

Emission Inventories: **Global 1° x 1°**

Jerome Fast and Laura Gallardo Klenner

Emission Database for Global Atmospheric Research (EDGAR):

- <http://www.mnp.nl/edgar/model/>
- emphasis on anthropogenic sources
- annual CO₂, CO, CH₄, SO₂, NO_x, NH₃, VOC for 2000 (version 32FT)
- auxiliary inventory contains aircraft annual NO_x and VOC

Precursors of Ozone and their Effects in the Troposphere (POET):

- <http://www.aero.jussieu.fr/project/ACCENT/POET.php>
- roots in GEIA and EDGAR inventories
- CO, NO_x, and speciated VOCs (15) for 1990 - 2000
- annual values for anthropogenic sources and monthly for biomass sources

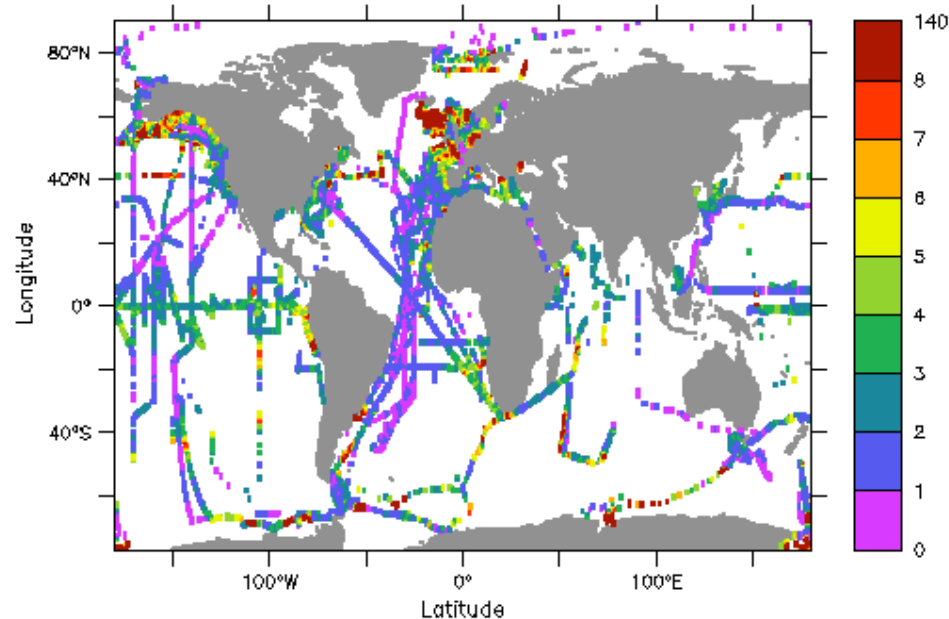
Aerosol Intercomparison (Aerocom):

- <http://nansen.ipsl.jussieu.fr/AEROCOM/emissions.html>
- SO₂ (industries, power plants, volcanoes), POM, EC (fossil fuels and biomass burning), sea-salt, dust, DMS, and “effective” SOA for 2000
- daily (sea-salt, dust, DMS), monthly (biomass burning, SOA), and annual (others) values
- log-normal aerosol size distribution parameters, injection altitudes

