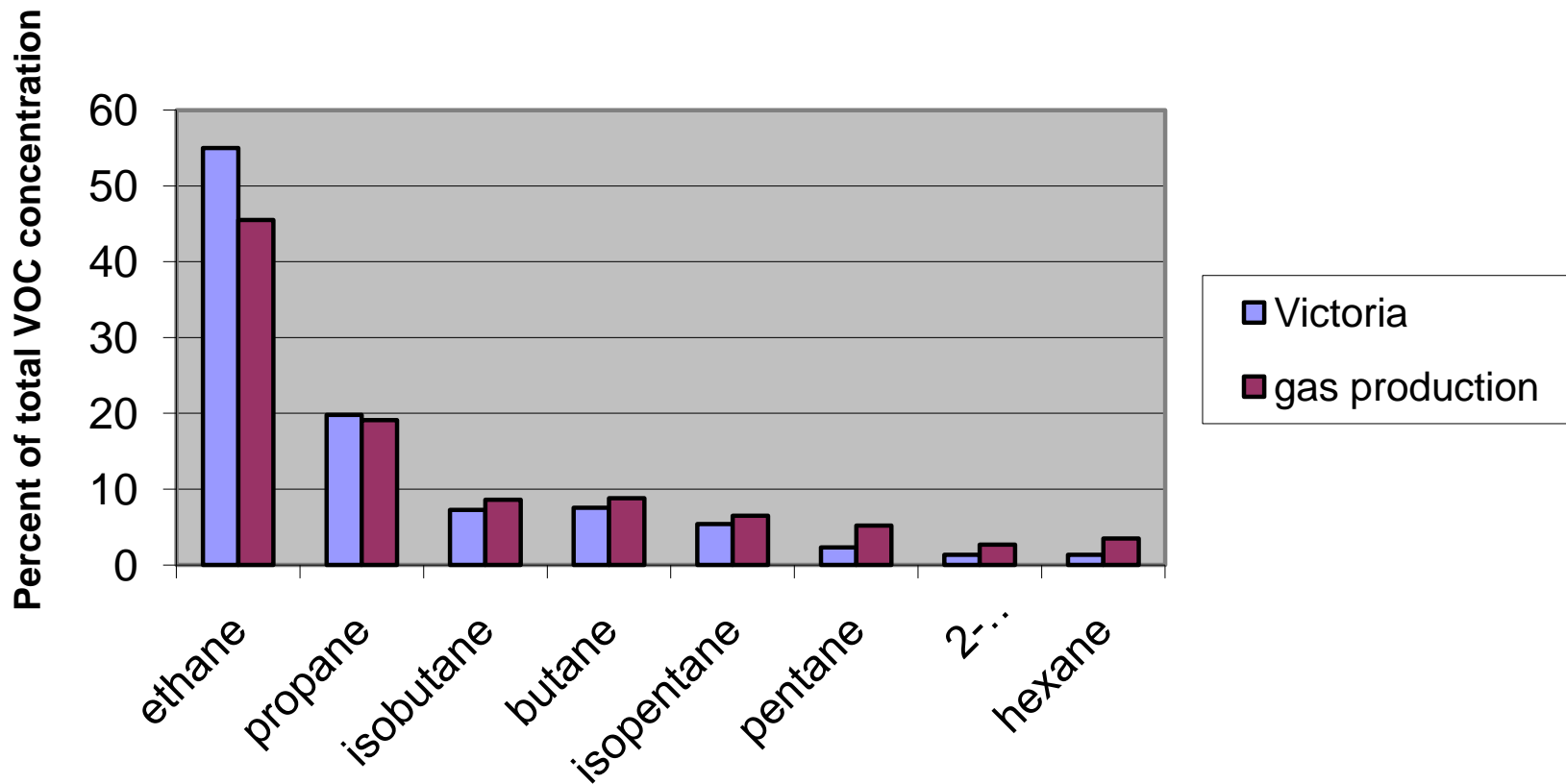
Compound	3 day Average	Normal average
ethane	54.9 ppbV	15.8 ppbV
propane	22.2 ppbV	8.2 ppbV
butane	8.2 ppbV	2.8 ppbV
isobutene	7.3 ppbV	2.1 ppbV

- HYSPLIT trajectories show that the air parcels on these days passed over a gas producing area prior to reaching the sample site.
- Surface mobile monitoring was conducted around this gas producing area on November 5, 2008.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 14 UTC 28 Sep 08
 EDAS Meteorological Data



**Comparison between VOC Canister Samples:
Average of Samples at Memorial Square Park
Sep 27, 28 and 29
to
Gas Field Production on Nov 5**



Oil and Gas Production

Finding 1.

