



Global Emissions Inventory Activity

<http://www.geiacenter.org/>

The Global Emissions Inventory Activity (GEIA)

Claire Granier

LATMOS/IPSL, France and CIRES&NOAA/ESRL, USA

Alex Guenther, NCAR, USA

Paulette Middleton, Panorama Pathways, USA

Aude Mieville, Laboratoire d'Aerologie, France



OUTLINE

- **GEIA and its relationships with the IGBP International Program**
- **Recent activities and future plans**
- **The GEIA/ACCENT emissions portal**
- **The ECCAD database**

GEIA co-chairs:

- **Claire Granier, NOAA/ESRL, Boulder, CO and LATMOS/IPSL, Paris, France**
- **Alex Guenther, NCAR, Boulder, CO**

GEIA new co-chairs (in 2011):

- **Greg Frost, NOAA/ESRL, Boulder, CO**
- **Leonor Tarrason, NILU, Norway**

GEIA Network:

- **Paulette Middleton, Panorama Pathways, Boulder, CO**

GEIA portal:

- **Aude Mieville, Laboratoire d'Aerologie, Toulouse, France**

Global Emissions Inventory Activity



*Brings together **people**, **data** and **tools** to create
Highest quality information on global exchange processes.*

MISSION

- ✧ Quantify the anthropogenic emissions and natural exchanges of trace gases and aerosols that drive earth system changes and
- ✧ Facilitate use of this information by the research, assessment and policy communities.

Global focus → now Global + Regional + Megacities

Role and Objectives of IGBP

IGBP is an international scientific research programme on global change. Its objective is:

- to describe and understand Earth System dynamics,
- focusing on the interactive biological, chemical and physical processes,
- the changes that are occurring in these dynamics,
- and the role of human activities in these changes.



GLOBAL
I G B P
CHANGE

GEIA is a sub-project of three IGBP projects

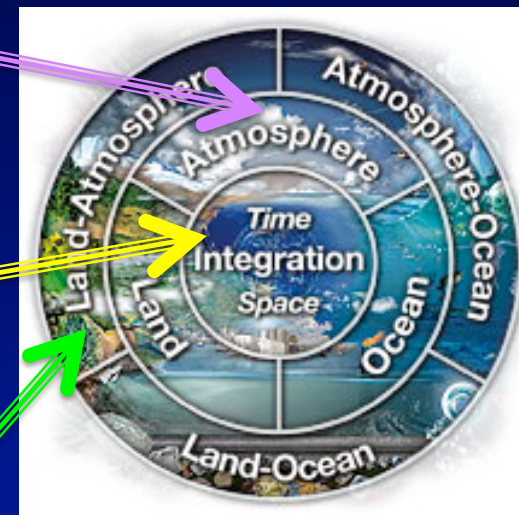
IGBP = International Geosphere-Biosphere Program

GEIA is a sub-project of:

IGAC = International Global Atmospheric
Chemistry project

AIMES: Analysis, Integration and Modeling
of the Earth System

iLEAPS: Integrated Land
Ecosystem-Atmosphere Processes Study



the home page
GEIA Web site: <http://www.geiacenter.org/>

GEIA

Global Emissions Inventory Activity



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PRODUCTS

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[GEIA v.1
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COORDINATION

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GEIA

-- an integrating project of
AIMES/International Geosphere-Biosphere Program --

*Brings together people, data and tools to create highest quality
information on global exchange processes.*

GEIA is managed by the GEIA [Steering Committee](#) and [supported internationally](#).

**NOW AVAILABLE: CONFERENCE REPORT and GEIA PLANS for 2010
GEIA-ACCENT Open Conference Oslo, Norway October 26-28, 2009**
Emissions of Gases and Aerosols
Progress, Modeling Needs, and Emerging Issues

[GEIA News - November 2009 Updates](#)

New Data Information
[Population, Ecosystems, Fire, Land-Use Change, ...](#)
ECCAD: emissions data and ancillary data for emissions calculation

Recent Reports and Events
[Comprehensive Assessment of North American Air Emissions Inventories
and Ambient Air Monitoring Networks](#)
September 2009

GEIA Portal
now at <http://www.aero.jussieu.fr/projet/ACCENT/database.php>
Please send your questions and suggestions to the [GEIA Forum](#).

GEIA 2009 Conference

Link with the ECCAD database
under development

GEIA catalogue

GEIA Emissions portal



Web Site Operation Sponsored by NASA

**Communication channel for global emissions activities –
Products (e.g., data, information, reviews,) &
Coordination (network – over 1000 currently, conferences, reports, ...)**

2009 Conference Talks, Posters and Report

GEIA

Global Emissions Inventory Activity

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GEIA - ACCENT 2009 Conference -- Overview

[Overview](#) - [Reports](#) - [Program](#) - [Committees](#) - [Participants](#) - [Presentations](#) - [Photos](#)

**Oslo Innovation Center, Oslo Norway
October 26-28, 2009**

[Conference Report and GEIA Plans for 2010](#)

[Final Program](#). Including Abstracts of All Oral and Poster Presentations

[Committees](#)

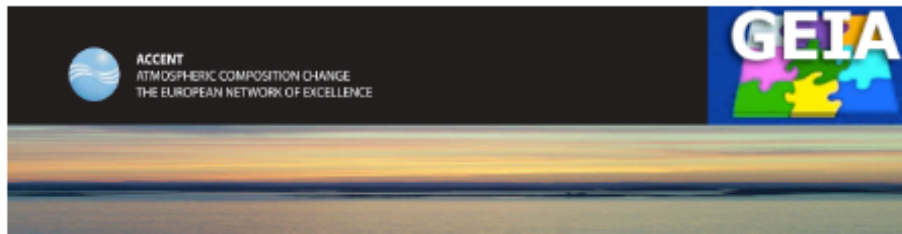
[Participants and Email Contact Information](#) (October 28, 2009)

[Presentations](#) (Updated December 2009)

Please contact the Author-Participant if you would like additional information, particularly if the presentation is not posted.

[Photos](#) (November 10, 2009)

[Summaries](#)



Emissions of Gases and Aerosols Progress, Modeling Needs and Emerging issues

Report of the GEIA-ACCENT Conference
October 26-28 2009
Oslo, Norway

*The Report concludes with the
Steering Committee Outline of Next Steps*

Editors: Claire Granier, Paulette Middleton, Alex Guenther,
Aude Mieville, Jose M. Baldasano, Michael Gauss,
Trissevgeni Stavrakou, Alison Steiner, Fiona Tummon
and Nele Veldeman

Organization Committee: Claire Granier, Paulette Middleton,
Bjorg Rognerud, Ivar Isaksen, Alex Guenther, Aude Mieville,
Greg Frost, Laurens Ganzeveld, Charles Ichoku, Zbigniew Klimont,
Cathy Liousse, Jean-François Muller, Leonor Tarrason
and Vigdis Vestreng

GEIA 2009 Conference Report

available at:

geiacenter.org



The GEIA-ACCENT Emissions portal

- Access to several global and regional inventories
- For now, only grided inventories
- Common NetCDF (CF convention) format; ASCII available for older data
- Standardized templates, and indications on how to cite each dataset
- Very simple graphics (pre-calculated maps)

GEIA / ACCENT Portal home page

<http://www.aero.jussieu.fr/projet/ACCENT/database.php>



Home

Project description

Emission Data portal

Data manipulation tools

Workshops & meetings

Contacts

Web links

ACCENT web portal

GEIA project

Other Web links

GEIA/ACCENT Emission Data Portal

This web site is designed for Mozilla, Firefox or Netscape browsers

When using any data from the GEIA/ACCENT web portal, we request that you acknowledge the authors of the datasets of each inventory, as well as the GEIA/ACCENT database activity (see Project description)

The **GEIA/ACCENT** data portal provides surface emissions data (total and gridded data), for the main emission categories (total anthropogenic, total biomass burning, biogenic, and oceans) at global or regional scales, from several inventories (RETRO, POET, EDGARFT2000, GFEDv2, GEIA v1,...).

You can access the data through the 'INVENTORIES TABLE':

- **INVENTORIES TABLE**

You can also have the List of species for each inventory :

- **LIST of SPECIES**

Links to other Emission Inventories / Databases

- **EMEP** -- Norwegian Meteorological Institute -
- **EDGAR** -- MNP -
- **Aerocom** -- LSCE(CNRS) / MPI-Met -
- **IIASA** -- International Institute for Applied Systems Analysis (IIASA) -

Accessible through the GEIA website and the ACCENT network website

Global Inventories

Inventory	Categories	Spatial resolution	Temporal resolution	Period	Home site (for detailed or sectorized data)
RETRO	anthropogenic biomass burning	0.5° x 0.5°	monthly	1960 -2000	=>
EDGAR-HYDE 1.3	anthropogenic	1° x 1°	decadal	1890 -1990	=>
EDGAR 3.2FT2000	anthropogenic biomass burning	1° x 1°	annual	2000	=>
POET	anthropogenic biomass burning natural	1° x 1°	annual (anthro) monthly (biom. burn.) monthly (nat.)	1990 -2000 period	=>
GFED v2	biomass burning	1° x 1°	monthly 8 day (available on GFED home site)	1997 - 2005	=>
GICC-bb	biomass burning	1° x 1°	monthly	1997 - 2005	-
CO2 Andres et al.	anthropogenic	1° x 1°	annual	1751 - 2003	no
AMAP -Mercury	anthropogenic	0.5° x 0.5°	annual	1995 and 2000	=>
MEGAN - biogenic emissions	biogenic (natural)	0.5° x 0.5°	annual	2000	
GEIA v.1	anthropogenic biomass burning natural	1° x 1°	annual + monthly for NOx, SO2, and nat.VOC	depends on the compound	=>

