

The ECCAD database: access to a variety of inventories of emissions for greenhouse gases and air pollutants

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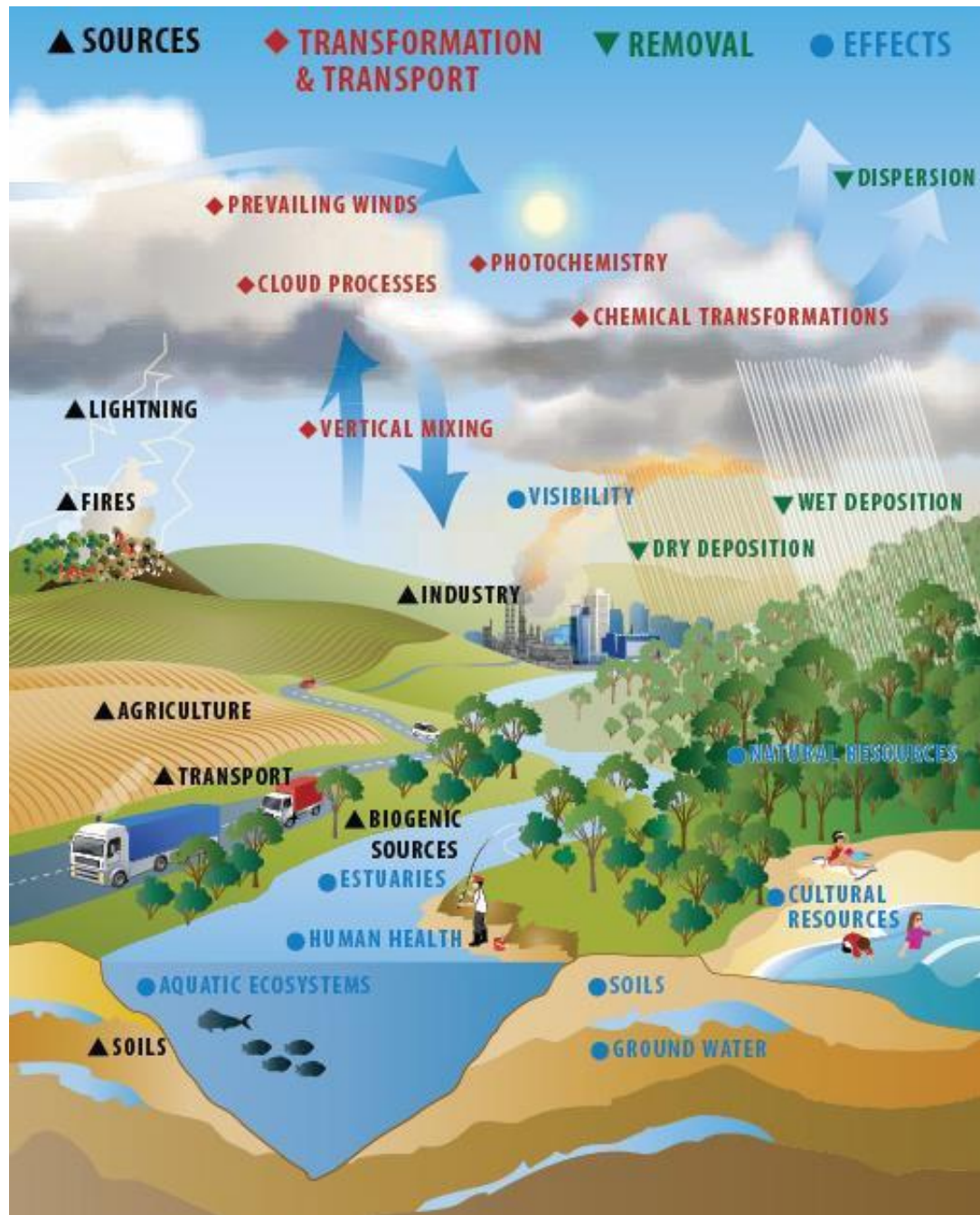
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Sciences Laboratory, Boulder, USA





Sources of air pollutants and greenhouse gases:

- Industry
- Agriculture
- Transportation
- Fires
- Soils
- Vegetation
- Oceans
- Lightning
- Volcanoes

Large diversity of sources for atmospheric pollutants

	Anthro-pogenic	Biomass burning	Biogenic/continental	Oceanic	Photo-chemistry
CH4	Major	Significant	Major	Minor	No
CO	Major	Major	Significant	Minor	Major
NOx	Major	Significant	Major	No	Minor
VOCs	Major	Major/Sign.	Major	Minor	Major/Sign.
SO2	Major	Minor	Major	No	Minor
BC/OC	Major	Major	No	No	Minor
NH3	Major	Minor	Minor	No	No
PMs	Major	Major	Major (dust)	No	Major