Oil and gas production can make a significant contributions to the VOC concentrations measured in the Victoria urban area.

Gas Treating Plant

- **The emissions from the Enterprise Gas Treating Plant located in DeWitt County were evaluated by comparing the concentrations measured during mobile sampling with those predicted with the ISC model.**
- **The emissions inventory was obtained from the TCEQ.**
- **Measurements were made during mobile sampling at three locations downwind of the plant**
 - **50 meters**
 - **300 meters**
 - **1500 meters**
- **Modeling conducted using meteorological conditions observed during the measurements**

Gas Treating Plant

Finding 2.

The actual NO_x emissions from the gas treating plant are somewhat larger by a factor of 1.6 than the emissions reported in the EI, but due to the uncertainty in the modeling, it is likely that these emissions are correctly reported in the EI.

Finding 3.

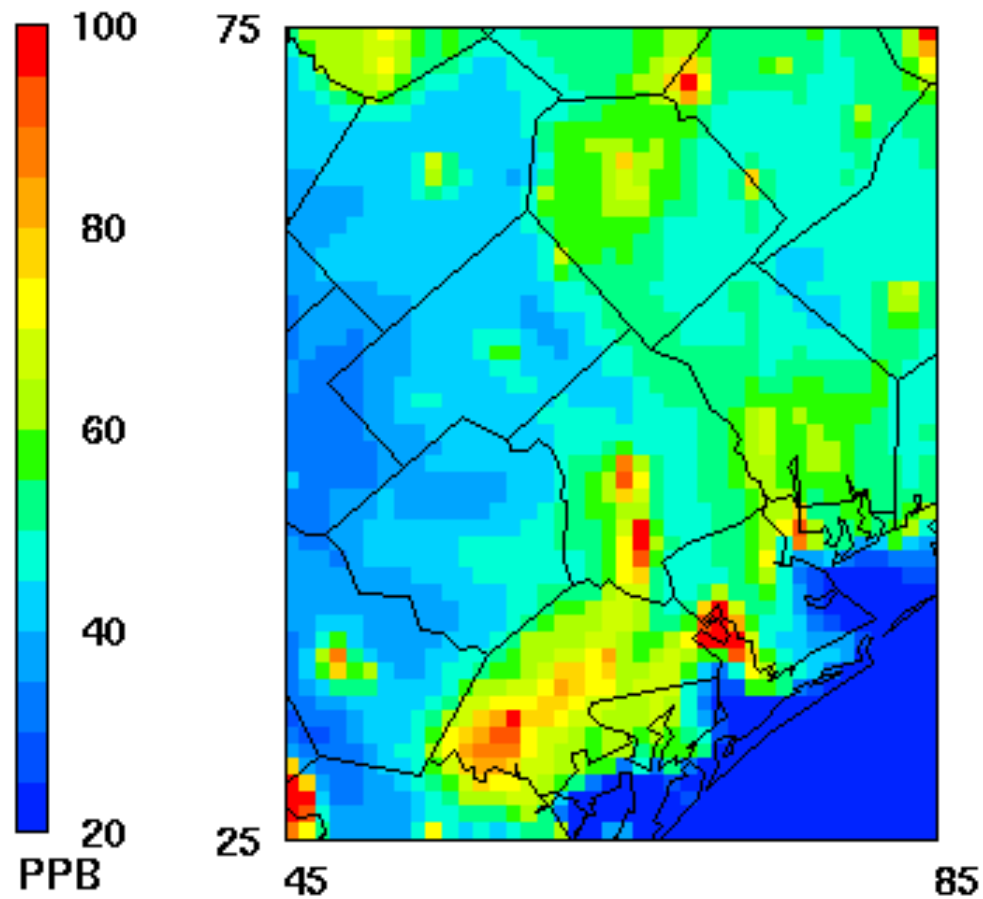
The actual total VOC emissions from the gas treating plant are much larger by a factor of approximately 100 than the emissions reported in the EI.

Chemical Plants

- **The TNMHC concentrations measured while mobile sampling near the Dow and Invista Chemical Plants were compared to the VOC concentrations maps generated by CAMx.**
- **For the Dow Chemical plant the ratios of the observed to modeled concentrations ranged from 0.96 to 1.71 with an average of 1.27.**
- **For the Invista Chemical plant the ratios of the observed to modeled concentrations ranged from 0.58 to 1.44 with an average of 0.89.**

1-hr Average VOC Conc.

