Discrepancies in reported and measured industrial VOC emissions, implications for tropospheric ozone

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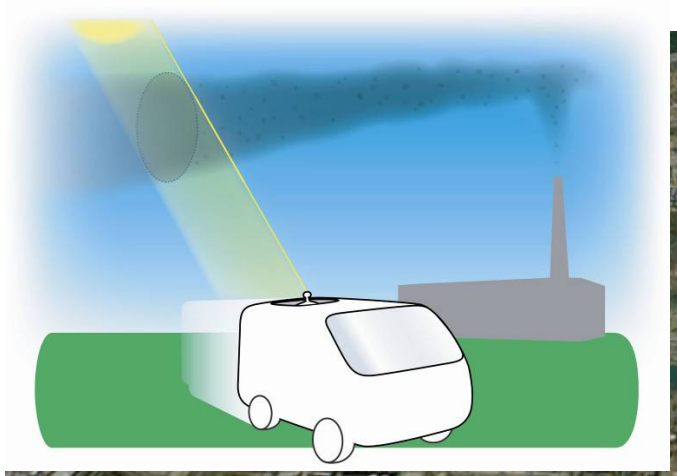
- Measurements show that global industrial VOC emissions are an order of magnitude higher than reported
- Why is this not being picked in atmospheric background measurements and modelling?
- Likely the same problem with methane production.
- Modelling shows that this has impact on local and regional ozone production (
- Also important for climate and potentially for SOA formation

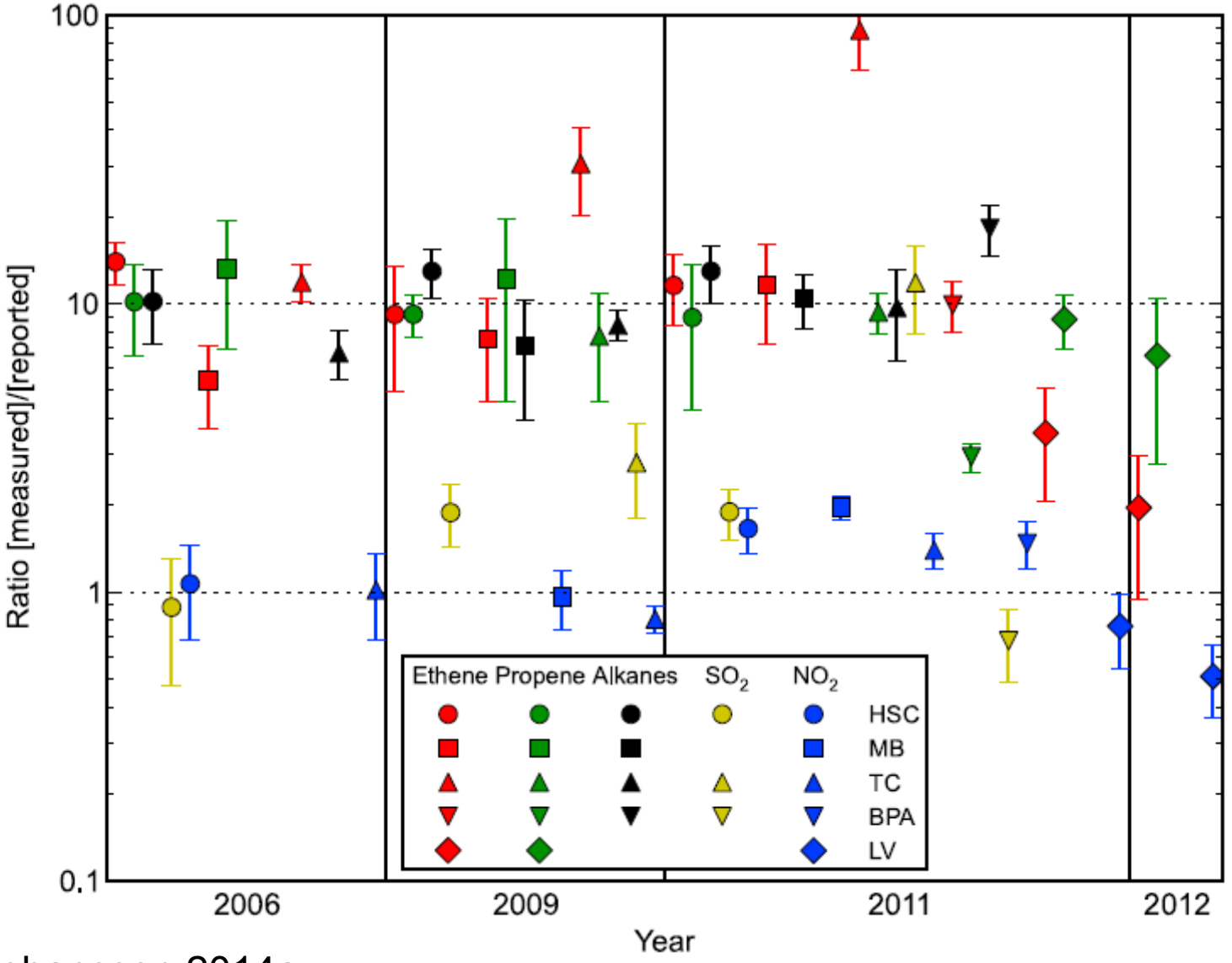
Method

SOF measurement of alkanes downwind a refinery



VOCs: **Alkanes** (80-90%), **Aromatics** (5-15%) and **Alkenes** (0-5%)

Optical measurements Texas



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Measured emissions versus reported