CH4 : methane

CO : carbon monoxide

NOx : nitrogen oxides

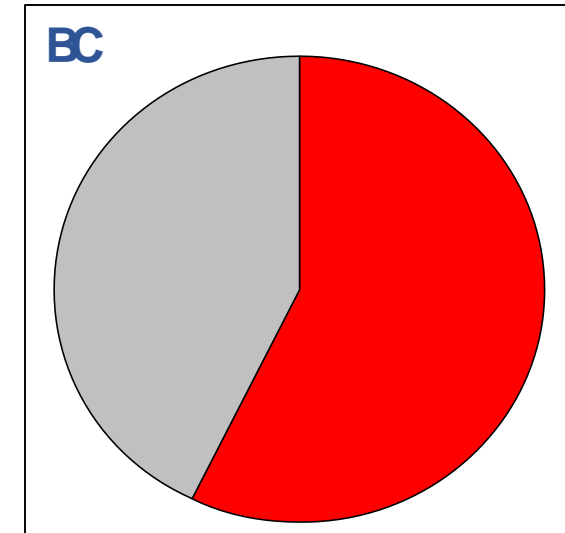
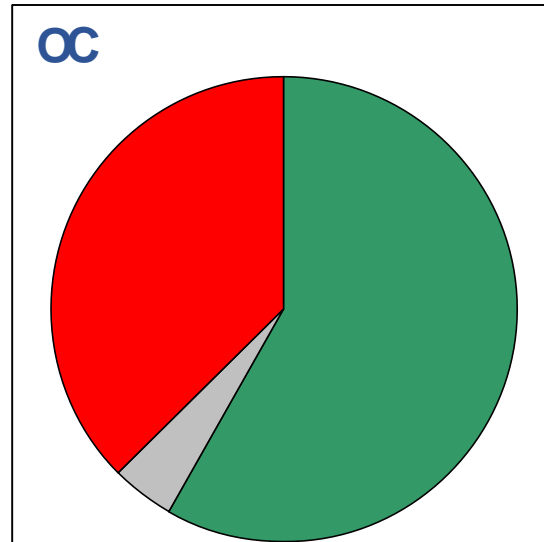
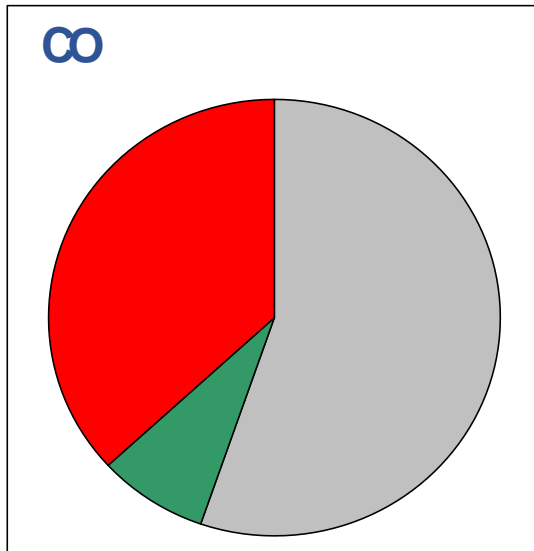
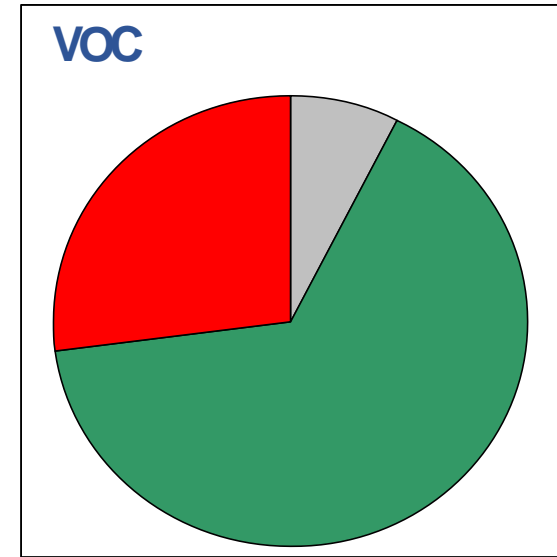
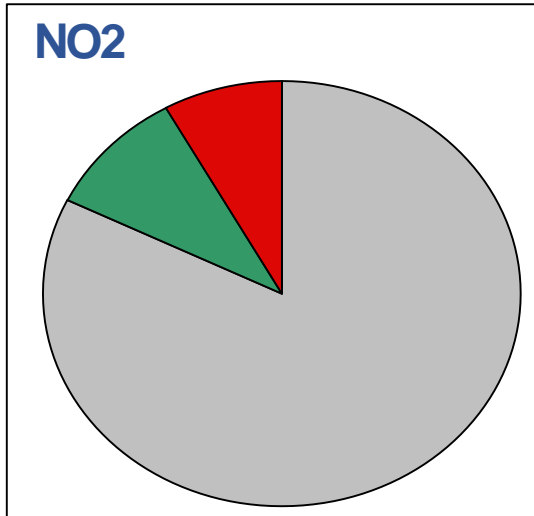
VOCs = Volatile Organic Compounds

BC : black carbon (soot) OC :