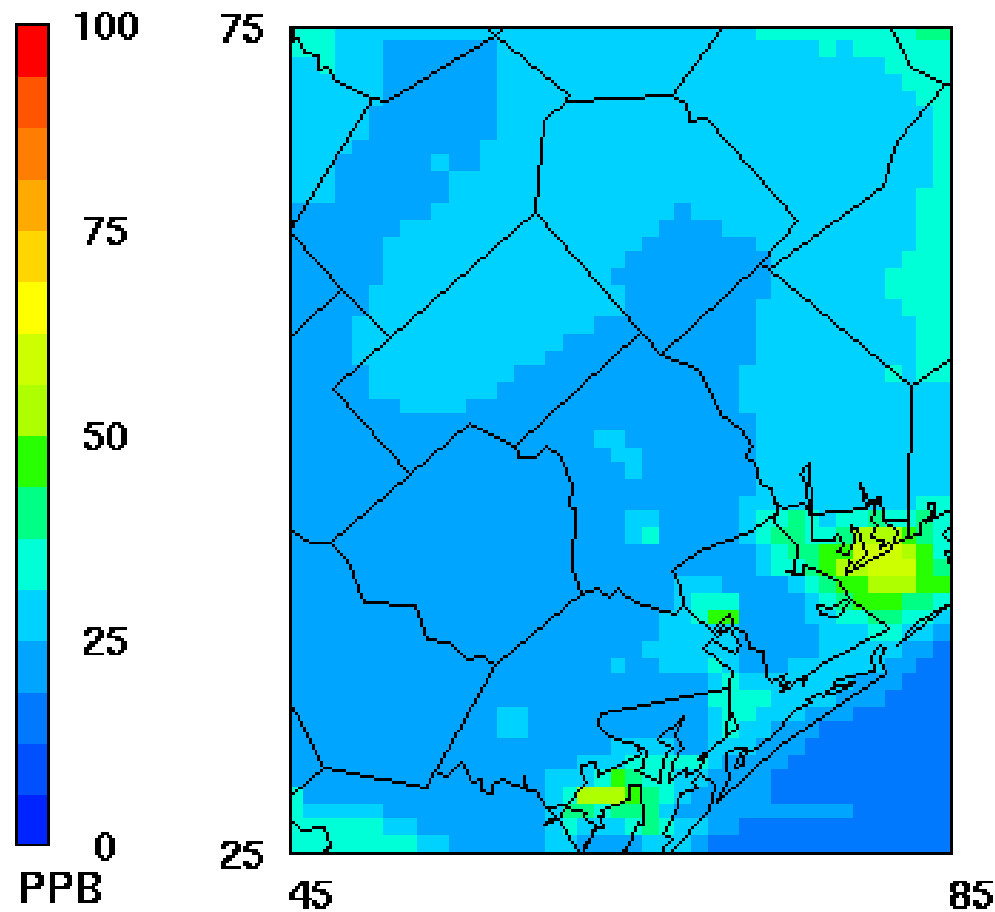
September 19, 2007



September 19, 1999 7:00:00
Min= 14 at (80,30), Max= 327 at (45,28)

1-hr Average VOC Conc.

September 18, 2007



September 18, 1999 18:00:00
Min= 16 at (85,25), Max= 60 at (81,43)

Chemical Plants

Finding 4.

It is likely that the actual total VOC emissions from the Dow and Invista/Dupont chemical plants are correctly reported in the EI.

Urban Areas

- **10 sets of TNMHC concentrations measured while mobile sampling in urban area were compared to the VOC concentration maps generated by CAMx.**
- **In the Victoria urban area the ratios of observed to modeled TNMHC concentrations ranged from 0.63 to 2.36 with an average ratio of 1.14**
- **In Cuero the ratios of the observed to modeled TNMHC concentrations ranged from 0.52 to 1.75 with an average of 0.86**

Urban Areas

- In Hallettsville the ratios of the observed to modeled TNMHC concentrations ranged from 1.88 to 2.34 with an average of 2.11.
- In Luling the ratios of the observed to modeled TNMHC concentrations ranged from 0.56 to 1.81 with an average of 1.01.
- In Yoakum the ratios of the observed to modeled TNMHC concentrations ranged from 0.16 to 2.11 with an average of 0.83 .

Urban Areas

- **Hallettsville is located very close to a number of oil and gas production sites and gas processing plants.**
- **Since the other urban areas have ratios that indicate that the reported total VOC emissions are likely the same as the estimates of total VOC in the EI, it very likely that the actual oil and gas production emissions in the Hallettsville are greater than the total VOC emissions reported in the EI.**

Urban Areas

Finding 5.

It is likely that the actual total VOC emissions from the Victoria, Cuero, Luling and Yoakum urban areas are correctly reported in the EI.

