



Evaluation and Improvement of Energy Sector Emissions

SUMMARY

Many kinds of **top-down approaches** were developed

Speaker	Methodology	Species	Emission sources
Gabrielle Pétron	Field measurements	CH ₄ , NMVOC	oil & natural gas operation (USA)
Johan Mellqvist	Remote sensing	NMVOCs	fugitive emissions (USA etc.)
Hugo Denier van Der Gon	Bottom-up, OMI satellite	SO ₂	LPSs (Europe)
Nicolas Huneeus	Assimilation (MODIS)	aerosols	(global)
J. Brioude	Flux ratio inversion method	CO ₂	(Houston)
Dominik Brunner	KF with FLEXPART	methylbromide	Agriculture (Europe)
Manvendra K. Dubey	Multi-scale Measure. and Modeling	CO ₂ and Pollutant	Power plant (USA)

These top-down approaches are useful tools for verification and improvements of emission inventories for different emissions sources and different chemical species in the energy sector and others.

Sectors, scale, pollutants, methods

- Oil and gas industry (CH₄, NMVOC);
direct and indirect measurements
- Power plants (SO₂, NO_x, CO₂);
ground measurements, remote sensing, forward and inverse modeling
- Global aerosols; assimilation of AOD measurements
- Regional CO₂;
flux ratio inversion method using co-emitted species inventories
- Hourly-regional-local-building scale CO₂;
bottom-up and process based models
- Chemical industry-agriculture (Halocarbons);
regional inversion model

Key Findings - Conclusions

- Bottom-up inventories underestimate significantly fugitive emissions from oil and gas industry; modeling community responded while regulators work on it
- Bottom-up EI knowledge and remote sensing... a 'winning team' to validate inventory, efficiency of measures and policies
 - Adding modeling tools to the 'team' allows to assess a wider range of pollutants and extend analysis from regional to global scale
- Existing tools allow for fine spatial and temporal resolution of species helping to design and evaluate policies at different scales: from regional, national to large point sources or even buildings
- Inverse methods confirm strong reduction of selected halocarbons emissions over Europe but also identifies possible non-compliance

Contribution to the 'Town Hall' discussion

○ LIMITATIONS

- Outdated emission factors/methods still often used
- Uncertainty not always stated/assessed
- Spatial distribution often inaccurate
- Limited use of top-down method in developing countries

○ INNOVATION

- Validation capability improves via combination of assessment methods and often allows for near real-time assessment and feedback to policy
- Fine scale applications and use of micro-scale socioeconomic data

○ EMERGING ISSUES

- Validation of trends and absolute values more important than ever
- How to communicate evaluation results to regulators?
- Improving temporal and spatial resolution
- Increasing importance of 'new' sources expected
- Increase use of top-down approaches in developing countries