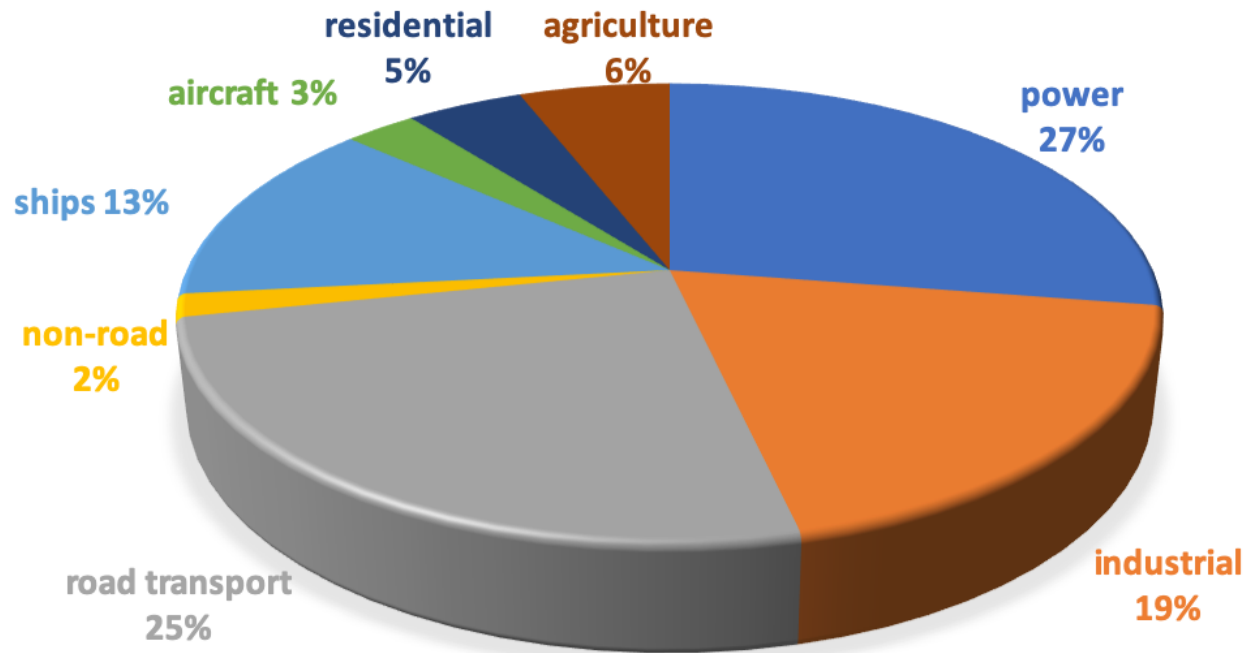
organic carbon NH3 : ammonia

PMs = particulate matter

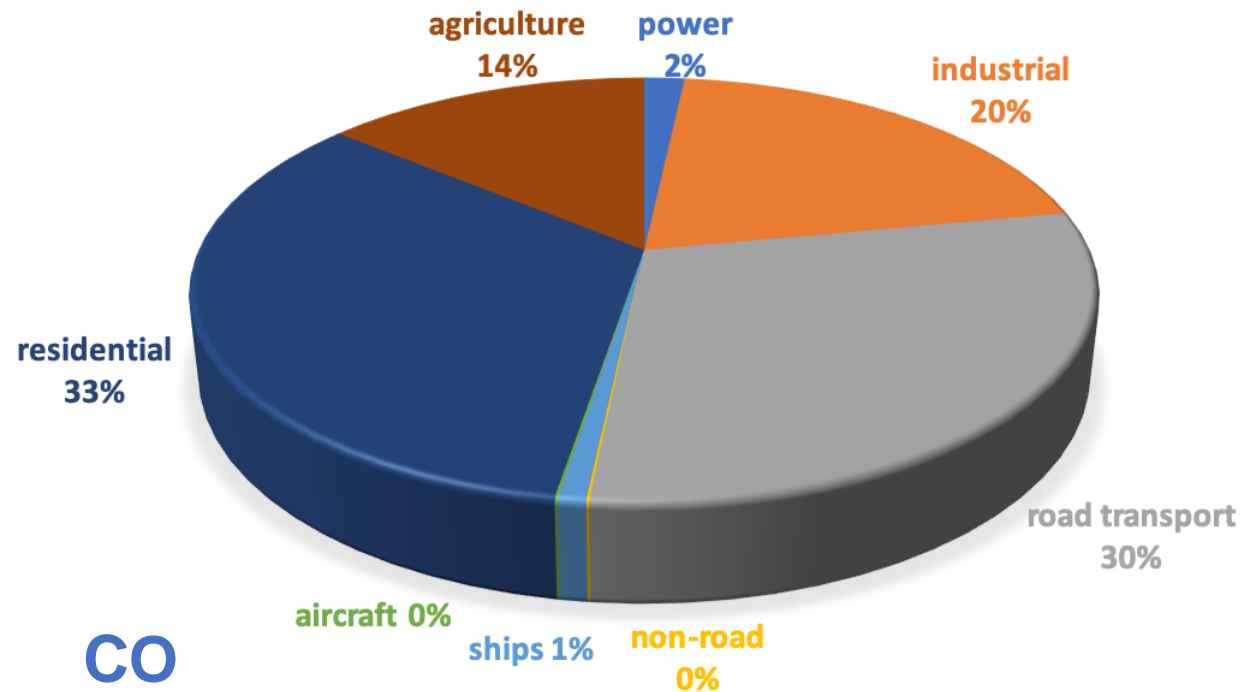
All emission sectors need to be taken into account