Emission Inventories: **Other Global 1° x 1°**

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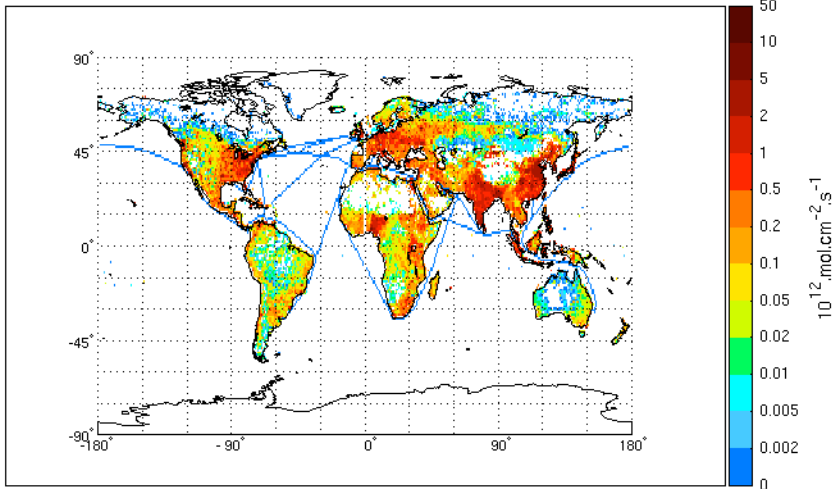
- **Bond:** annual black carbon and primary organic carbon for 1996
- **Guenther:** monthly biogenic VOCs generated using MEGAN
- **Lavoue:** monthly black carbon and primary organic carbon for 1995 - 1997
- **Andres & Kasgnoc:** 25-year averaged of volcanic SO₂
- **Price et al.:** monthly lightning NO_x averaged between 1983-1990
- **Kettle et al.:** monthly DMS based on 1972-1998 oceanic measurements



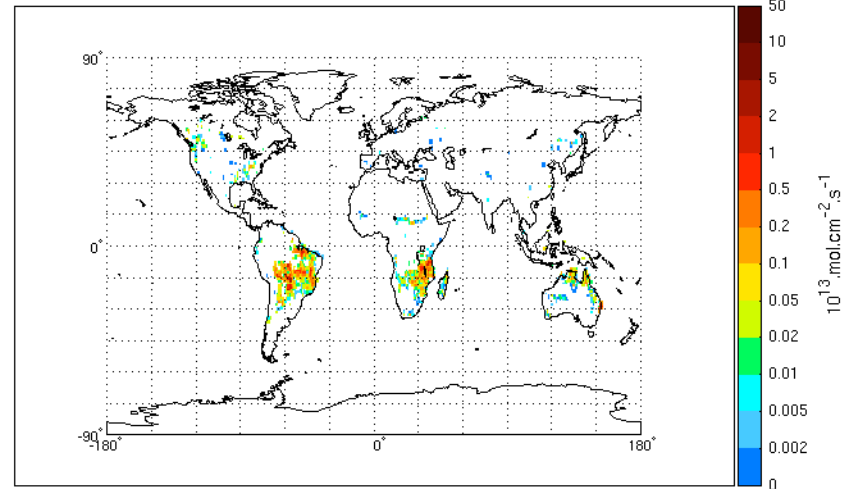
Emissions Inventories: Example Plots

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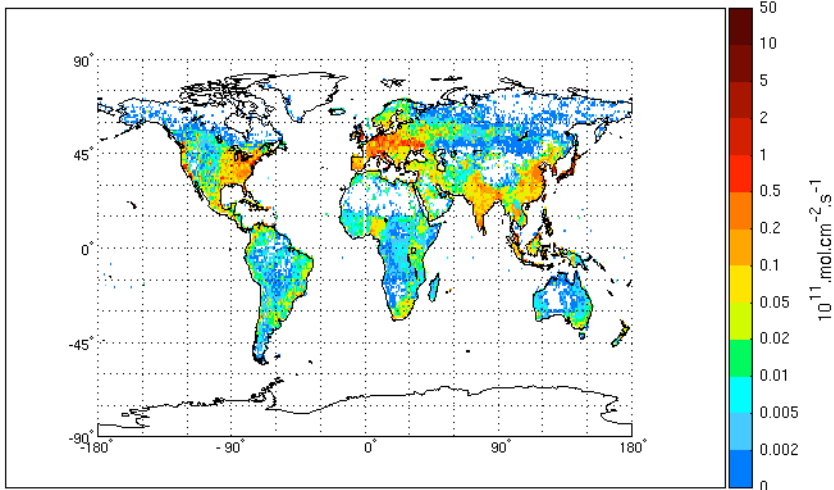
Anthropogenic total co emissions for year 2000



