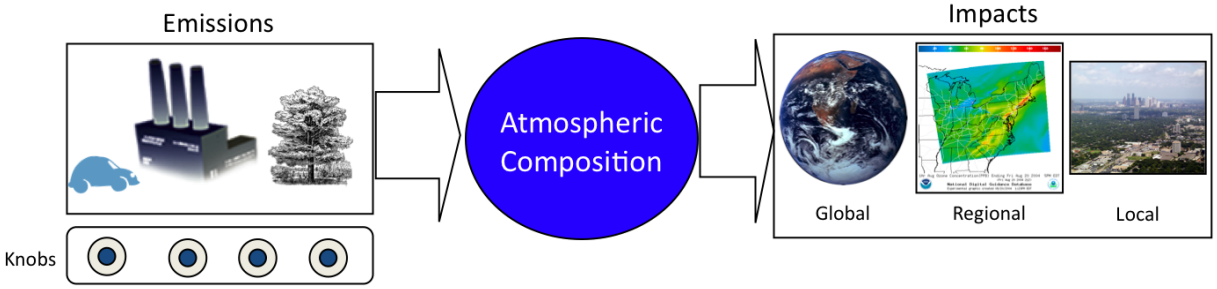
Improving emissions understanding

Greg Frost

Why understand emissions? **Actions about the atmosphere focus on emissions.**



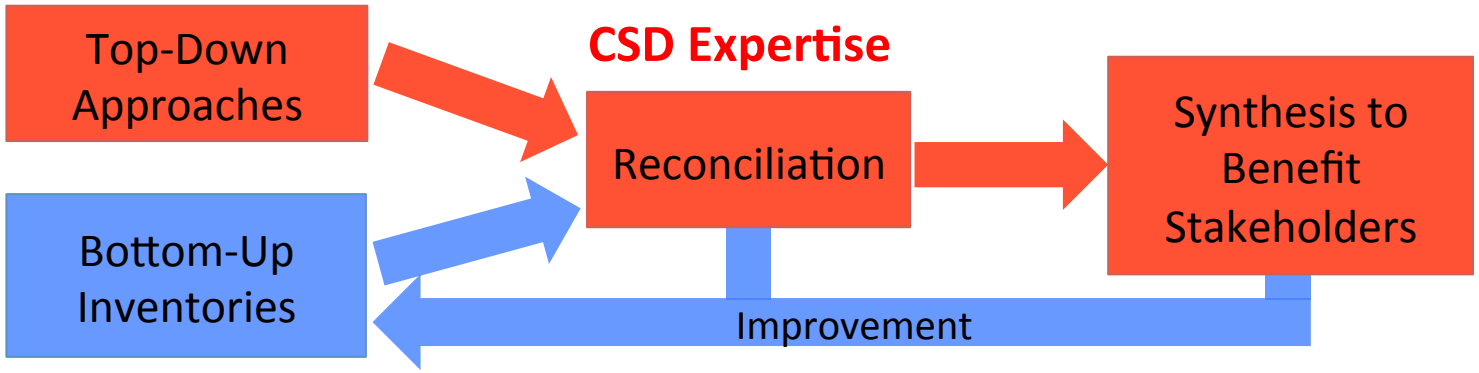
This is the Century of Accountability.

Emission inventories are inherently uncertain, but these uncertainties are difficult to quantify.

X±? ton/yr

G. J. Frost et al., Atmos. Environ., 2012 & 2013

CSD improves the scientific basis for emissions, benefitting many stakeholders.



CSD's Top-Down Approach to Emissions Understanding

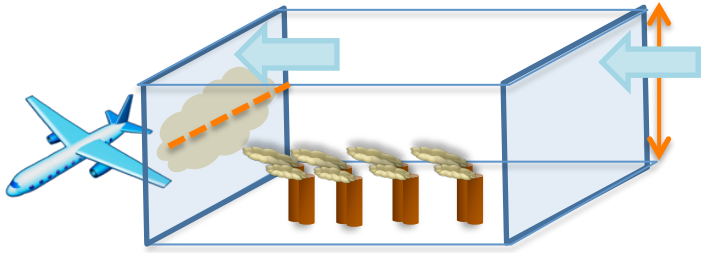
CSD improves the scientific basis for emissions information.

How we do it

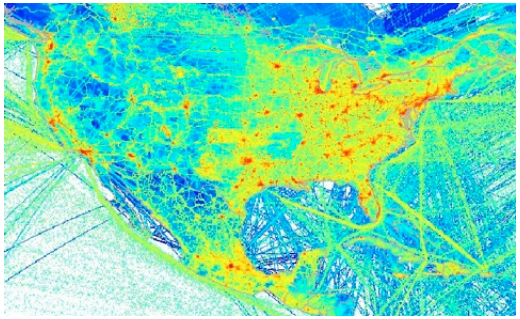
- Observations of atmospheric abundance
- Models as transfer standard: abundance ⇔ emissions
- Reconciliation with bottom-up inventories
- Quantifiable uncertainties
- Different methods → same answer
- Pollutants relevant to air quality & climate

What we determine

Total emissions



Spatial mapping



Temporal variation

Sector partitioning

Example of CSD's Top-Down Approach

CSD determined weekday & weekend emissions in the Los Angeles Basin.