Anthropogenic emissions quantification for various sectors



NOx
Nitrogen oxides

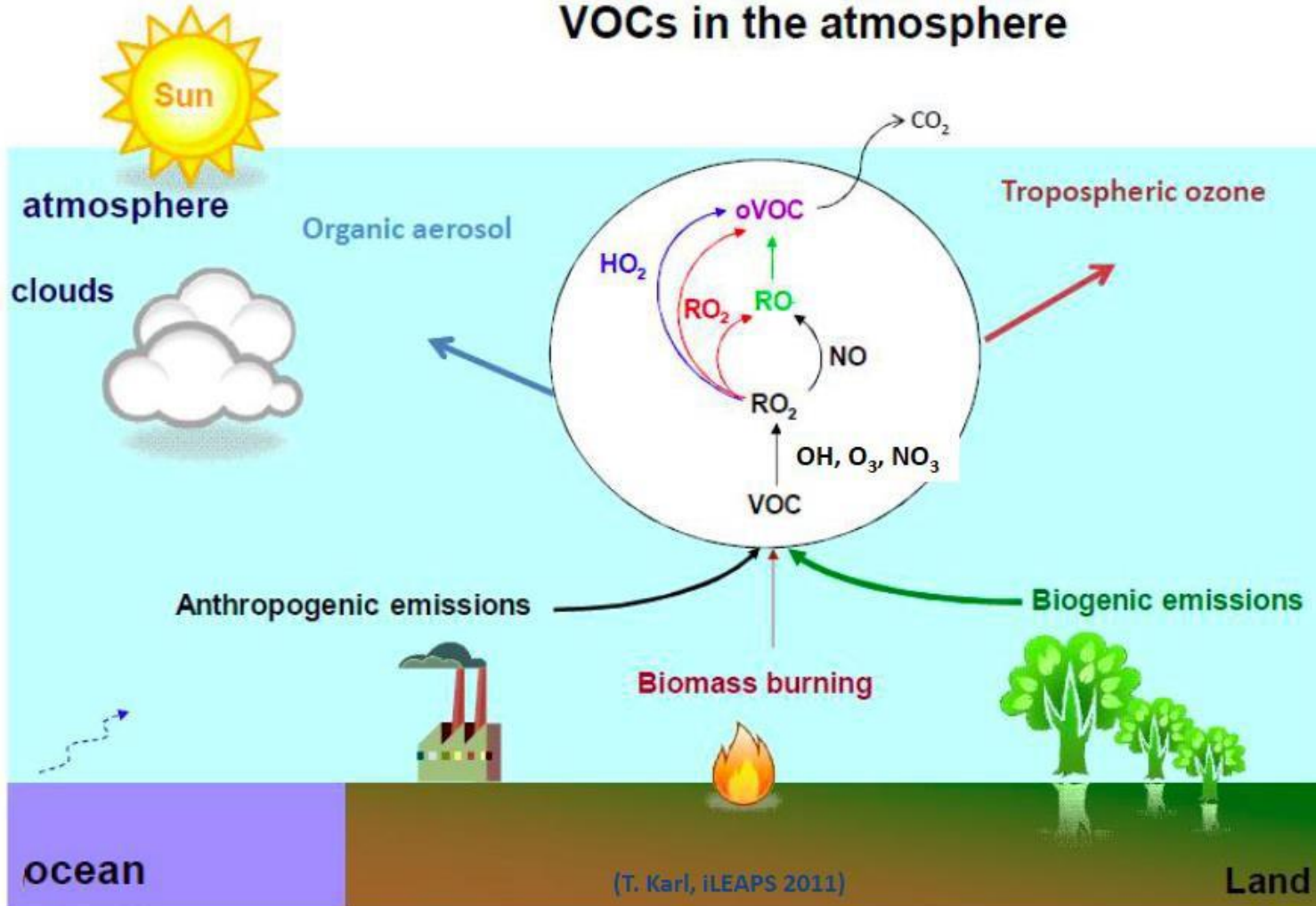


CO

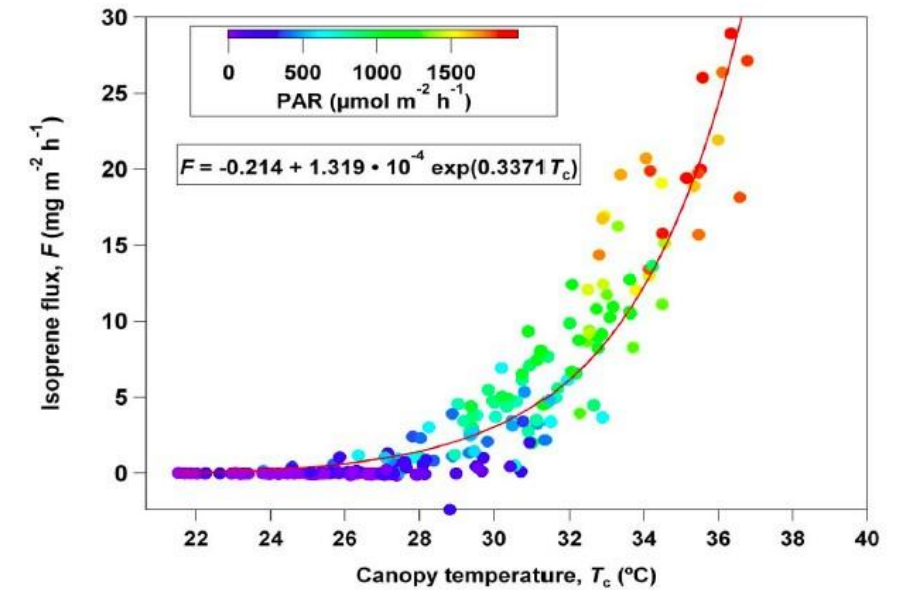
VOCs = volatile organic compounds

Anthropogenic and natural source

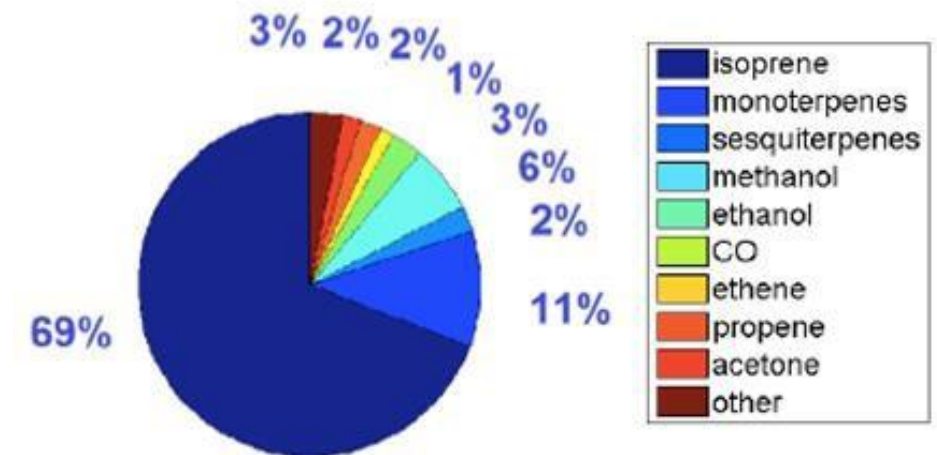
Earth system



Effects of temperature and radiation on isoprene emission



Relative composition of global BVOC emissions



Global Emissions Initiative

Brian McDonald

GEIA Co-Chair

*NOAA/Earth System Research Laboratory,
Boulder,
CO, USA*

Cathy Liousse

GEIA Co-Chair

*Laboratoire d'Aerologie
Toulouse, France*

Claire Granier

GEIA Database Manager

Paulette Middleton

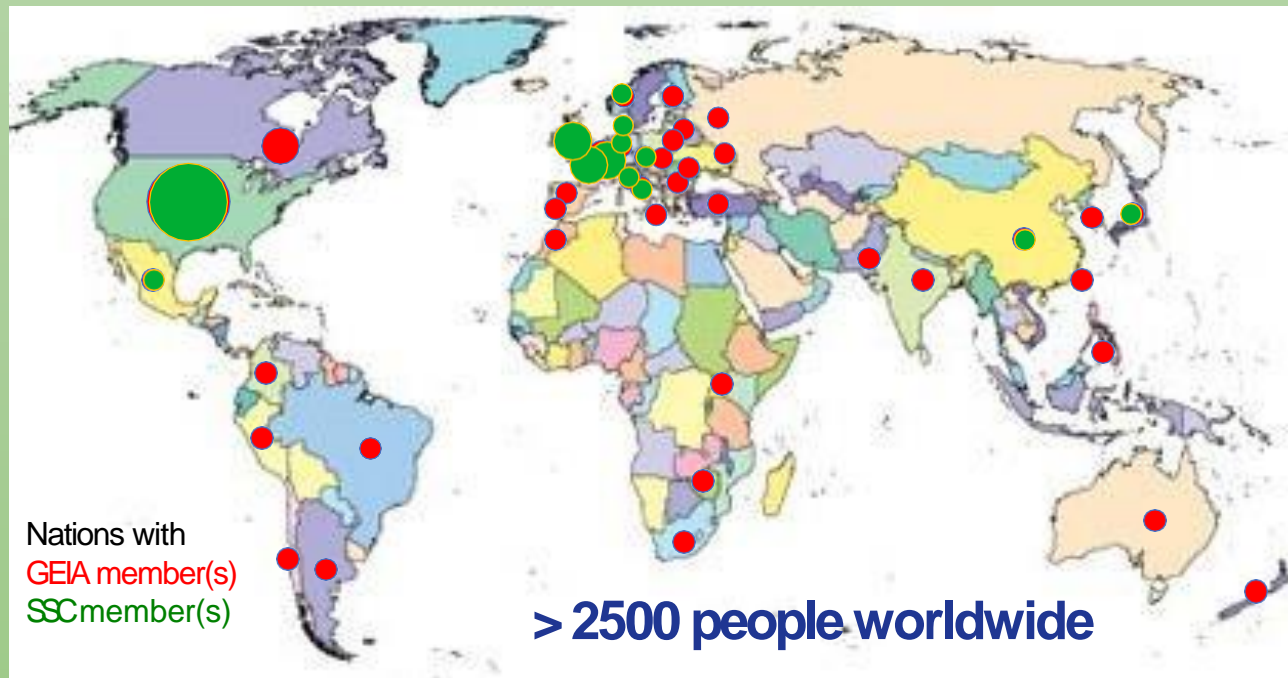
GEIA Network Manager

Panorama Pathways, Boulder, CO, USA



- Founded in 1990
- Community initiative
- Bridging science and policy
- Bringing together people, data, and tools
- Creating and communicating emissions information
- Key forum for emissions knowledge
- Serving stakeholders in rapidly evolving global society

Network



Scientific Steering Committee

Alexander Baklanov (*Switzerland*)

Beatriz Cardenas (*Mexico*)

Hugo Denier van der Gon (*The Neth.*)

Gregory Frost¹ (*USA*)

Claire Granier² (*France, USA*)

Nicolas Huneus (*Chile*)

Greet Janssens-Maenhout (*Italy*)

Johannes Kaiser (*Germany*)

Terry Keating (*USA*)

Zbigniew Klimont (*Austria*)

Catherine Liousse (*France*)

Paulette Middleton³ (*USA*)

Ute Skiba (*UK*)

Allison Steiner (*USA*)

Leonor Tarrasón¹ (*Norway*)

Erika von Schneidmesser (*Germany*)

Yuxuan Wang (*China*)