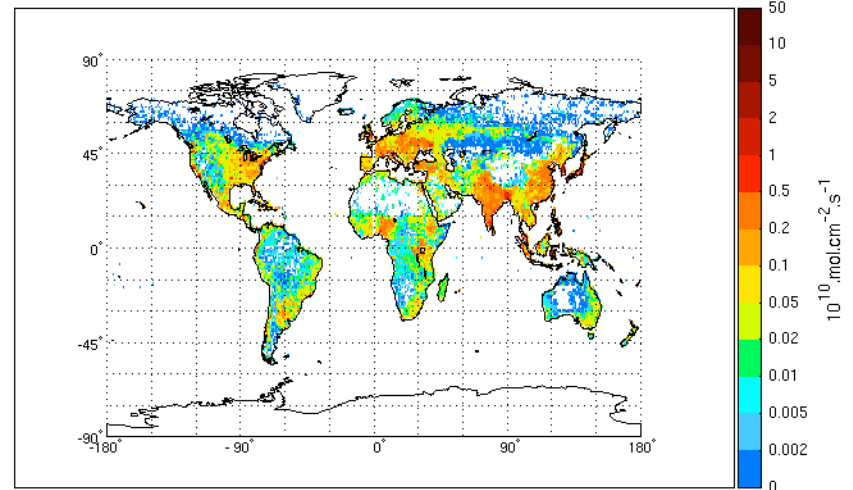
co emissions from forest burning for year 2000, month 10



Anthropogenic total toluene emissions for year 2000



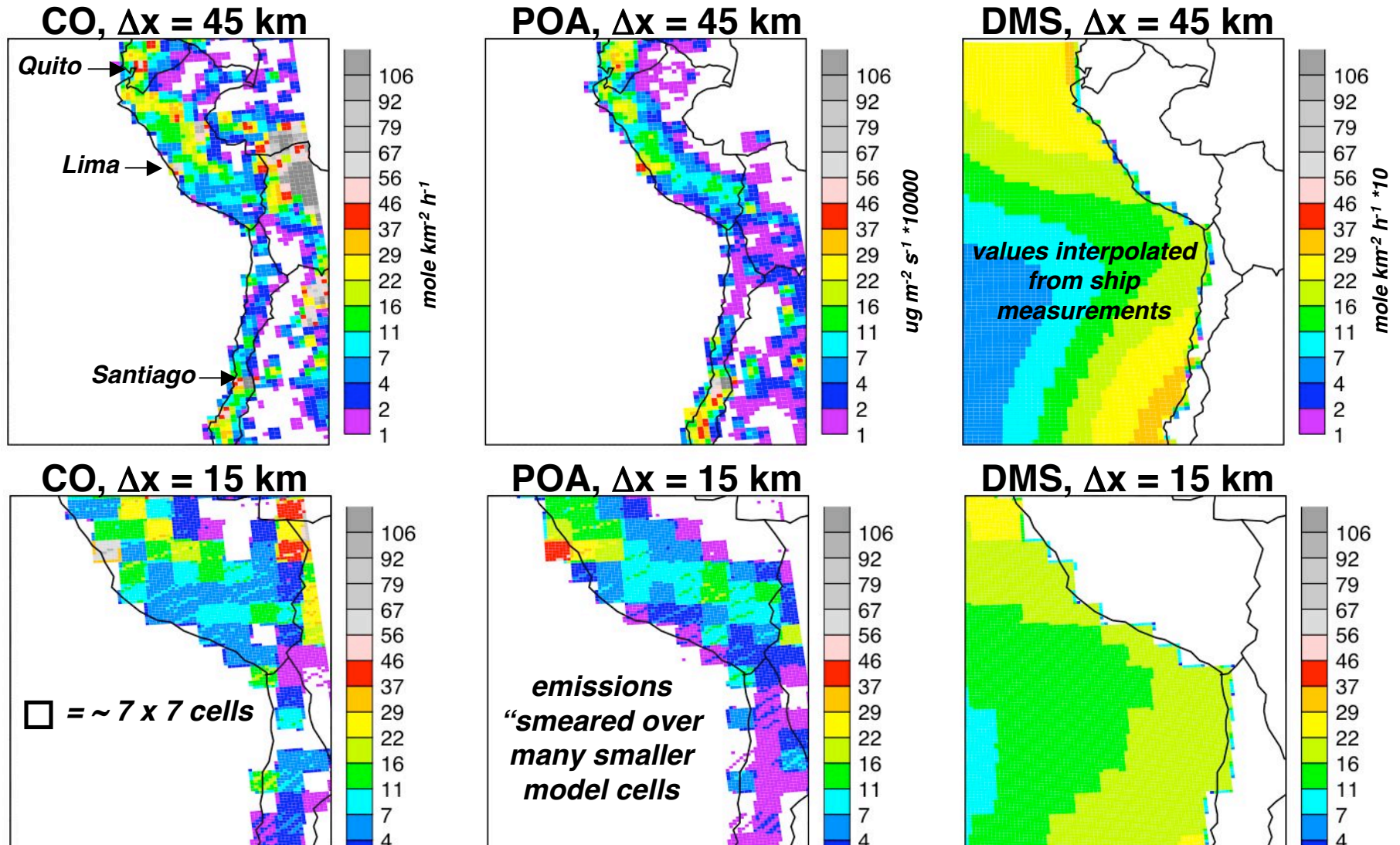
Anthropogenic total ch2o emissions for year 2000