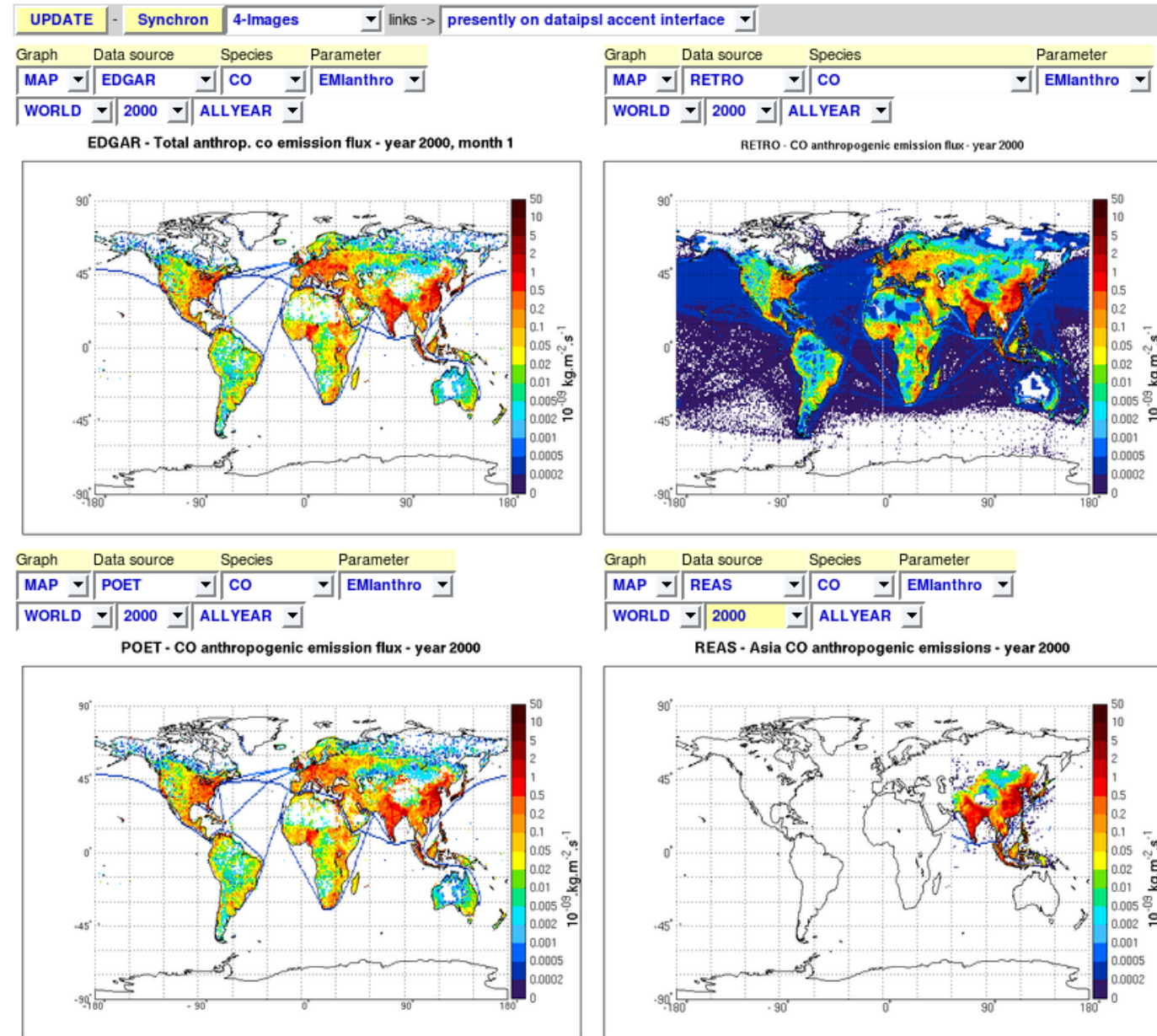
**GEIA-ACCENT
Current
On-site
Data**

**Several
datasets
to be
added in
the next
few weeks**

Regional Inventories

Inventory	Categories	Spatial resolution	Temporal resolution	Period	Home site (for detailed or sectorized data)
REAS - Asia	anthropogenic	0.5° x 0.5°	1 year	1980-2020	=>
EMEP - Europe	anthropogenic	0.5° x 0.5°	1 year	1970-2020	=>
ABBI - Asia	biomass burning	1° x 1°	1 day	March to May 2000 - March to May 2001	-

ACCENT EMISSION PROJECT INTERFACE ----- developed/hosted by IPSL/LSCE



Visualization
Tool
Example:
Comparison
of 4 datasets
providing
CO emissions
for 2000



The ECCAD database :

Emissions of atmospheric Compounds & Compilation of Ancillary Data

Claire Granier, Cathy Liousse

Sabine Darras, Vincent Pignot, Renaud Bodichon

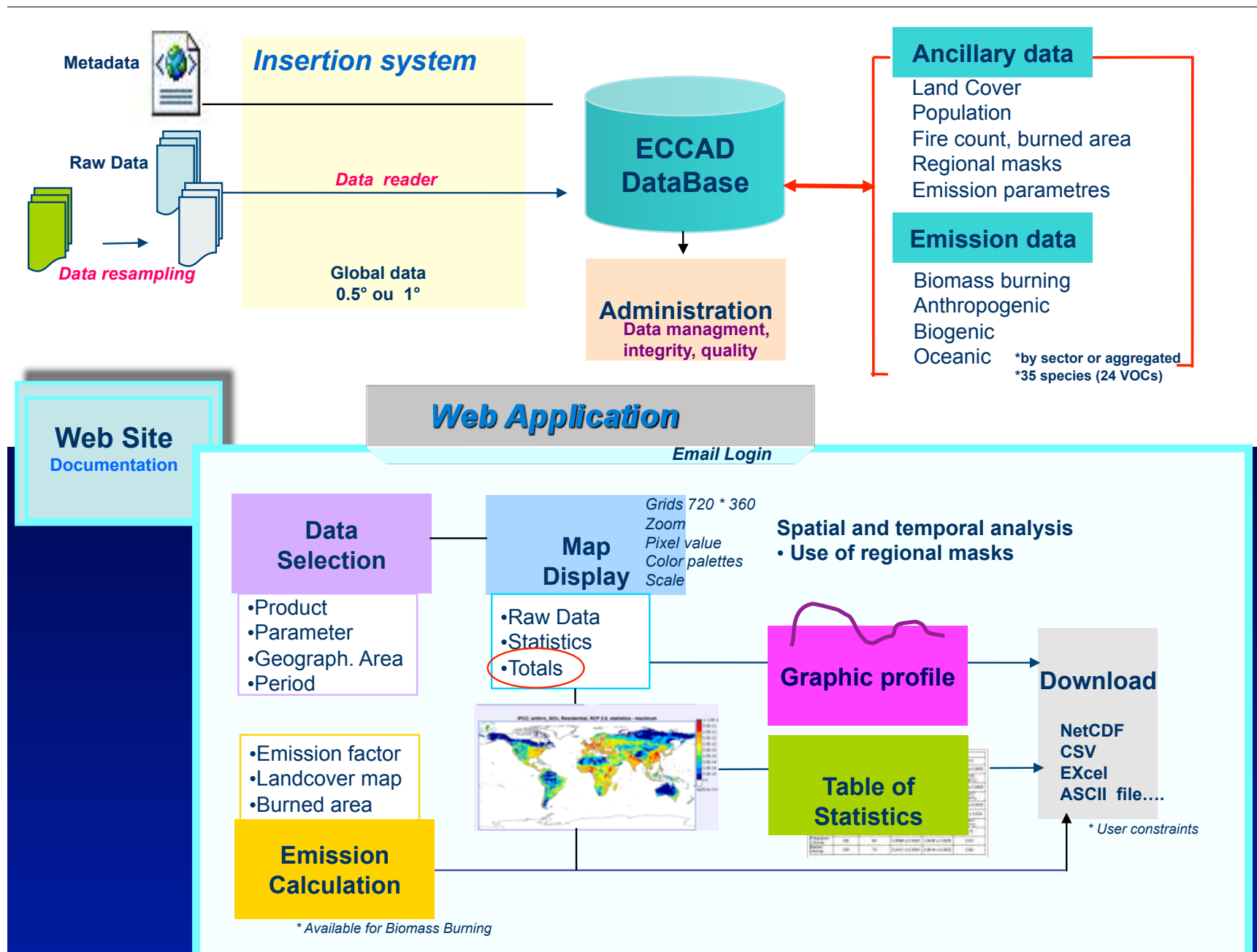
**LATMOS and IPSL, Paris, France
Laboratoire d'Aerologie, Toulouse, France**





The ECCAD database

- Under development, but many products already available
- Access to the same emissions inventories as in GEIA
- Access to ancillary data
- Interactive graphics
- On-line calculation of total emitted: global + regions
- Tools under development: regridding, comparisons, statistics, etc.
- Will eventually replace the GEIA emissions portal if long-term funding can be obtained





- Project description
- Context
- Data
 - Ancillary data
 - Emission data*
 - Major Species
 - Other Species 1
 - Other Species 2
- Tools
- Contact
- Database Access

Table of Species

Major Species													
	Anthropogenic Biomass burning Natural • Biogenic • Biogenic & Oceans												
Inventory	CO ₂	CH ₄	N ₂ O	CO	NO _x	NMVOCS	SO ₂	BC	OC	NH ₃	PM _{2.5}	TPM	Hg
IPCC	•	•	•	•	•	•	•	•	•	•			
Sectors	•	•	•	•	•	•	•	•	•	•			
RETRO		•		•	•								
EDGAR	•	•	•	•	•	•	•	•	•	•	•	•	•
POET				•	•								
GFED	•	•	•	•	•	•	•	•	•	•	•	•	•
GICC	•	•	•	•	•	•	•	•	•	•	•	•	•
MEGAN					•								
Andres	•												
Mercury													•
REAS	•	•		•	•	•	•	•	•	•			
EMEP				•	•	•	•			•	•	•	
Molecular mass (g mole ⁻¹)	44	16	44	28	30	72	64	12	12	17	-	-	200