¹ Co-Chair ² Database Manager ³ Network Manager

GEIA Community

China Emissions WG

Contacts: Kebin He, Qiang Zhang, Yuxuan Wang

- Improving scientific basis for Chinese emissions
- Sharing results between Chinese research groups

VOC Emissions WG

Contacts: Erika von Schneidmesser, Hugo Denier van der Gon

- Improving global understanding of VOC emissions
- Evaluating megacity VOC emissions speciation and sources

Latin America/Caribbean (LAC) Emissions WG

Contacts: Nicolas Huneus, Laura Dawidowski, Néstor Rojas

- Developing and evaluating LAC-specific emissions inform.
- Creating LAC regional emissions database and inventory

Urban Emissions WG

Contacts: Leonor Tarrasón

- Leveraging techniques for urban emissions characterization
- Building capacity in megacities around the world

African Emissions WG

Contacts: Cathy Liousse, Mogesh Naidoo, Sekou Keita

- Create African emission databases at country/city scales
- Create a network of African experts with local experts and decision makers

ECCAD database (Emissions of Chemical Compounds & Compilation of Ancillary Data)

Developed by Sabine Darras and Hung Le Vu at the Midi-Pyrenees Observatory in Toulouse, France

- Detailed metadata with complete reference
- User-friendly tools to visualize and analyse emissions
- Download
- Data with restricted access while the data are being checked and analyzed

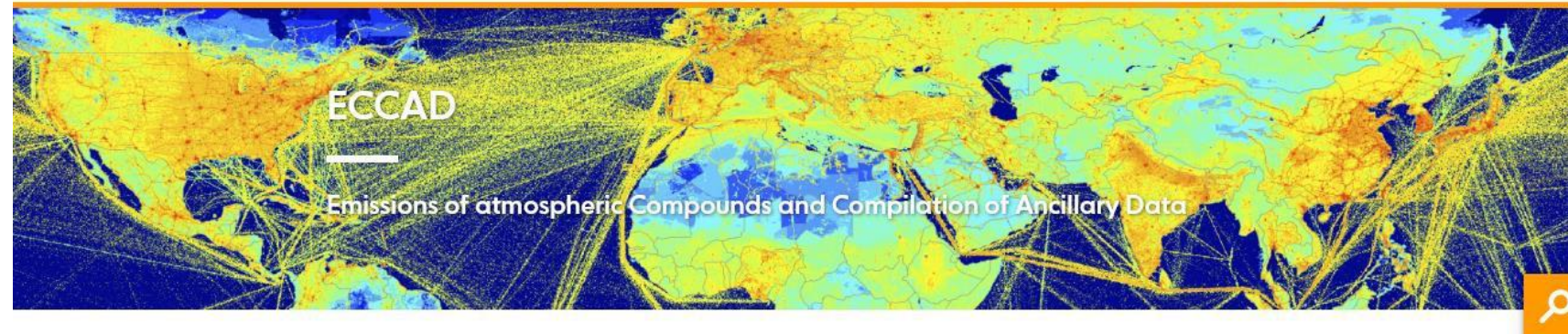
ECCAD is the official database of GEIA

<http://eccad.aeris-data.fr/>

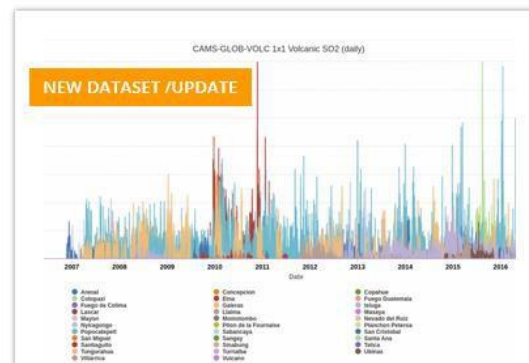


User Guide Contact us

DATA ACCESS DATA FORMAT ABOUT USERS FAQ

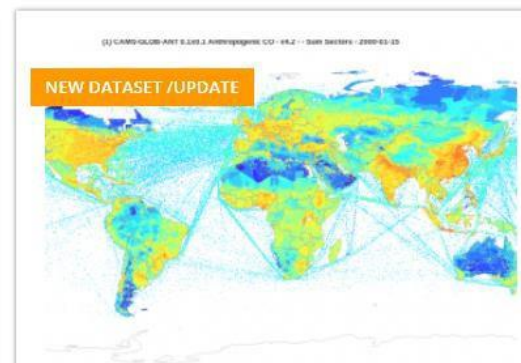


ECCAD : Making data accessible and providing tools for data analysis



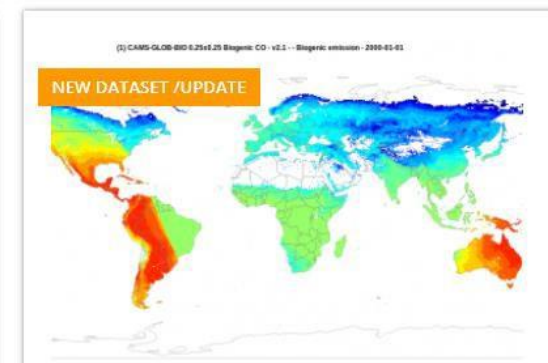
VOLCANIC EMISSIONS DATASET NOW AVAILABLE

This data-set presents volcanic gas emission data from NOVAC, the global Network for Observation



CAMS-GLOB-ANT V4.2 AND V4.2-R1.1 NOW AVAILABLE

Version v4.2 is in theory the same as v4.1 except for adding the 2020 emissions. However, due to



GLOBAL BIOGENIC DATASET UPDATED

CAMS biogenic emissions were calculated using MEGANv2.1 (Guenther et al., 2012). MEGAN is a

What you can find in ECCAD

Datasets:

- **Antropogenic emissions: current emissions, historical emissions, regional emissions**
 - IPCC/GIEC CMIP6 historical emissions (from 1750 to present)
 - RCPs IPCC/GIEC scenarios for CMIP5 (AR5, 2014)
 - SSPs IPCC/GIEC scenarios for CMIP6 (AR6, 2021)
 - Emissions for the Copernicus Atmosphere Service
 - Etc.

- **Fire emissions**

- **Natural emissions from:**
 - vegetation
 - oceans
 - volcanoes
 - termites

- **Ancillary data: population, vegetation maps, etc.**

ECCAD tools

Interactiv on-line tools

- **Map display : zoom, colors, scale range and stretching**
- **Zoom over a region**
- **Arithmetic between two grids**
- **Time series at one location and over geographical Bounding box**

Pre-processed data

- **Regional maps : continental, countries, other regions**
- **Time series and pie charts : per sector and per region**
- **Time series comparison between inventories**

ECCAD catalogue



ECCAD: Emissions of atmospheric Compounds and Compilation of Ancillary Data

Making data accessible and providing tools for data analysis

English

Claire ↗

Catalogue Data Tools User ?