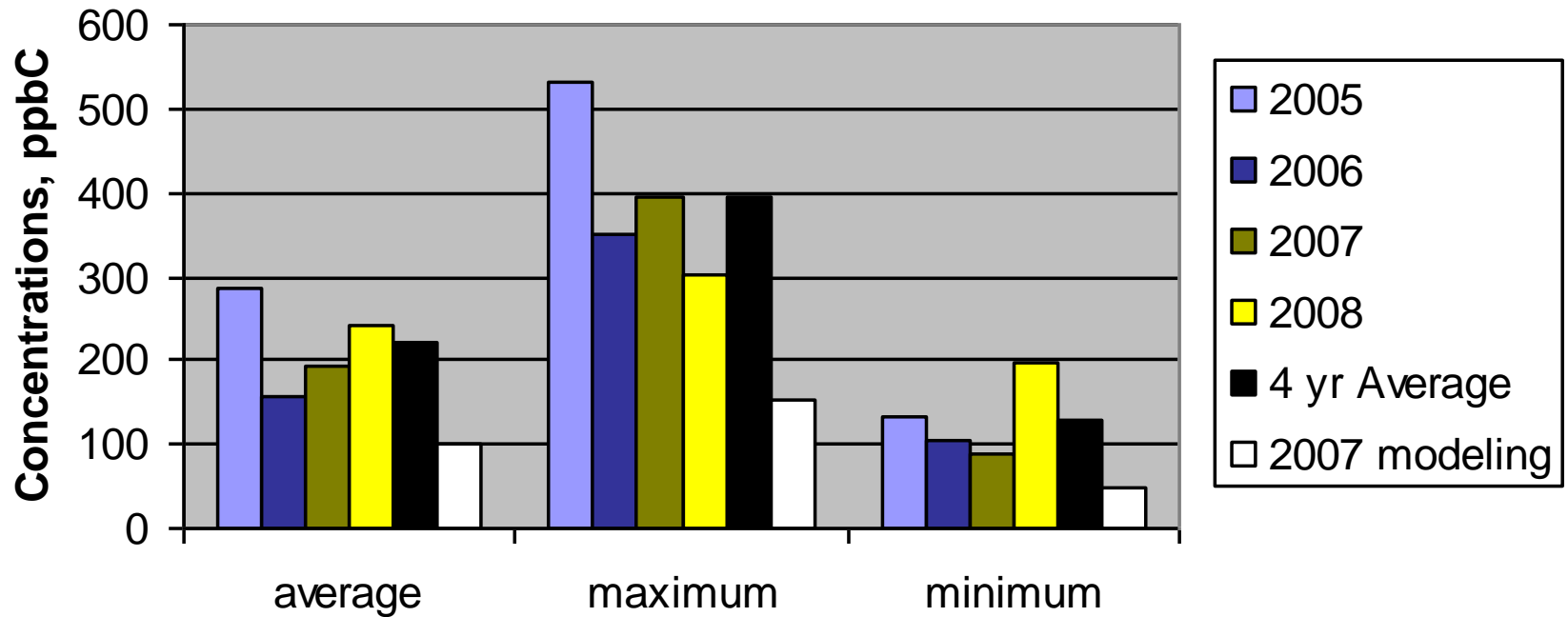
Finding 6.

It is likely that the actual total VOC emissions from oil and gas production are greater than the total VOC emissions reported in the EI.