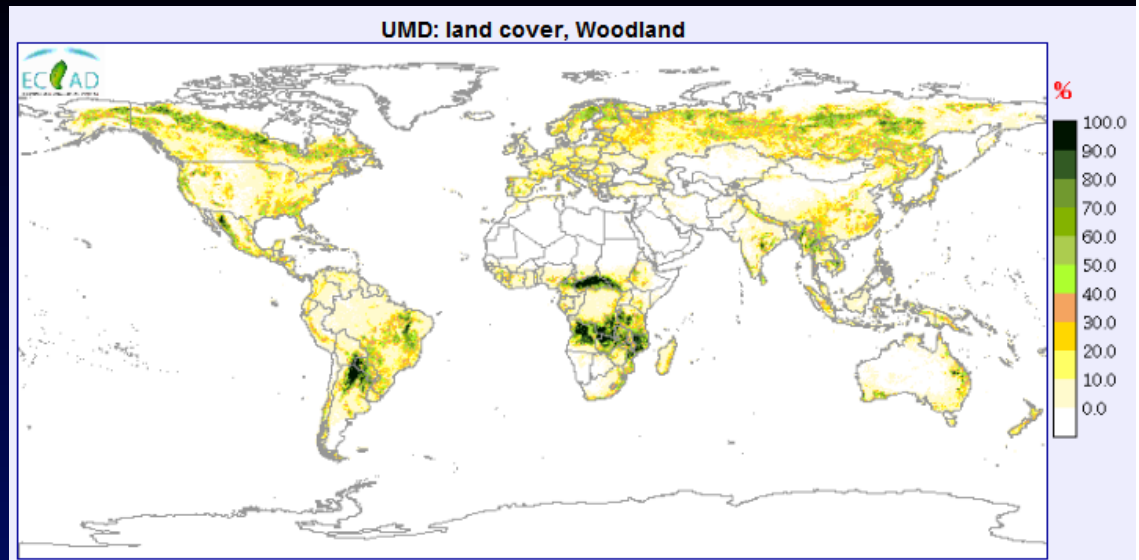
Other Species (1)																	
by sectors	Anthropogenic Biomass burning Natural • Biogenic • Biogenic & Oceans																
Inventory	Ethane	Propane	Butanes	Pentanes	Total Butanes & Higher Alkanes	Total Hexanes & Higher Alkanes	Ethene	Propene	Total Butenes & Higher Alkenes	Acetylene (Ethyne)	Other alkenes & higher alkynes	Methanol	Other Alcohols	Total Alcohols	Formaldehyde (Methanal)	Acetaldehyde (Ethanal)	Other aldehydes
	(C ₂ H ₆)	(C ₃ H ₈)	(C ₄ H ₁₀)	(C ₅ H ₁₂)			(C ₂ H ₄)	(C ₃ H ₆)		(C ₂ H ₂)		(CH ₃ OH)			(CH ₂ O)	(CH ₃ CHO)	
IPCC	*	*	*	*		*	*	*		*	*			*	*	*	*
	*	*	*	*		*	*	*		*	*			*	*	*	*
		*		**													
RETRO	*	*	*	*		*	*	*		*				*	*	*	*
	*	*					*	*		*		*		*	*	*	*
POET	*	*			*	*	*	*	*	*		*	*	*	*	*	*
	*	*			*	*	*	*	*	*		*	*	*	*	*	*
	**	**					**	**				*					
GICC	*	*			*	*	*	*	*	*		*		*	*	*	*
MEGAN																	
Molecular mass (g mole ⁻¹)	30	44	58	72	58	86	28	42	56	26	56	32	46	32	30	44	44

Other Species (2)																
by sectors	Anthropogenic Biomass burning Natural • Biogenic • Biogenic & Oceans															
Inventory	Acetone (C ₃ H ₆)	Other Ketones	Total Ketones	Total Acids	Benzene (C ₆ H ₆)	Trimethyl benzene (C ₉ H ₁₂)	Toluene (C ₇ H ₈)	Xylène (C ₈ H ₁₀)	Other Aromatics	Total Aromatics	Ethers	Esters	Other VOCs	Isoprene (C ₅ H ₈)	Monoterpenes (C ₅ H ₈) ₂	Chlorinated hydrocarb.
IPCC			*	*	*	*	*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*	*	*	*	*
RETRO	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*
	*	*			*	*	*	*	*	*	*	*	*	*	*	*
POET	*	*							*	*						
	*	*							*	*						
														*	*	
GICC	*	*			*	*	*	*	*	*	*	*	*	*	*	*
MEGAN														*	*	
Molecular mass (g mole ⁻¹)	58	72	72	59	78	120	92	106	126	126	81	184	68	68	136	138

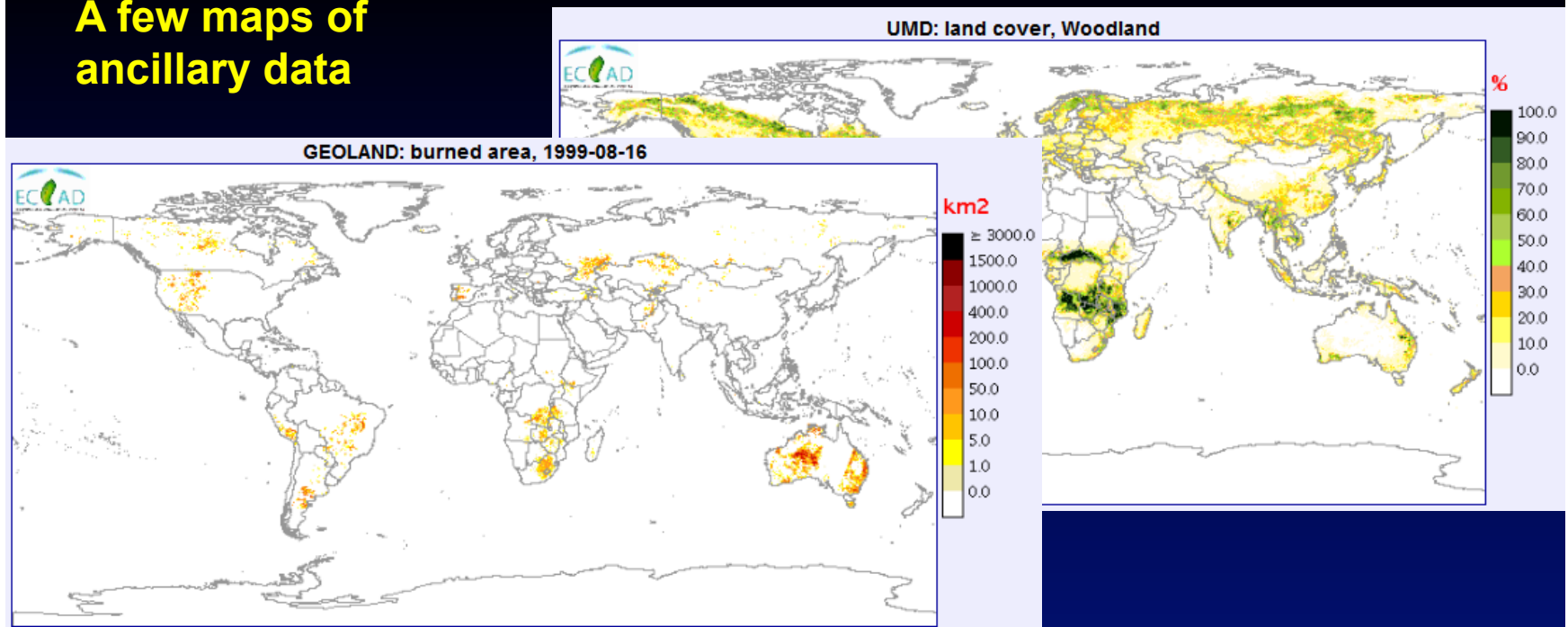
Ancillary data

Global grids at 0.5° resolution					
<u>Methodology</u>		<u>grid count</u>		<u>Resampling algorithms</u>	
Products	Parameter	Temporal	Coverage	Data type	Provider
UMD	Land Cover	Climat. mean	1992 - 1993	AVHRR	UMD University of Maryland
GLC2000		Decadal	2000	SPOT Vegetation	JRCJoint Research Center
CLM3		Climat. mean	1999 - 2003	MODIS/AVHRR	CIRES NOAA and CU-Boulder
WFA	Fire Count	Daily	11/1995 to 10/2003	ATSR	ESA
GEOLAND	Burned Area	Daily	04/1998 to 12/2000	SPOT Vegetation	VITO EU/FP6 geoland/CSP project
GBA2000		Monthly	2000	SPOT Vegetation	JRC
GPW3	Population	every 5 years	1990 to 2015	Administrative	CIESIN- SEDAC Columbia University
	Country	NC	2005		
Biomass Burning Parameters					
BD, EF, BE	Biomass Density, Emission Factor & Biomass Efficiency				