Inventories Species Sectors Versions / Scenarios Temporal Geographical Metadata

Q dataset name

CAMS-GLOB-TEMPO Global 0.1° Temporal profiles 2000-2020 Daily	CAMS-GLOB-BIO Global 0.25° 0.5° Biogenic 2000-2020 Monthly	CAMS-GLOB-SHIP Global 0.1° Anthropogenic 2000-2020 Daily	CAMS-GLOB-OCE Global 0.5° Oceanic 2000-2020 Daily
CAMS-GLOB-TERM Global 0.5° Termites 2000-2020 Monthly	CAMS-GLOB-SOIL Global 0.5° Soil 2000-2018 Monthly	CAMS-GLOB-ANT Global 0.1° Anthropogenic 2000-2022 Monthly	CAMS-GLOB-AIR Global 0.5° Anthropogenic 2000-2022 Monthly
CAMS-GLOB-VOLC Global 1° Volcanic 2005-2019 Daily	CAMS-REG-TEMPO Europe 0.1° Temporal profiles 2000-2020 Daily	CAMS-REG-AP Europe 0.1° 6km Anthropogenic 2000-2020 Yearly	CAMS-REG-GHG Europe 0.1° 6km Anthropogenic 2000-2017 Yearly
EDGARv4.3.2 Global 0.1° Anthropogenic 1970-2012 Yearly	EDGARv4.3.2-monthly Global 0.1° Anthropogenic 2010-2011 Monthly	EDGARv5 Global 0.1° Anthropogenic 1970-2015 Yearly	EDGARv5-monthly Global 0.1° Anthropogenic 2015-2015 Monthly
EDGARv4.tox1 Global 0.1° Anthropogenic 1970-2008 Yearly	EDGARv6 Global 0.1° Anthropogenic 2000-2022 Monthly	ECLIPSE-V6 Global 0.5° Anthropogenic 1990-2050 Yearly	DACCIWA Africa 0.1° Anthropogenic 1990-2015 Yearly
DACCIWA2	HTAPv2	IASB-TD-OMI	CEDS

CAMS Global anthropogenic emissions: CAMS-GLOB-ANT

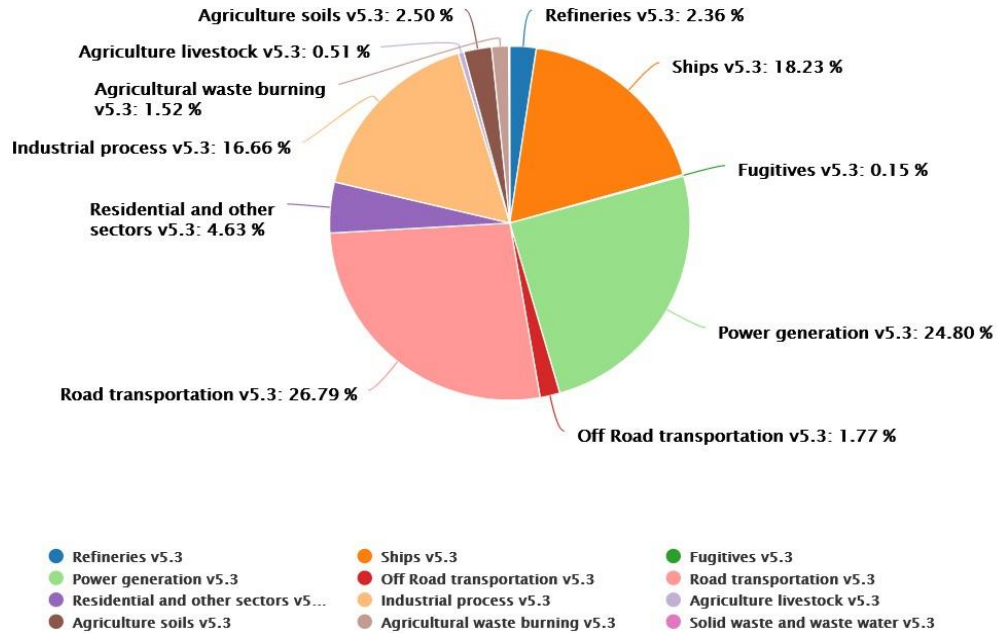
Developed at Laboratoire d'Aerologie, Toulouse, France (Antonin Soulié, Claire Granier, Sabine Darras, Thierno Doumbia) – See Antonin Soulie's poster

- **Based on existing inventories and extrapolated to more recent years**
- **2000-2022, monthly averages**
- **0.1x0.1 degree spatial resolution**
- **Emissions for CH₄, CO, NO_x, SO₂, NMVOCs, NH₃, BC, OC and 25 individual VOCs**
- **Formatted for direct use in chemistry-climate models**