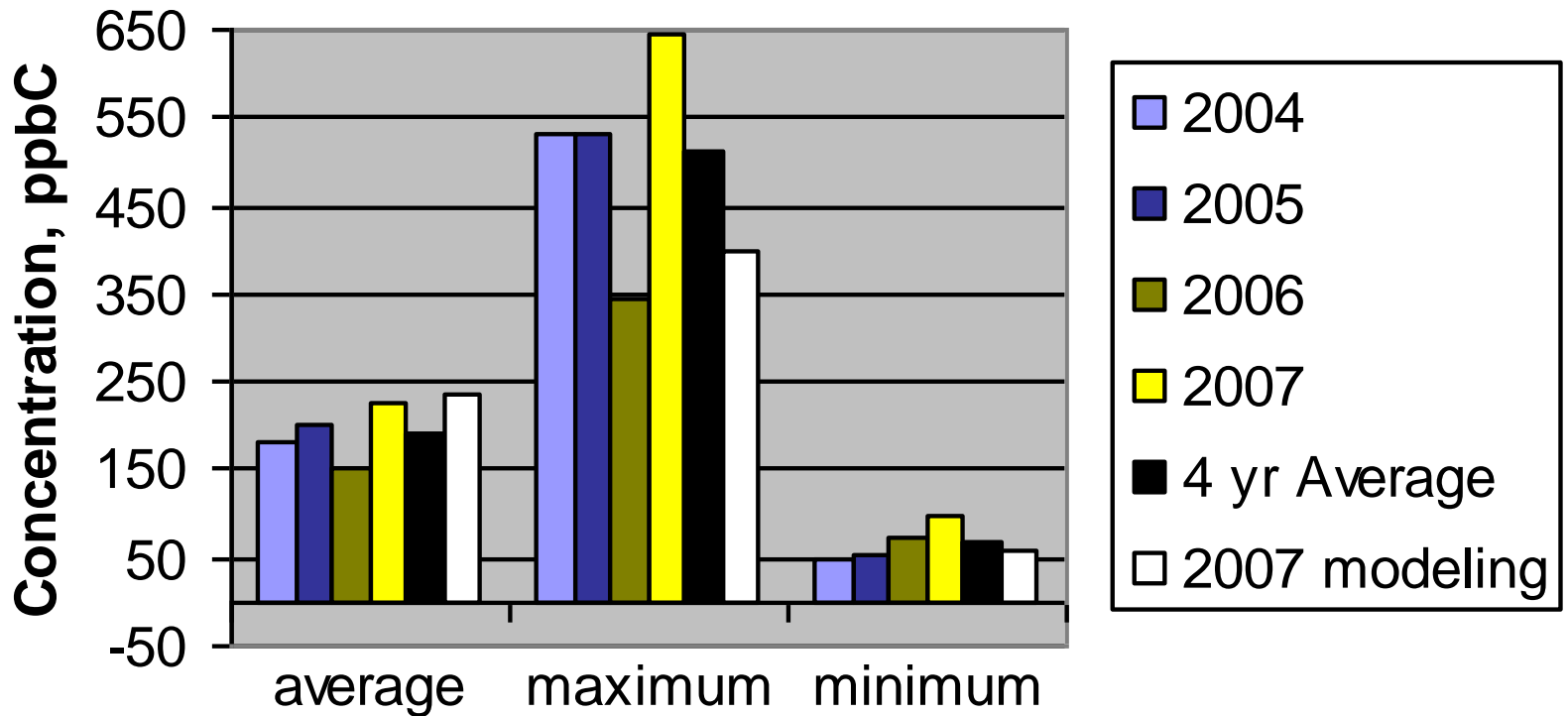
Urban Areas

- **CAMx modeling in Austin and Victoria was performed using the 1999 NEI projected to 2007.**
- **Total VOC concentrations from the CAMx modeling in Austin and Victoria were compared to the total VOC concentrations obtained from the canister sample results.**

Total measured VOC concentrations compared to total modeled VOC concentrations in Victoria



Total measured VOC concentrations compared to total modeled VOC concentrations in Austin



Urban Areas

Austin urban area emission sources

- **mobile and area sources**

From the VOC canister data it is likely that the actual total VOC emissions in the Austin area are correctly reported.

Victoria urban area emissions sources

- **mobile and area emissions sources**
 - **If the mobile and area source total VOC emissions are likely correctly reported in Austin, they are likely correctly reported in Victoria**
- **three chemical plants**
 - **Finding 4 indicates that the total VOC emissions from the chemical plants in the Victoria area appear to be correctly reported**
- **large areas of oil and gas production**

Urban Areas

- **From the VOC canister data it is likely that the actual total VOC emissions in Victoria area are greater by a factor of 2.2 than the reported total VOC emissions**
- **Hypothesis**
In Victoria the difference between the reported total VOC emissions and the actual total VOC emissions may be due to larger actual total VOC emissions from oil and gas production than are reported.

Urban Areas

Finding 7.

It is likely that the total VOC emissions in the Victoria area are correctly reported in the EI except that the actual oil and gas production total VOC emissions are much greater than those reported in the EI.

Gasoline Service Stations

- While conducting mobile sampling in the Victoria area, TNMHC concentrations were measured while passing a number of gasoline service stations
- TNMHC concentrations ranged from 20 ppbC to 5,503 ppbC.
- The average TNMHC concentration in Gonzales was 285 ppbC, which decreased to 141 ppbC when the single outlier concentration of 1,584 ppbC was not included.
- The average TNMHC concentration in Victoria was 771 ppbC
which decreased to 180 ppbC when the single outlier concentration of 5,503 ppbC was not included

Gasoline Service Stations

Based on the mobile monitoring:

Finding 8.

Gasoline service stations contribute a significant amount of total VOC emissions, but these emissions vary in time and space.

Questions?