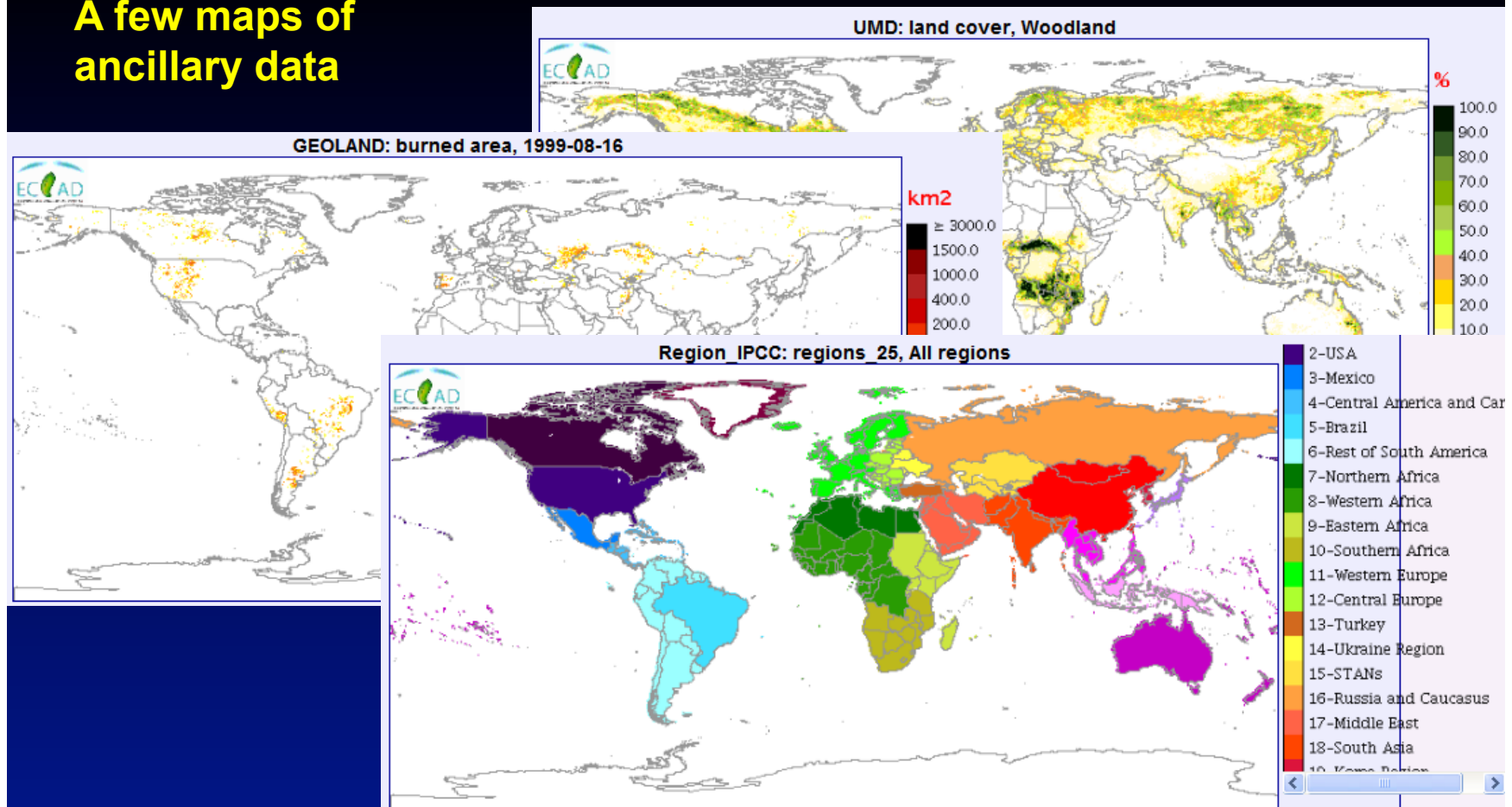
A few examples of ancillary data



A few maps of ancillary data

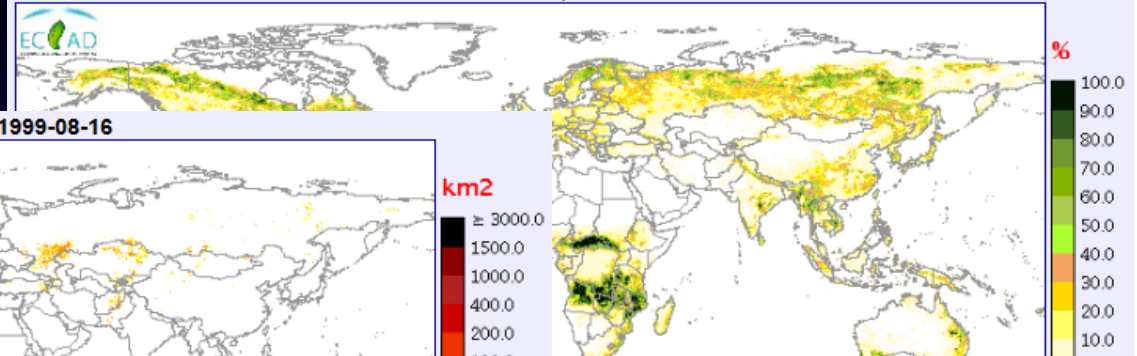


A few maps of ancillary data

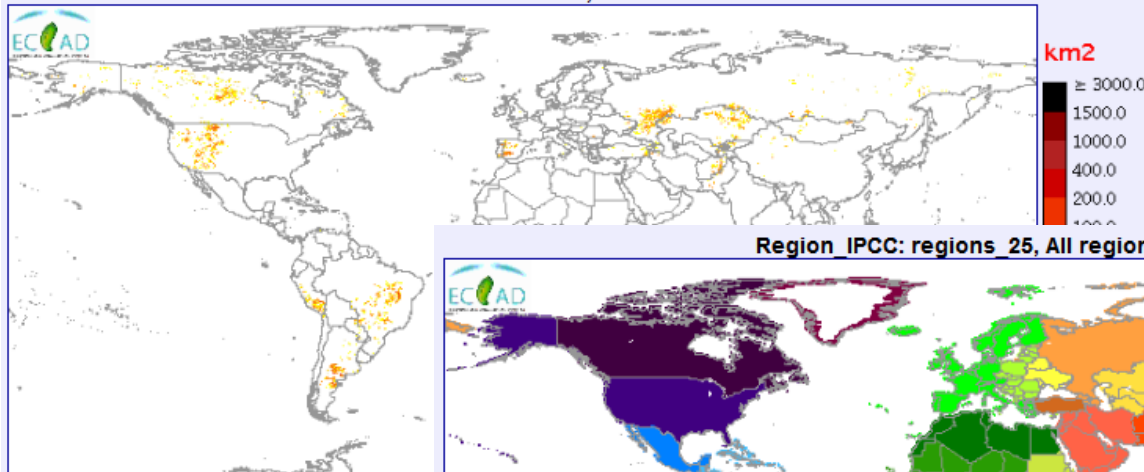


A few maps of ancillary data

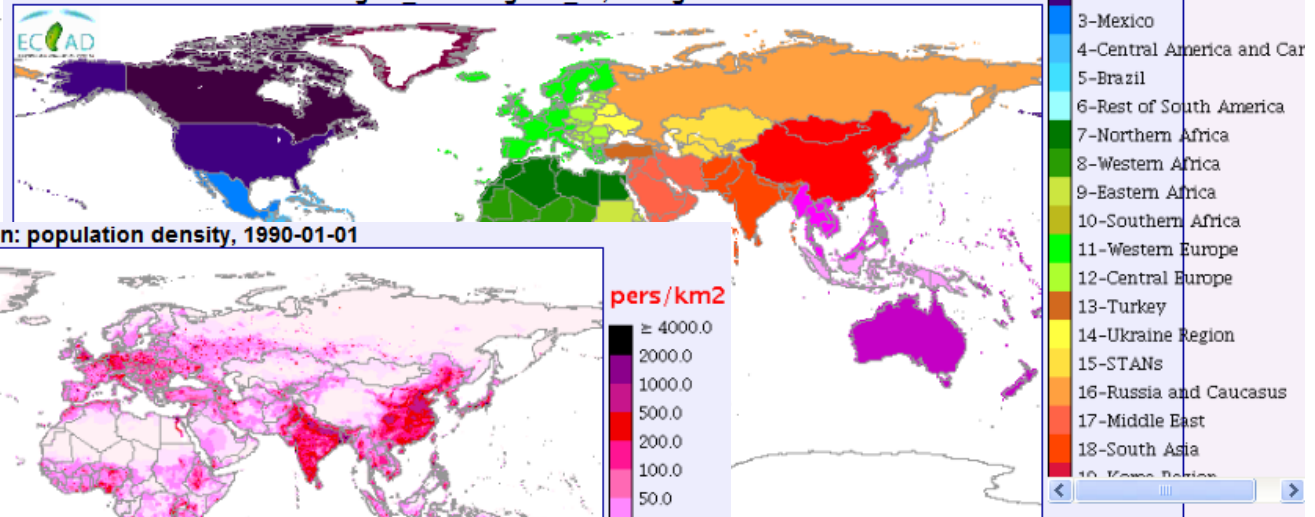