Example of tools using the CAMS anthropogenic emissions – NO_x for year 2022

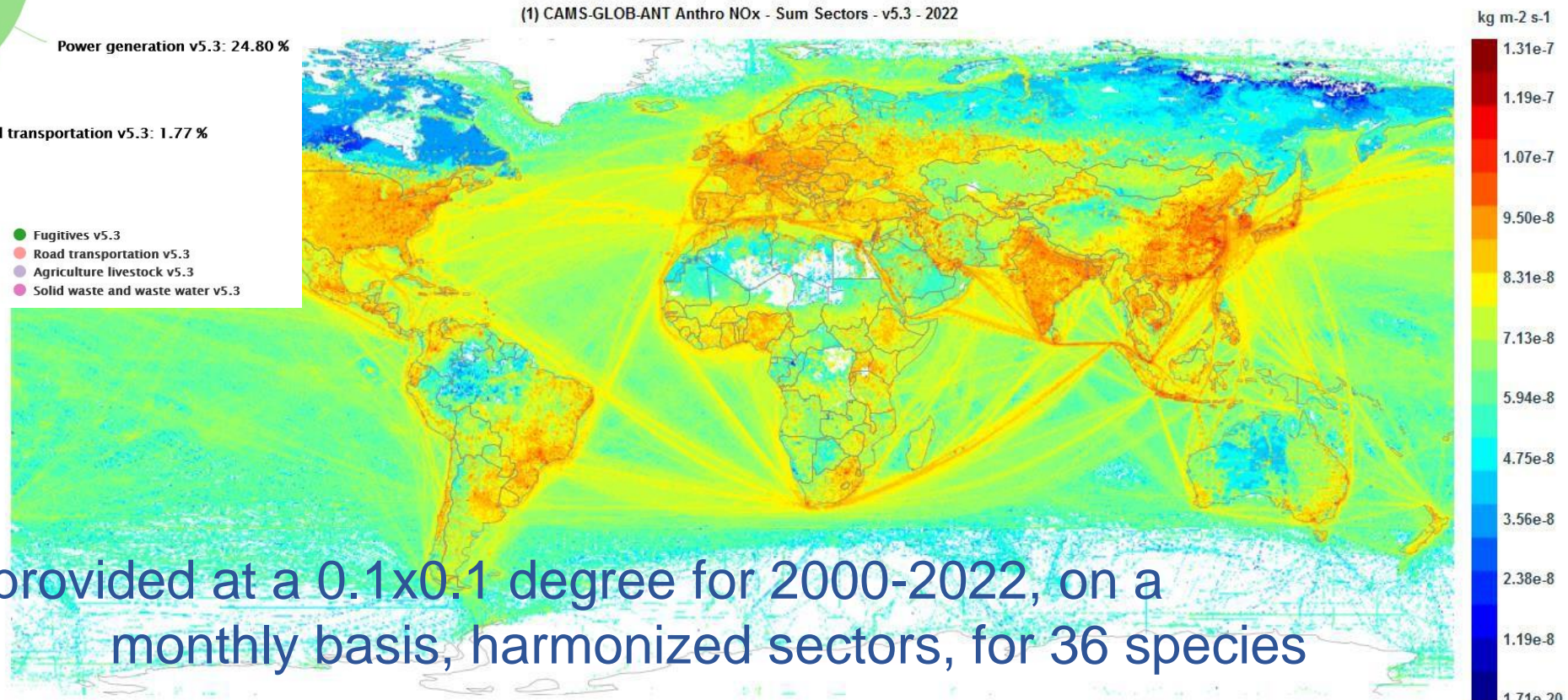
CAMS-GLOB-ANT Anthro NO_x v5.3 monthly

monthly (2000-2022)



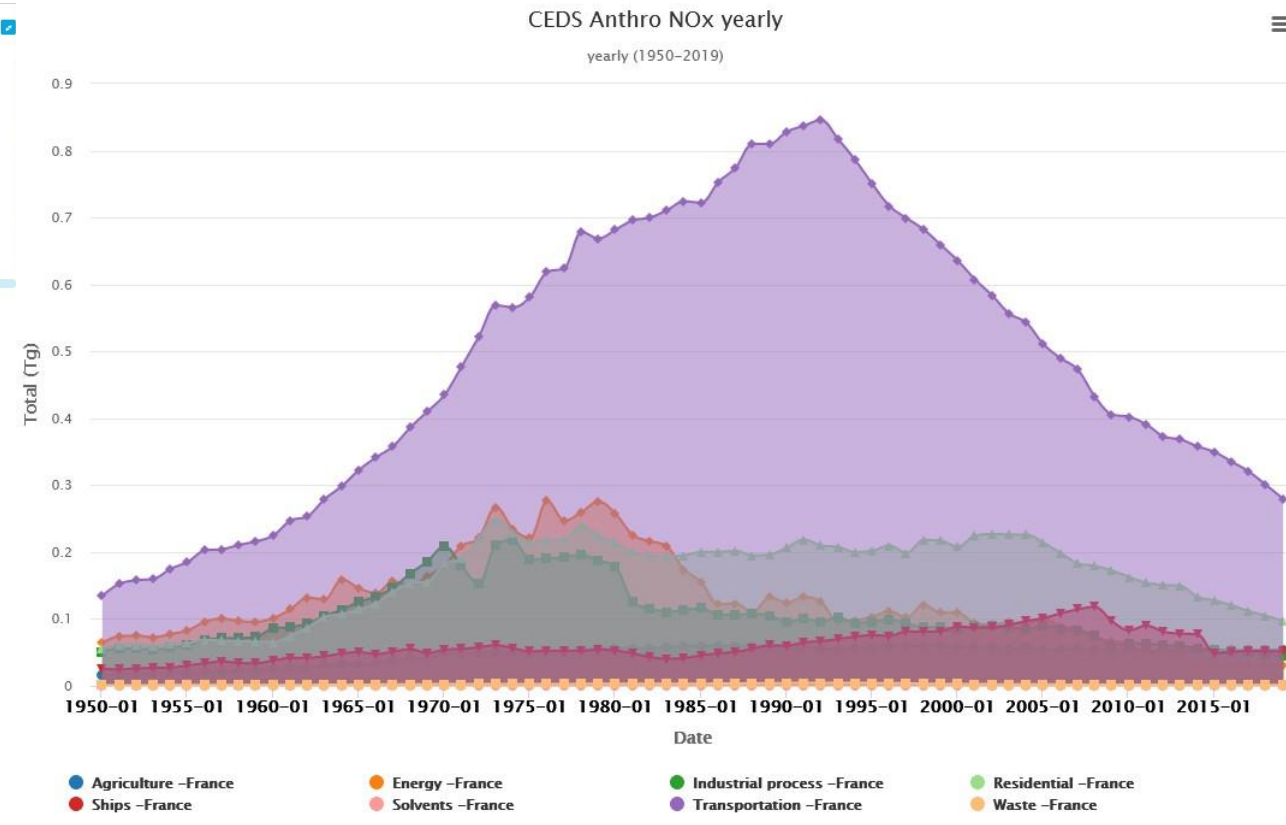
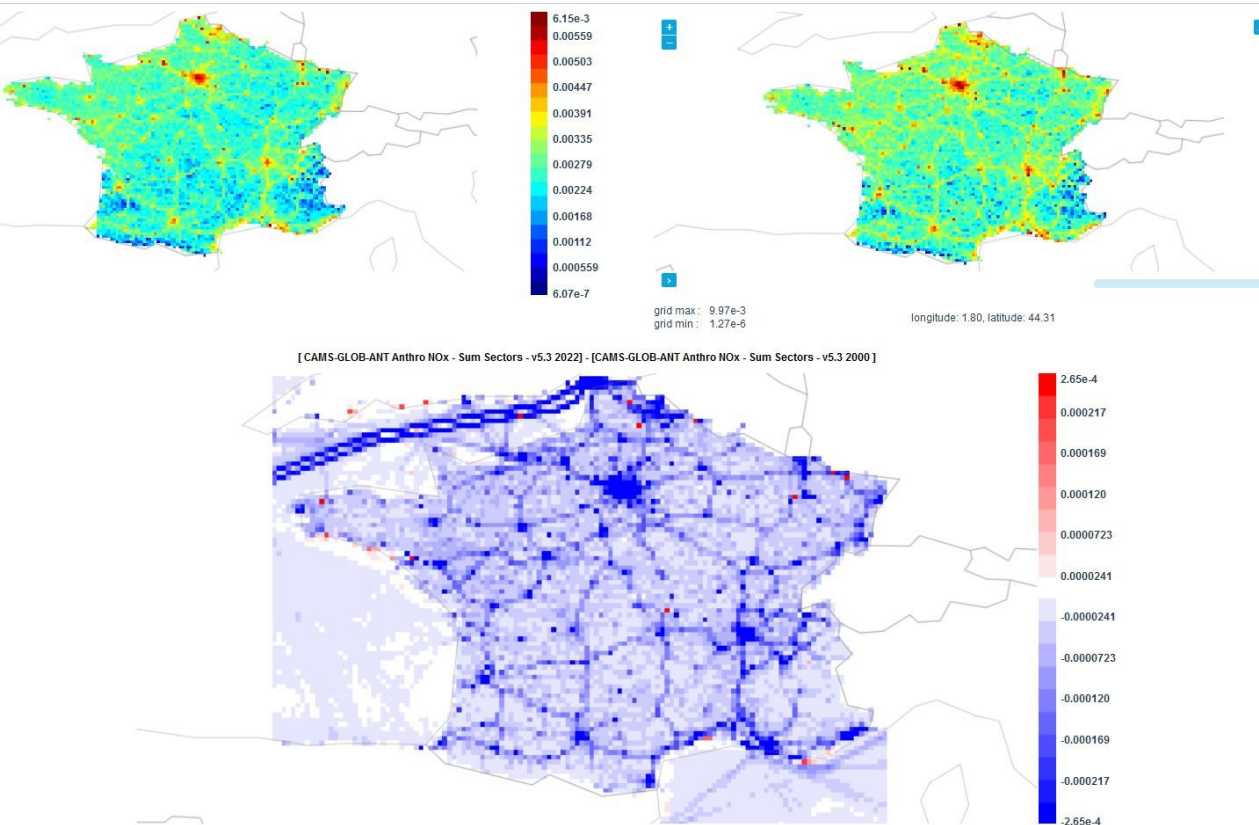
Contribution from each sector

