

Sources and Sinks Working Group

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What Are the Fluxes to and from the Atmosphere?



Ongoing Needs and Research Activities

- **Improve and update bottom-up emission inventories (global, regional, sectoral, species-dependant)**
- **Top-down constraints to evaluate and improve bottom-up inventories
parameterizations of natural processes**
- **Develop representation of sinks**

Sources and Sinks Science Updates (v9-01-02)

Description	Contact
GEIA Hg anthropogenic emissions	Bess Corbitt (Harvard) Noelle Selin (MIT)
Modified Hg(II) emissions in plumes	Helen Amos (Harvard)
Update to GFED3 biomass burning	Prasad Kasibhatla (Duke)
RETRO Anthropogenic VOCs emissions	Dylan Millet (UMN)
Added seasonality to Streets NH ₃ emissions over Asia	Jenny Fisher (Harvard)
Aerosol deposition to snow/ice	Jenny Fisher (Harvard)

Sources and Sinks Science Updates (v9-01-03)

Description	Contact
Updated ocean source and sink of acetone	Emily Fischer (Harvard)
Complete shift of biogenic VOC emissions from GEIA to MEGAN; retire GEIA	Dylan Millet
OVOC's dry deposition	Jingqiu Mao (NOAA/GFDL)
Historical emission inventories of SO ₂ , NO _x , BC, and POA	Eric Leibensperger (SUNY Plattsburgh)
PARANOX model for evolution of ship exhaust plumes	Geert Vinken (Eindhoven)
Improved snow scavenging and washout parameterization	Qiaoqiao Wang (Harvard)
Refined distribution of the lightning NO _x source	Lee Murray (Harvard)
MAP_A2A algorithm to regrid emissions on the fly	Prasad Kasibhatla (Duke) Matt Cooper (Dalhousie)
Anthropogenic NO _x scaling factors from OMI	Lok Lamsal (NASA) Matt Cooper (Dalhousie)

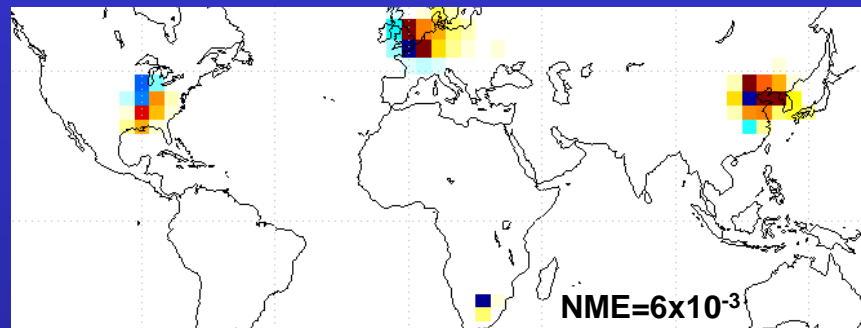
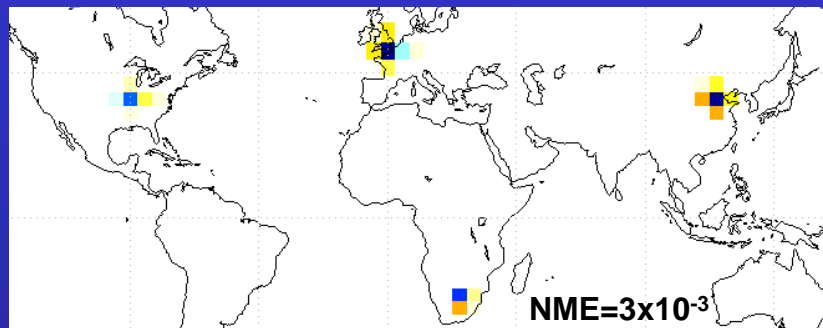
Adjoint Reduces Inversion Error vs Mass Balance

Test to Recover 30% Increased NO_x Emissions in Four Locations Using a Week of Synthetic Observations of NO_2 Columns

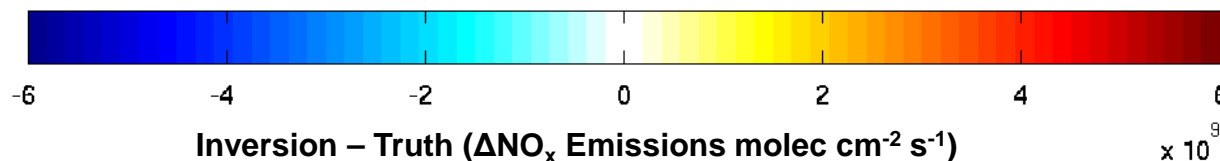
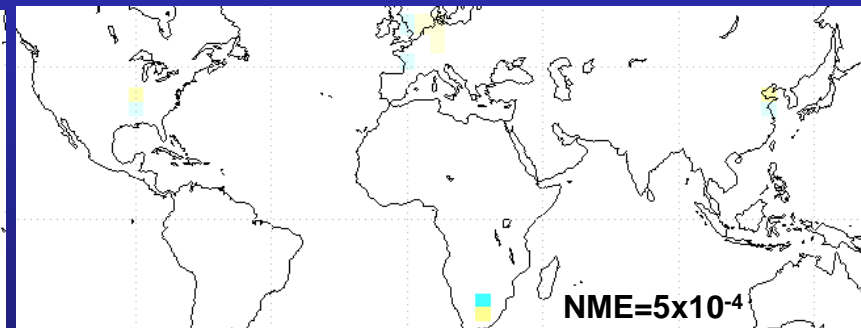
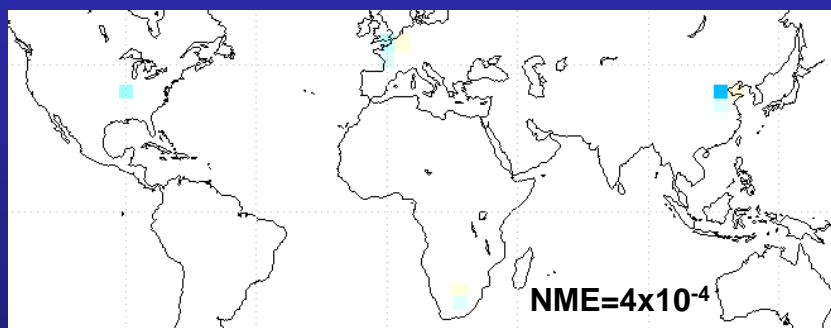
July

November

Mass Balance



Adjoint



NME = Normalized Mean Error

Padmanabhan et al., in prep

Future Challenges

- Updating emission inventories (grass-roots, multiple people involved, updates driven by research priorities)
- Temporal allocation of emissions (may be more important at higher resolution)
- Robust top-down estimates
- Integration of top-down and bottom-up
- Sinks!

Future Leaders

Qiang Zhang, Tsinghua University

extensive bottom-up experience, and integration with top-down

Jintai Lin, Peking University

developing novel methods for top-down inversions

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- **Integration of top-down and bottom-up**
- **Sinks!**