Can these emissions be used for regional models?

Emission Inventories: Regional Modeling

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Marcelo Mena currently developing regional emissions based on population & other proxies

Emission Inventories: **Partial Wish List**

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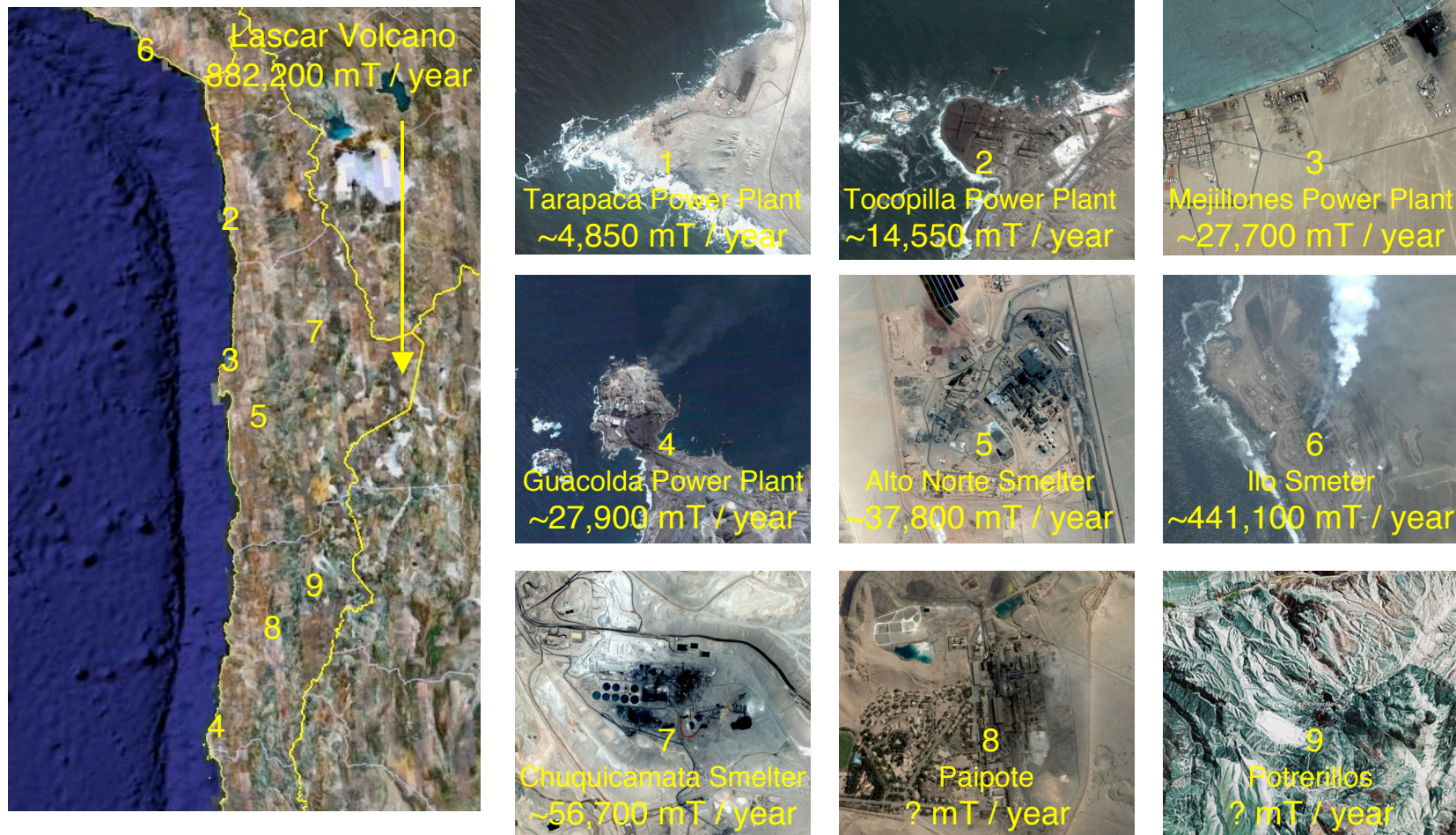
Property	What Modelers Need	What Modelers Get
Horizontal Spatial Resolution	4 - 10 km ² preferred	1 x 1° at best
Vertical Spatial Resolution	Point source stack heights, converted to model vertical level	None. (Exception: Volcano heights usually available, but vertical extent/location of emissions must still be estimated)
Temporal Resolution	Hourly, with a diurnal cycle	Annual totals for anthropogenic species; seasonal (sometimes monthly) totals for biogenic and biomass burning species
VOC Emission Speciation Profile	VOC emissions speciated according to surrogate hydrocarbon compounds used in a given model's chemical mechanism.	Total amount of VOCs. Units often unclear (e.g., moles—of what? Carbon? CO? CO ₂ ?; tons [metric or English?])—again of what?)
Emission Type	Total (Anthropogenic + Biogenic) Emissions for a Given Species	Often separate inventories exist for different source types (Examples: anthropogenic SO ₂ , oceanic ship track SO ₂ , volcanic SO ₂ ; anthropogenic NO _x , soil NO _x , lightning NO _x , oceanic ship track NO _x , aircraft NO _x). Usually in different formats with different spatial & temporal scales.