UMD: land cover, Woodland



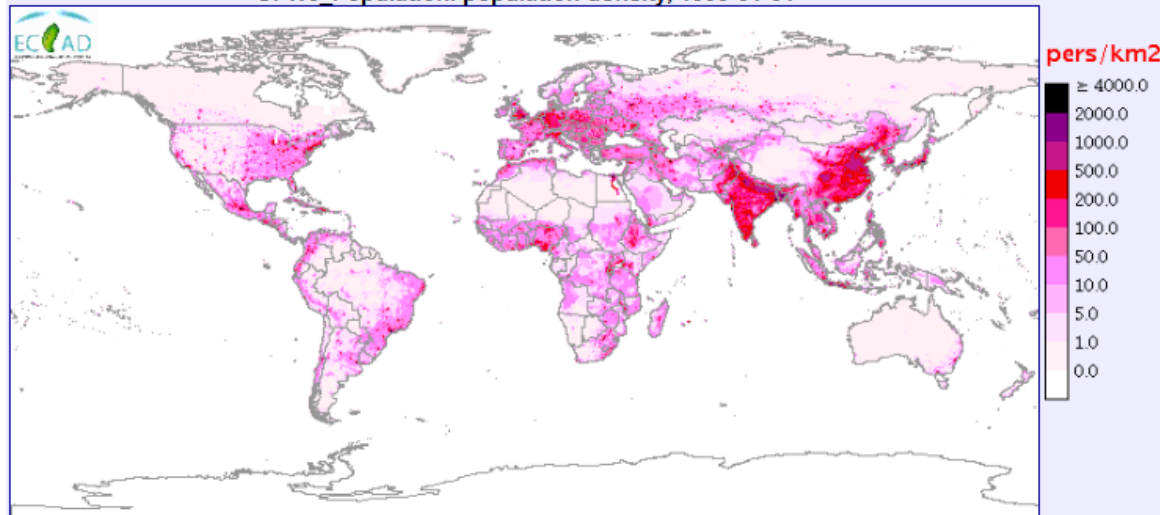
GEOLAND: burned area, 1999-08-16



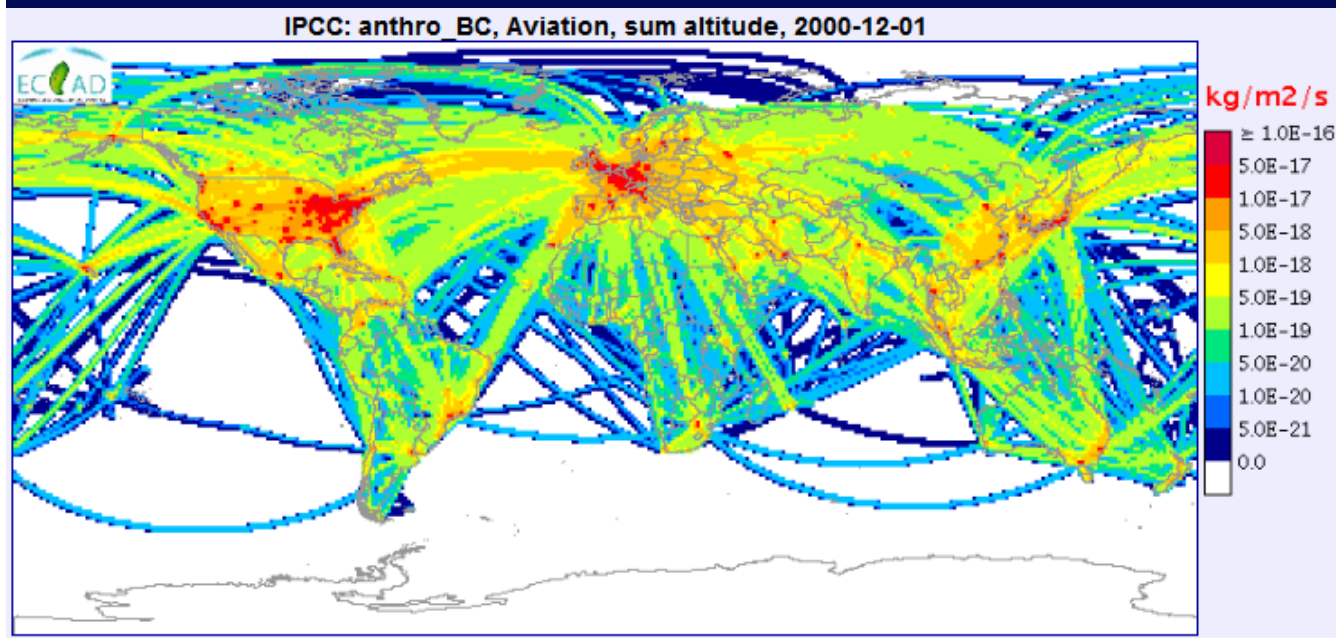
Region IPCC: regions 25, All regions



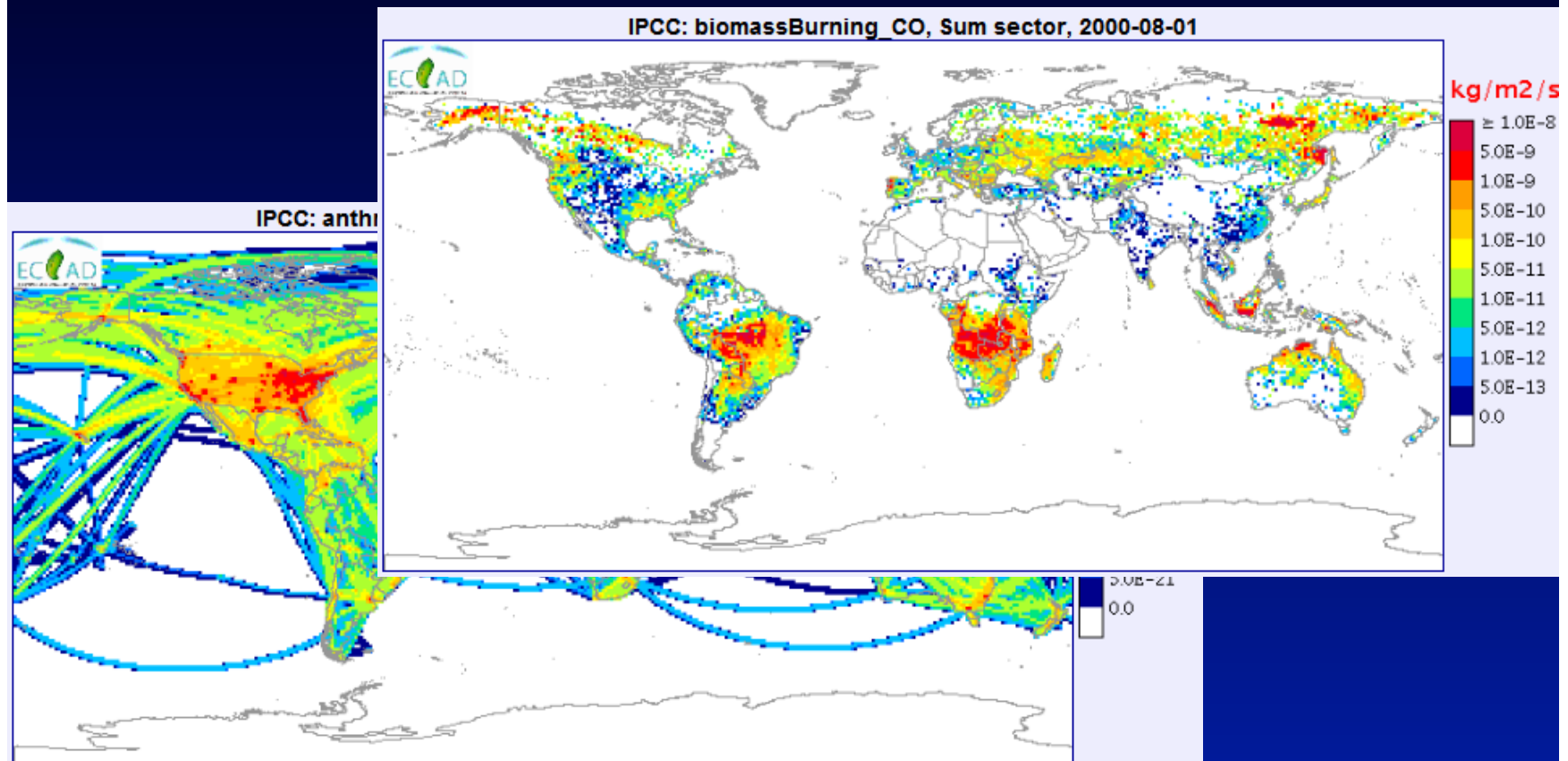
GPW3_Population: population density, 1990-01-01