CSD aircraft observations

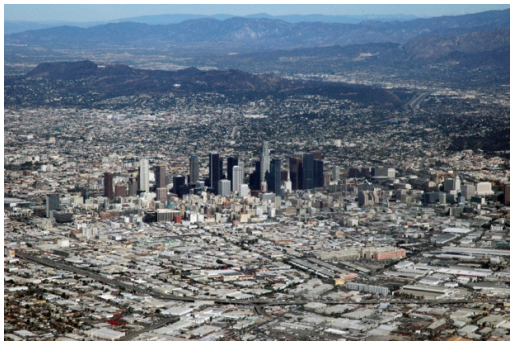
- Measured NO_x, CO, & CO_2
- Saw different weekend vs. weekday NO_x

CSD inverse model

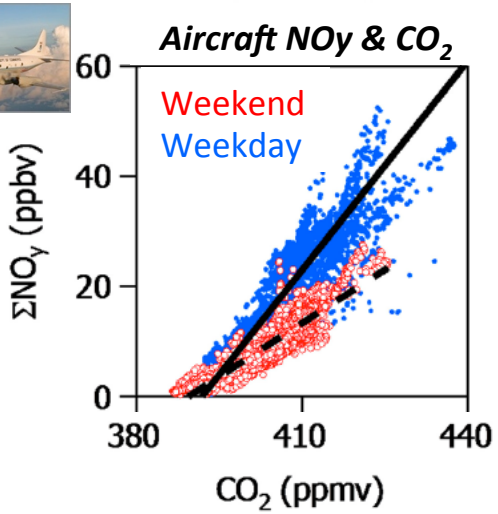
- Driven by aircraft data
- Derived weekday & weekend emissions
- Compared to bottom-up inventories

What did we learn & why do we care?

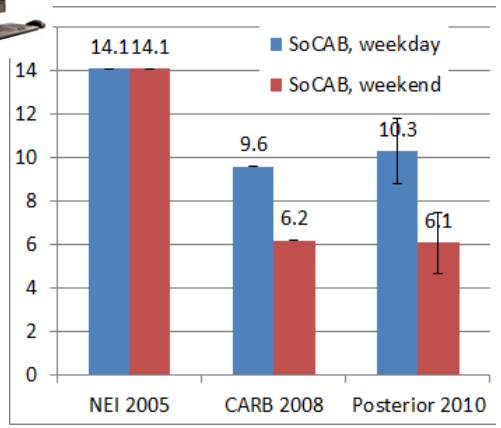
1. Quantified weekday & weekend NO_x, CO, & CO_2 emissions in LA Basin
2. Weekends: fewer heavy-duty diesel vehicles → lower NO_x, higher O_3
3. CSD science = objective test of regulatory data



CalNex 2010



I. Pollack et al., JGR, 2012



J. Brioude et al., ACP, 2013

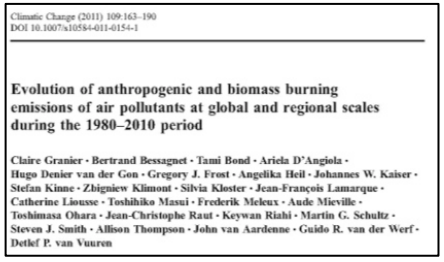
CSD Provides Benefits to Emissions Stakeholders

CSD synthesizes and conveys emissions science for the benefit of stakeholders.

Some of CSD's emissions stakeholders

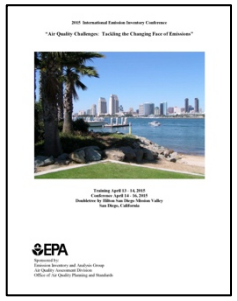
How CSD reaches stakeholders

- Journals
- Conferences
- Assessments
- Direct outreach


Climatic Change (2011) 109:163–190
DOI 10.1007/s10584-011-0154-1

Evolution of anthropogenic and biomass burning emissions of air pollutants at global and regional scales during the 1980–2010 period

Claire Granier · Bertrand Bessagnet · Tami Bond · Ariela D'Angiola · Hugo Denier van der Gon · Gregory J. Frost · Angelika Heil · Johannes W. Kaiser · Stefan Kinne · Zbigniew Klimont · Silvia Kloster · Jean-François Lamarque · Catherine Liousse · Toshihiko Masui · Frederik Meleux · Aude Mieville · Toshimasa Ohara · Jean-Christophe Raut · Keywan Riahi · Martin G. Schultz · Steven J. Smith · Allison Thompson · John van Aardenne · Guido R. van der Werf · Detlef P. van Vuuren

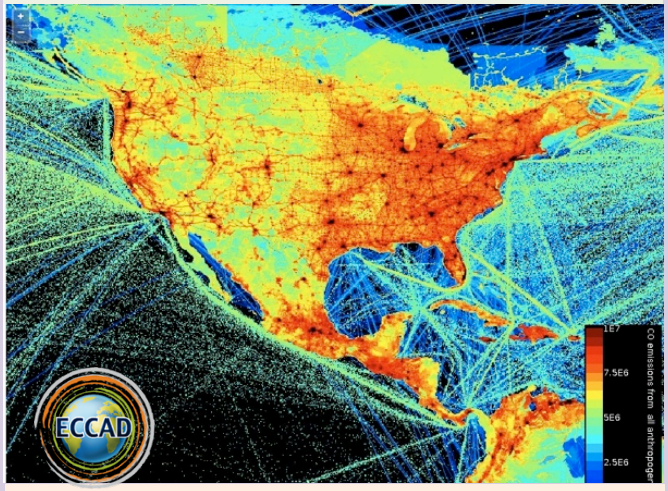


CSD benefits to emissions stakeholders

- Connecting emissions research to inventories
- Making inventories accessible & useful
- Nurturing community of emissions experts
- Building capacity to understand emissions

GEIA
Global Emissions InitiAtive

Co-Chair: Greg Frost *(CSD)*
Databases: Claire Granier *(CSD)*



GEIA Working Groups

- China
- Latin America/Caribbean
- VOCs
- Historic Emissions
- Urban