Source region	Species	SOF (kg/h)*	Inventory (kg/h)	Factor
Houston ship channel 2011	Ethene Propene Alkanes SO2 NO2	610 560 11600 2330 1830	74 77 85 1970 1300	8.3 7.3 13.6 1.2 1.4
Rotterdam 2008 (total)	Alkanes	5553	1265	4.4
Le Havre 2008 (total)	Alkanes	4407	1048	4.2
Antwerpen 2010 (total)	Alkanes	5510	715	7.7
California, Bay Area (total)	*Alkanes*			
Middle east	*Alkanes*			*>5*
China	*Alkanes*			*>5*

*Data obtained by J. Mellqvist, J. Samuelsson, B. Offerle, J. Johansson, S. Brohede, P. Andersson and H. Salberg

If VOC emissions from industries are increased by 5, what is the modelled effect on ground ozone mean concentration using the EMEP model, (D. Simpson)?

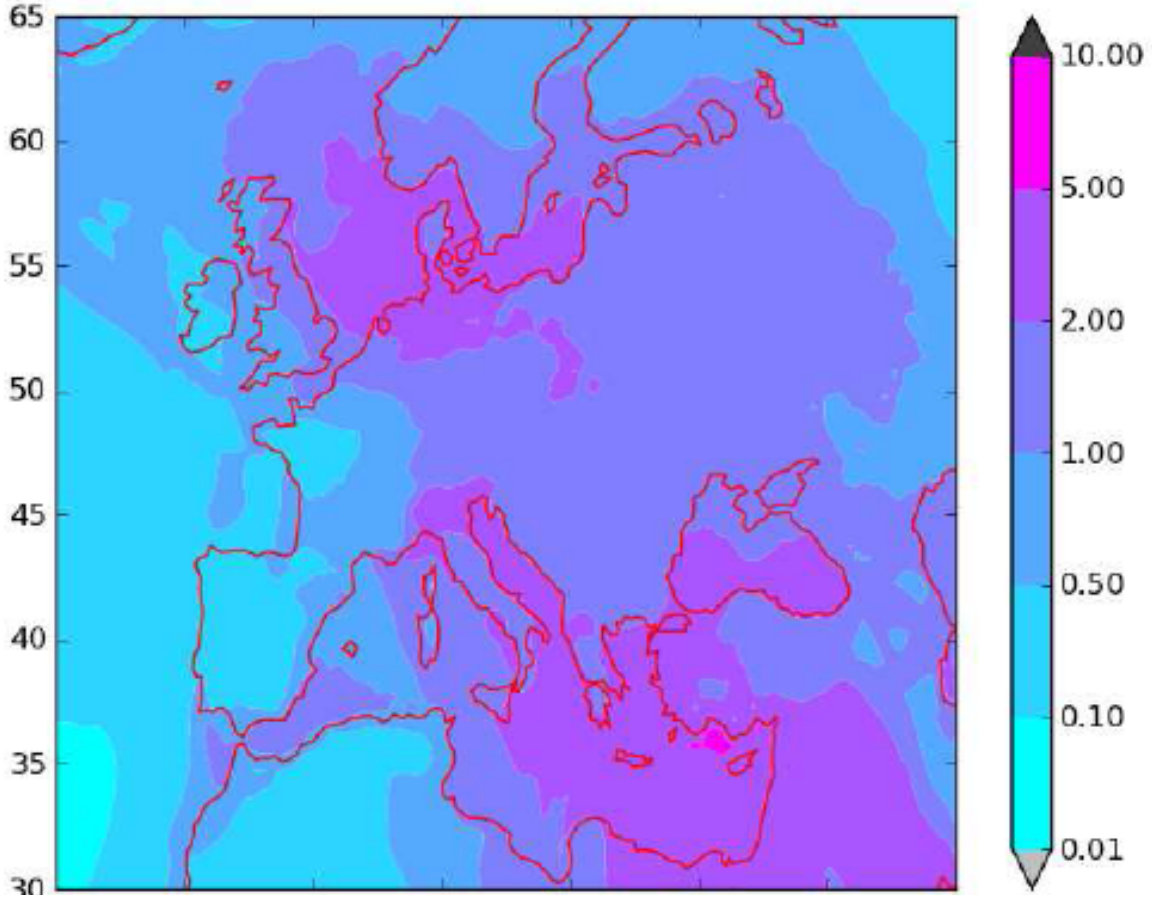

Figure 1: Change in (top) mean of daily maximum, and (bottom) mean O_3 concentrations (ppb), with factor 5 increase in SNAP4+5 NMVOC emissions. Calculations for July 2009, EMEP MSC-W model (7 km TNO emission grid).

References

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- Johansson, J., Johan Mellqvist, Jerker Samuelsson, Brian Offerle, Jana Moldanova , Bernhard Rappenglück, Barry Lefer, and James Flynn (2014) , Formaldehyde Quantitative Measurements and Modeling of Industrial Formaldehyde Emissions in the Greater Houston Area during Campaigns in 2009 and 2011, Journal of Geophysical Research: Atmospheres, 119, DOI: 10.1002/2013JD020159
- Johansson, J. K. E., J. Mellqvist, J. Samuelsson, B. Offerle, B. Lefer, B. Rappenglück, J. Flynn, and G. Yarwood(2014), Emission measurements of alkenes, alkanes, SO2, and NO2 from stationary sources in Southeast Texas over a 5 year period using SOF and mobile DOAS, J. Geophys. Res. Atmos., 119, doi:10.1002/2013JD020485.