A few examples of emission maps

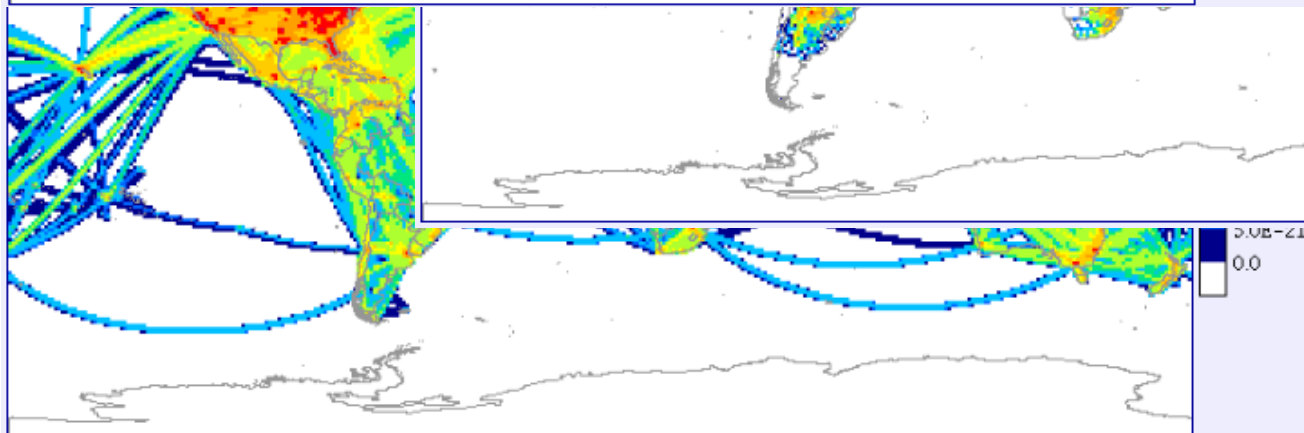
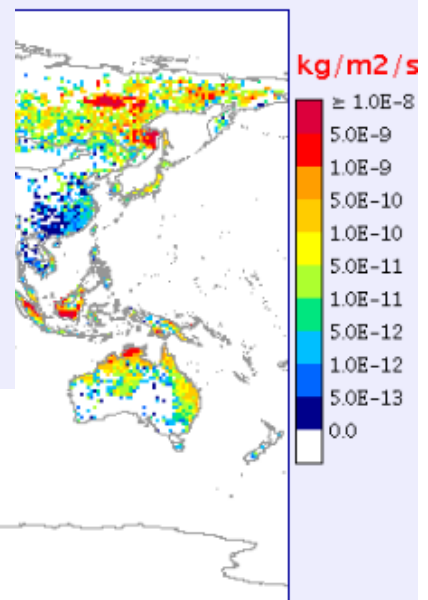
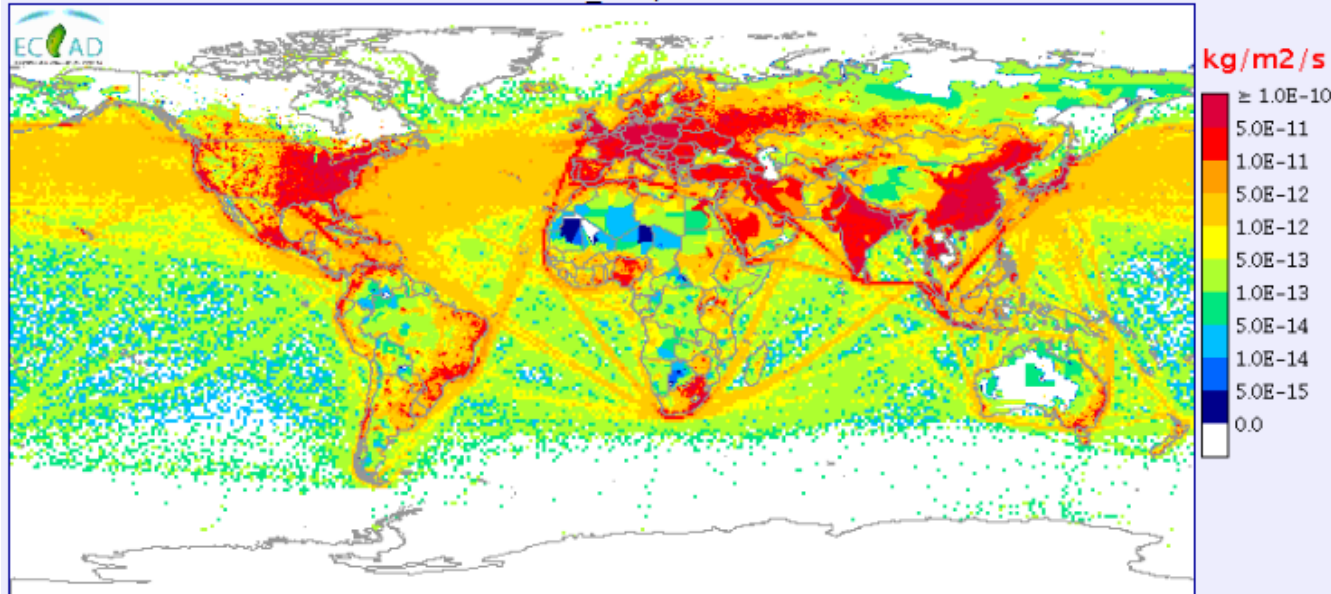


A few examples of emission maps



A few examples of emission maps

RETRO: anthro_NOx, 2000-01-01

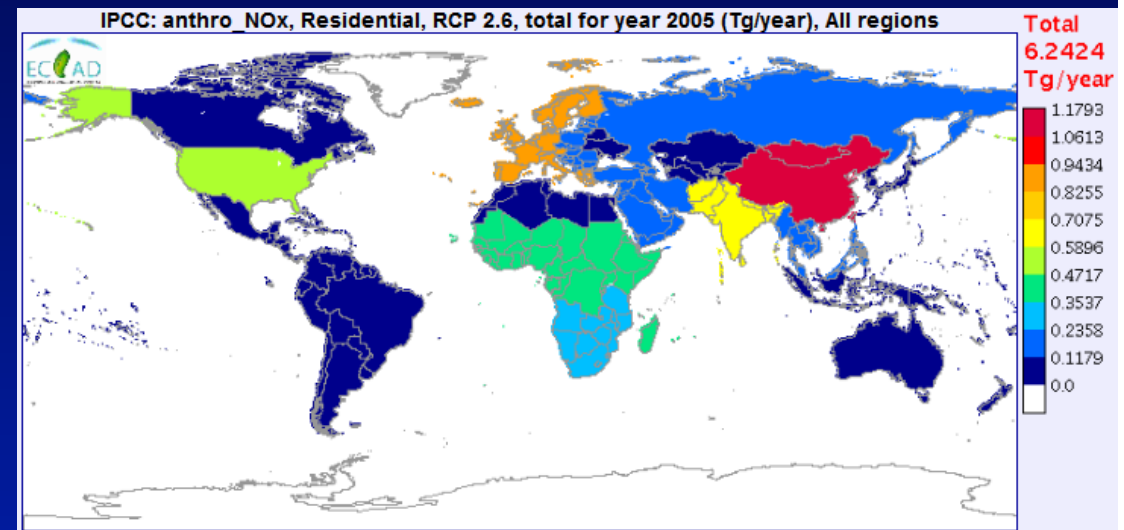
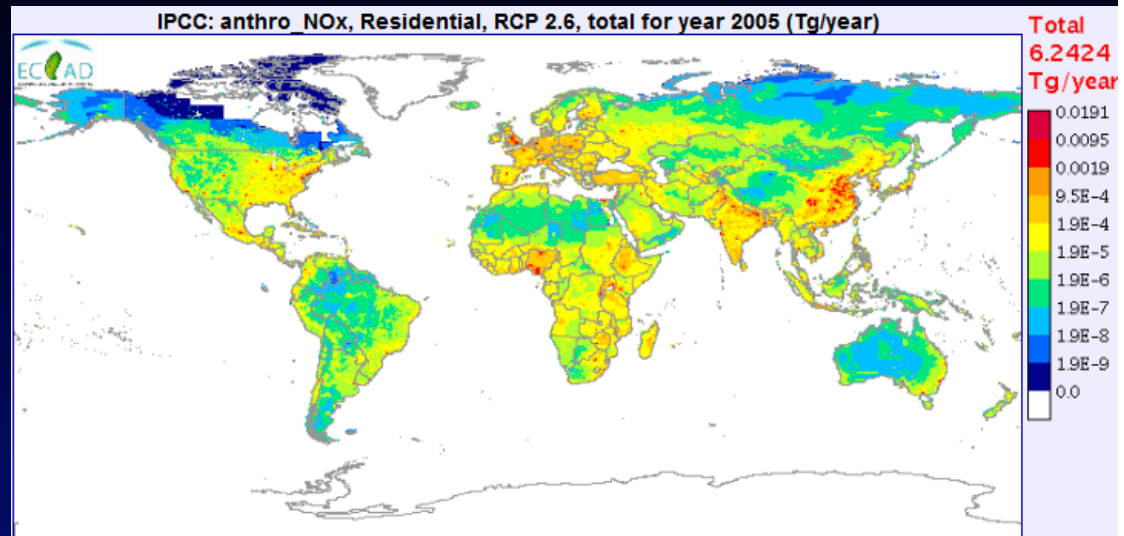


CO ETHER - 23/24 NOVEMBRE 2005

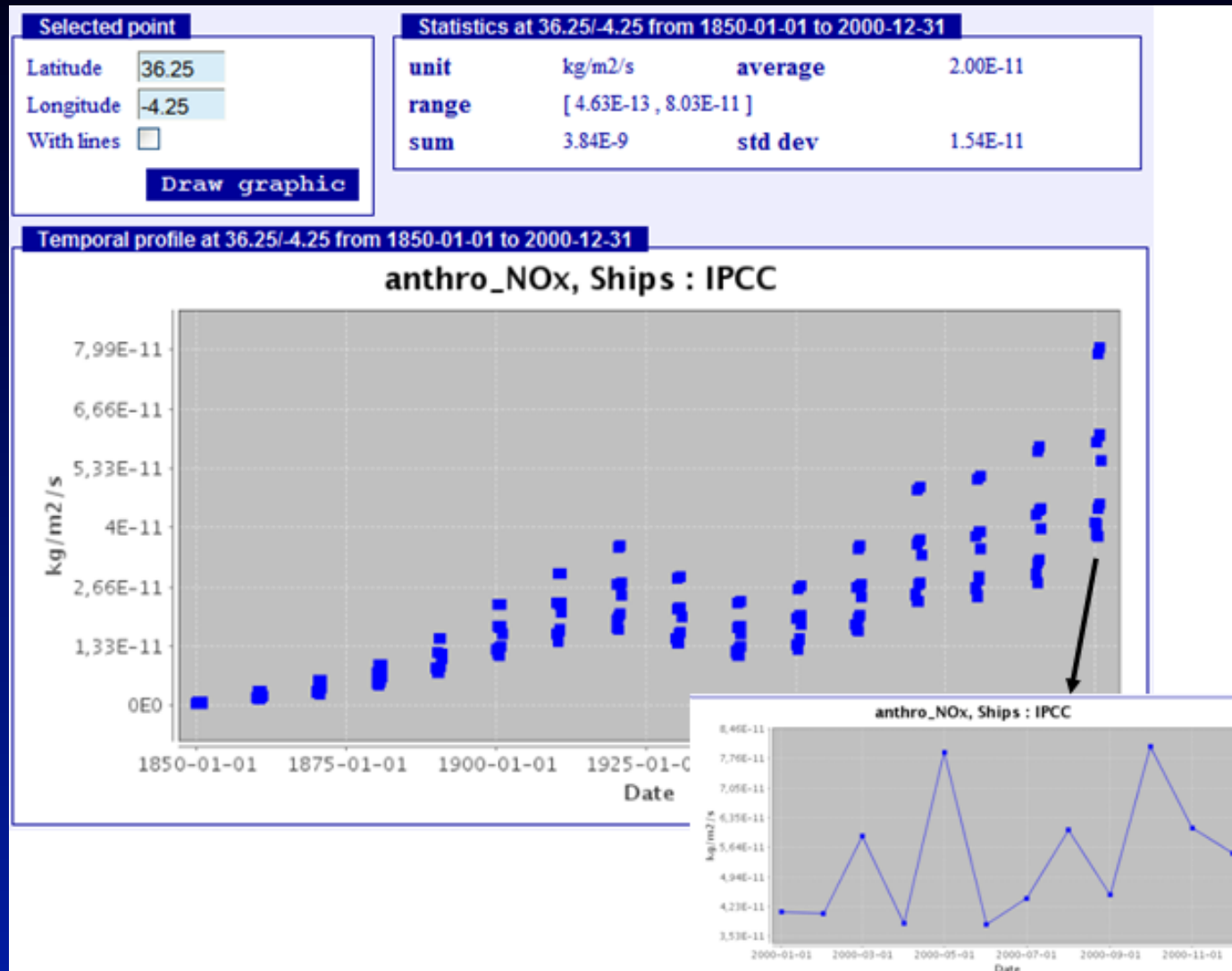
Example of tools: Totals over years, months, global, regions, sectors, ...