Aerosol Composition	Particle emissions segregated into chemical components corresponding to the aerosol chemical mechanism used in a given model	Some estimates of black carbon and organic carbon emissions available; common assumption that 2.5% of sulfur emissions are aerosol sulfate (remaining 97.5% is gaseous SO ₂)
Aerosol Size Distribution	Particle emissions segregated into bins or modes used in a given model	"You're not serious, are you?" (Actual quote from an inventory developer)

from Elaine Chapman (PNNL)

Emission Inventories: **Local Information**

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Compiled from Chilean National Commission for the Environment (CONAMA) Annual Emission Estimates of SO₂ for 2005



Latest information (SO₂, NO_x, etc.) for power plants available

Emission Inventories: Discussion

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- **What inventories are most appropriate for VOCALS modeling?**
 - ➔ Do current $1^\circ \times 1^\circ$ inventories need to be adjusted to 2008? What assumptions are required?
 - ➔ Do we need SeaWiFS derived DMS for field campaign period?
- **Should modelers use the same emission inventories?**
 - ➔ Easier said than done.
 - ➔ Would 2008 (most appropriate for field campaign period) be available in a short period of time when modelers will start to perform their research, or should we rely on 2007 or older estimates?
 - ➔ Issues of consistency between regional and global models. Emissions used for regional models would need to be “aggregated” to scales compatible for global models, but then this would depart from standard global $1^\circ \times 1^\circ$ inventories.