Example: NO_x,
residential sector
2005, RCP 2.6

- Global
6.24 Tg/year
- Using regional
masks
 - Total by regions
 - Totals by country



- NOx ship: 1850 to 2000, over Strait of Gibraltar



[Data](#)[Map](#)[Stat](#)[Graphic](#)**Selection**Mode Month Mask **Display**ColorMap Scale Copyright 2006-2008
CNES-CNRS**DataSet**

anthro_NOx

IPCC

Ships

RCP : None

192 grids**Selected Period**

from : 1850-01-01

to : 2000-12-31

Domain

Lat North/South

90.0 / -90.0

Lon East/West

180.0 / -180.0

Zoom

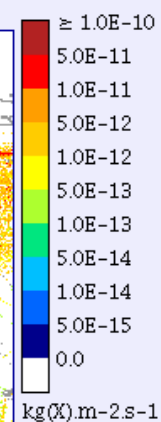
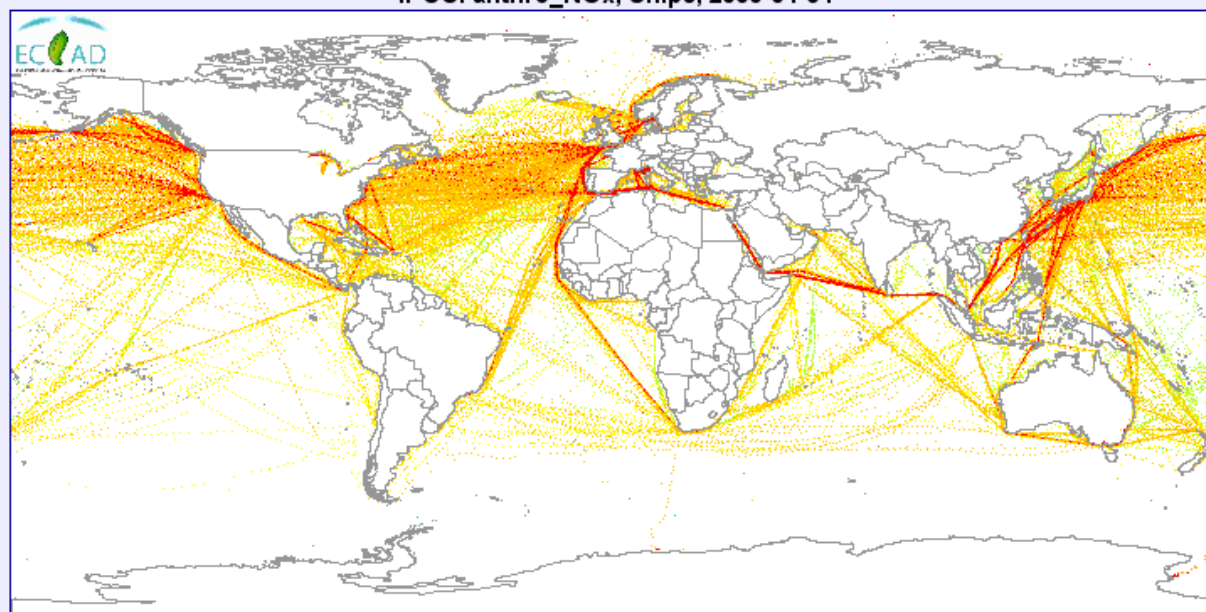
Lat North/South

90 / -90

Lon East/West

180 / -180

IPCC: anthro_NOx, Ships, 2000-01-01

Click on map to zoom [Unzoom](#)

**DataSet**

population density
[GPW3_Population](#)

Selected Period

from : 1990-01-01
to : 2015-01-01

Domain

Lat North/South
90.0 / -90.0
Lon East/West
180.0 / -180.0

Zoom

Lat North/South
59 / 14
Lon East/West
-48 / -138

Clicked pixel

Lat/Lon
36.25 / -93.25
Value
13.4016

Map**Graphic****Stat****Grid Selection**

Date 1990-01-01 ✓

Statistics over time period

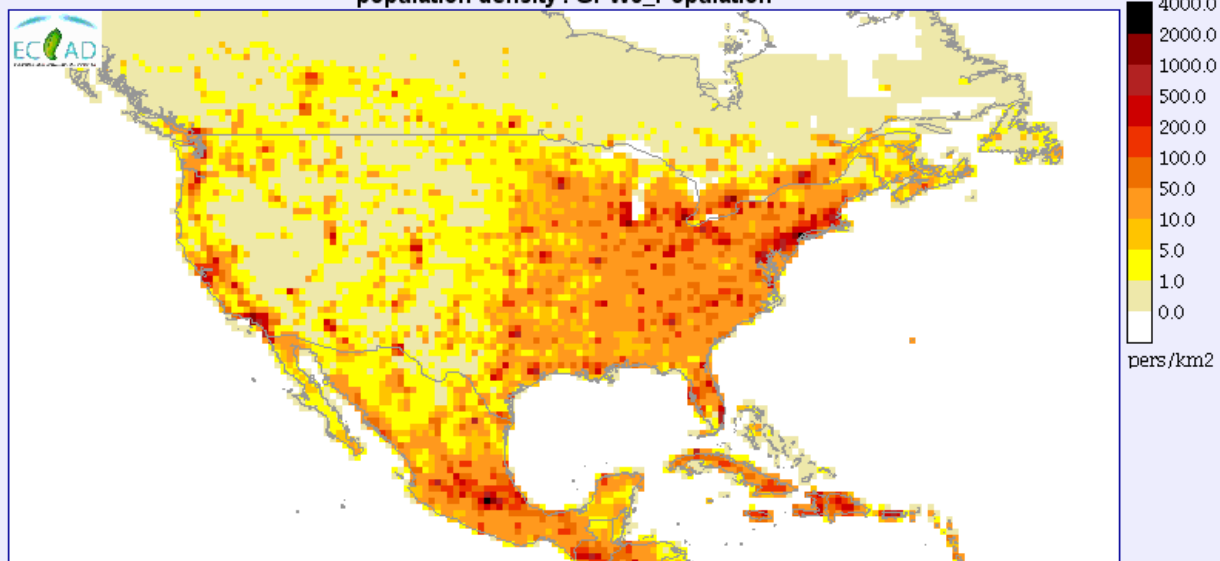
6 grid(s) none

Display Selection

ColorMap brown

ClassLevel population

population density : GPW3_Population

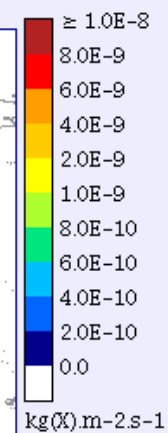
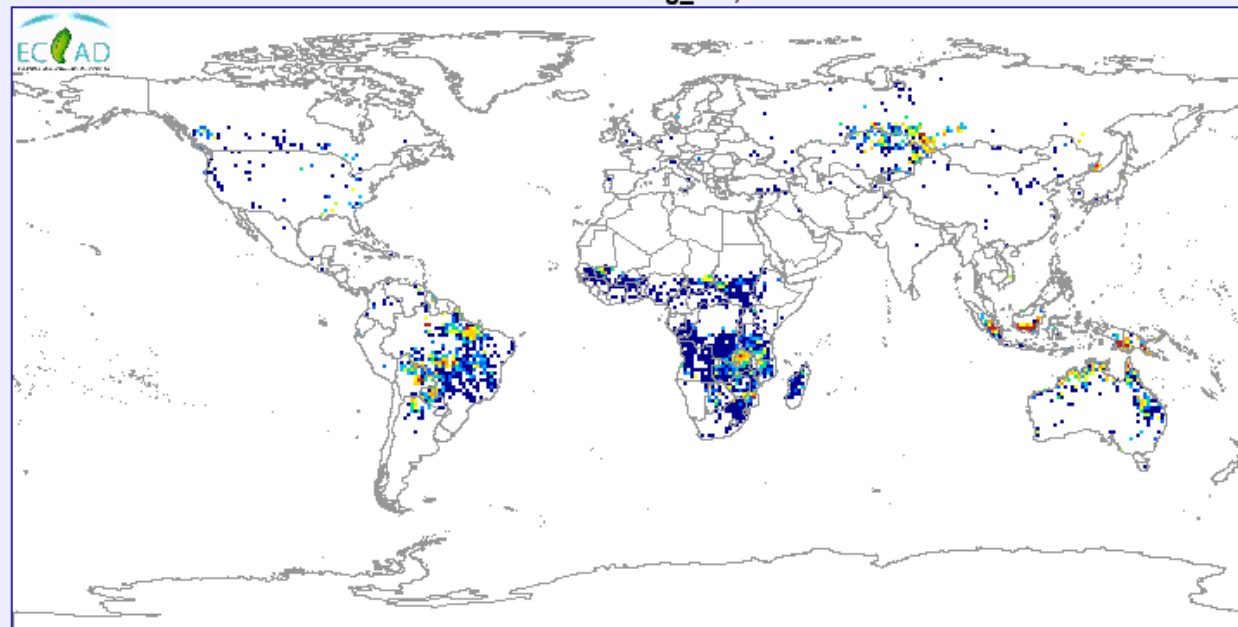


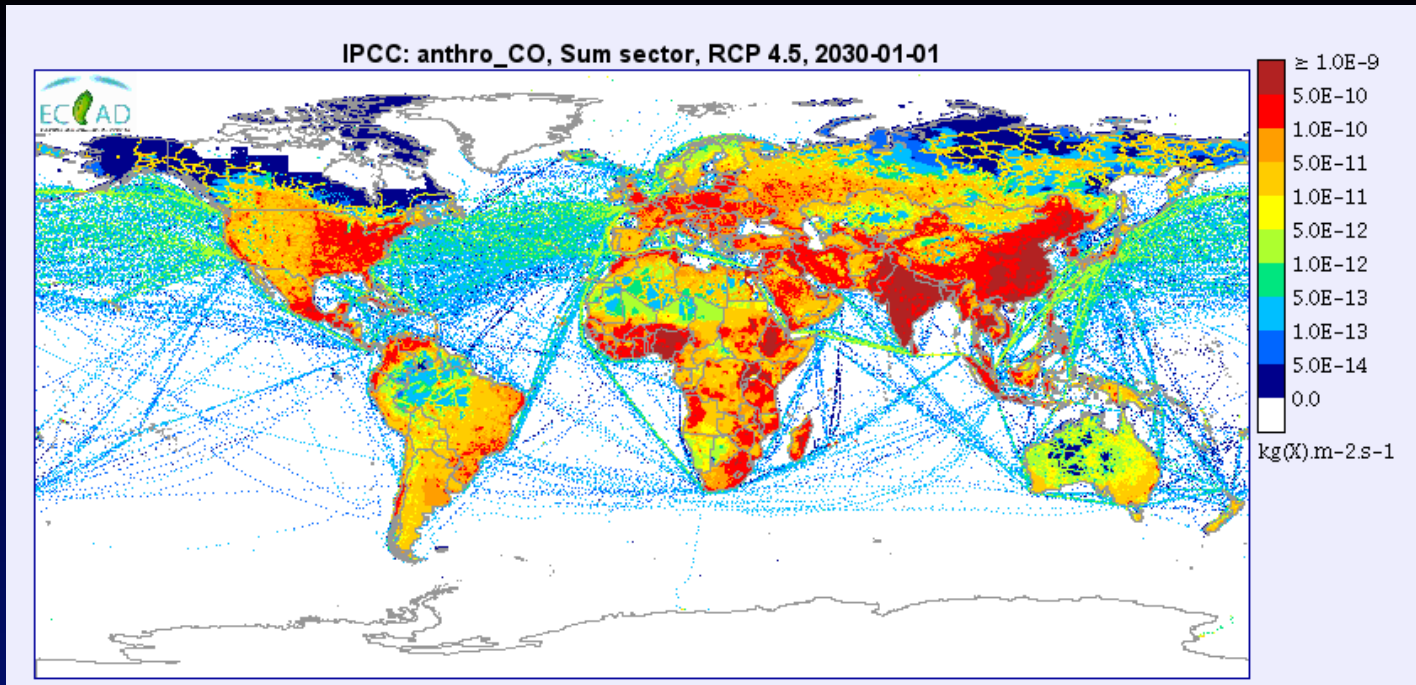
Click on map to zoom

Unzoom**Back to selection**

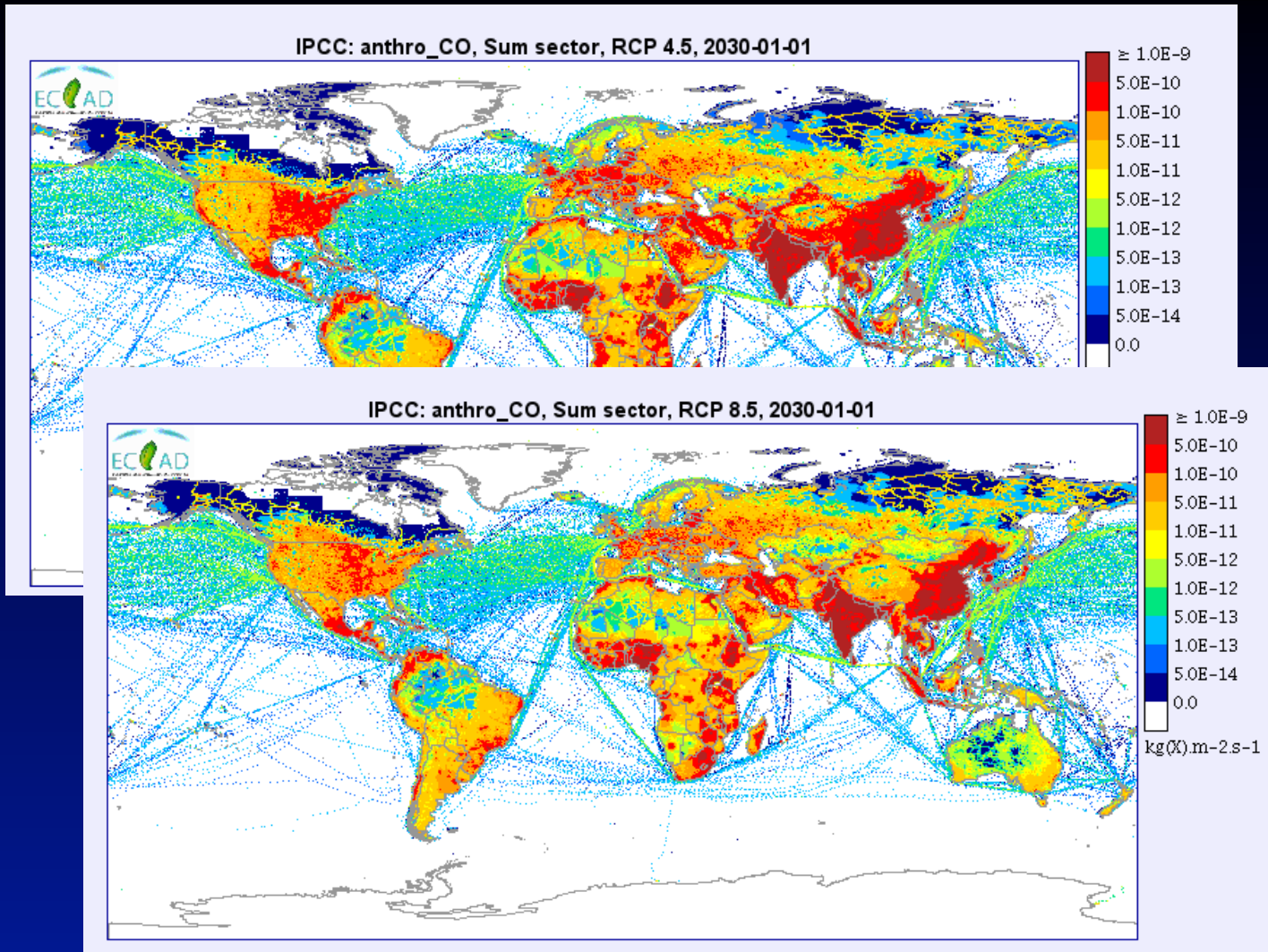
[Data](#)[Map](#)[Stat](#)[Graphic](#)**Selection**Mode Month Mask **Display**ColorMap Scale Copyright 2006-2008
CNES-CNRS**DataSet**biomassBurning_CO
GFED
108 grids**Selected Period**from : 1997-01-01
to : 2005-12-31**Domain**Lat North/South
90.0 / -90.0
Lon East/West
180.0 / -180.0**Zoom**Lat North/South
90 / -90
Lon East/West
180 / -180

GFED: biomassBurning_CO, 1997-10-01

Click on map to zoom [Unzoom](#)



Future emissions



Future emissions

Detailed user's manual available

Data selection 2

The screenshot shows the 'Data selection 2' interface of the Ether web application. The interface includes a navigation bar at the top with links: Home, Products, Tools, User's manual, Data, Emission calculation, and a power icon. Below the navigation bar, there are two tabs: 'Data' and 'Emission calculation'. The 'Data' tab is active, showing a 'Product Selection' section with the following details:

Category	anthropogenic emission
Parameter	CO2 (Carbon Dioxide)
Product	IPCC
Sector	Sum
Description	IPCC Global emissions from burning sources, list

Below the 'Product Selection' section is a 'More information' link. To the right of the 'Product Selection' section, a green box contains the text: 'Upper Left Corner (ULC) and Lower Right corner (LRC) latitude and longitude coordinates -> Defines study area geographical limits'. Below this, there are two sections: 'Area Selection' and 'Date Selection (yyyy-mm-dd)'. The 'Area Selection' section has a table with latitude and longitude coordinates:

Latitude	90.0	-90.0
Longitude	-180.0	180.0

Below the table is a 'Default' link. To the right of the 'Area Selection' section, a green box contains the text: 'Temporal period : Begin and End date'. Below this, a green box contains the text: 'Data temporal periodicity'. The 'Date Selection' section has a table with 'Begin Date' and 'End Date' fields, with values '1850-01-01' and '2000-12-31' respectively. Below the table is a 'Default' link and a 'Grid temporal resolution: monthly' label. At the bottom of the interface, there are two buttons: 'Download' and 'Visualize'. Below the 'Download' button is a green box containing the text: 'Download selected data'. Below the 'Visualize' button is a green box containing the text: 'Data map display'. A green box at the bottom left contains the text: 'Back to default values'.



GEIA Future plans

- **Expand the GEIA email network**
- **Update the information available from the GEIA website**
- **Update the emission reviews available from the GEIA website**
- **Develop a new database of papers and reports on emissions**
- **Start to organize a working group on emissions analyses**
- **Expand the megacities-regional-global connections, for example through the development of a few regional centers**
- **Strengthen the links between GEIA and AIMES, IGAC and iLEAPS, as well as with CIERA.**