(1) CAMS-GLOB-ANT Anthro NO_x - Sum Sectors - v5.3 - 2022



Emissions are provided at a 0.1x0.1 degree for 2000-2022, on a monthly basis, harmonized sectors, for 36 species

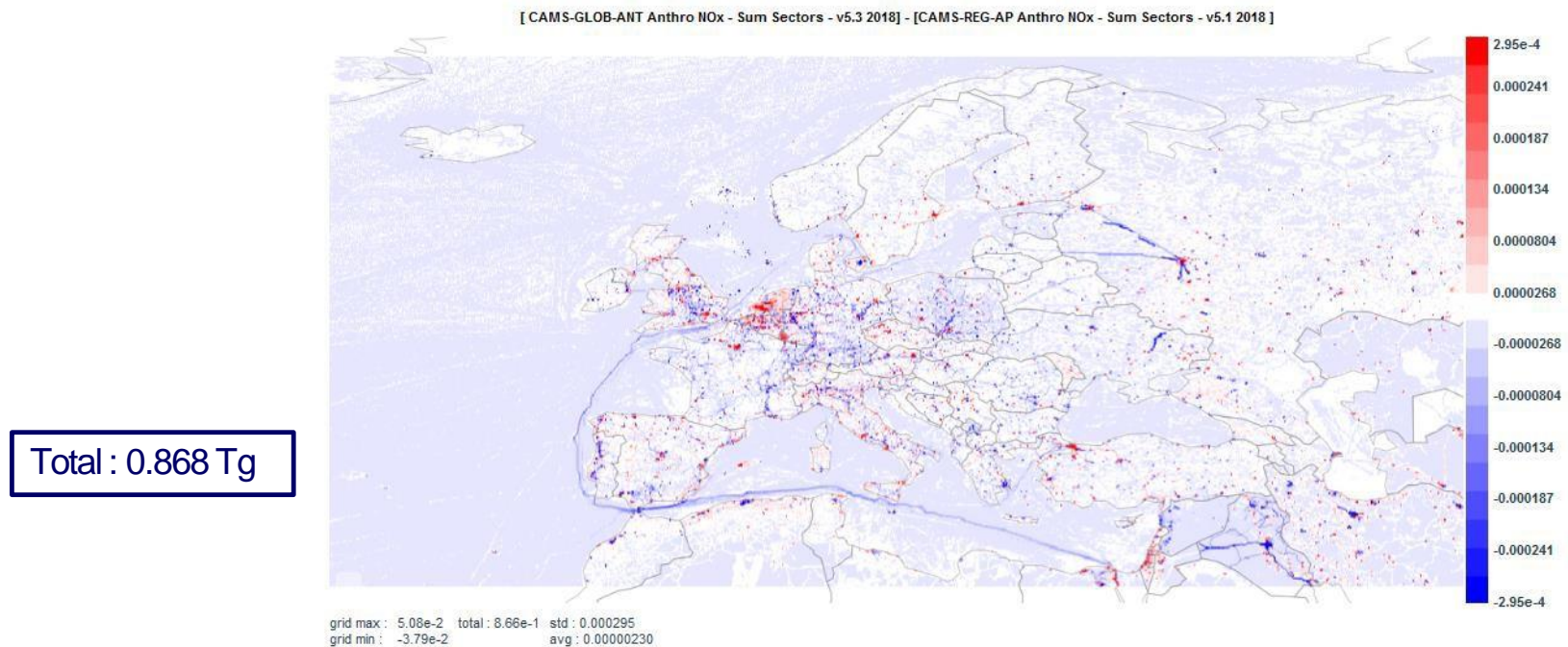
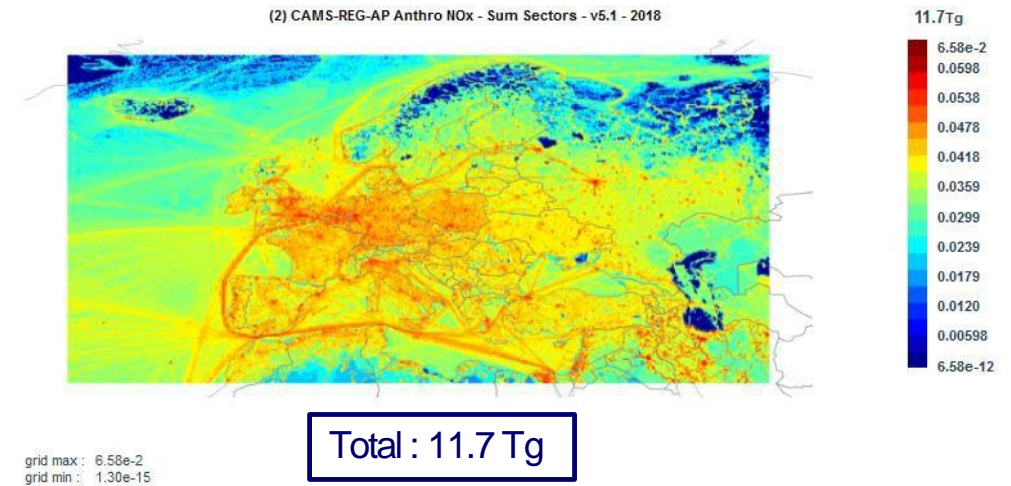
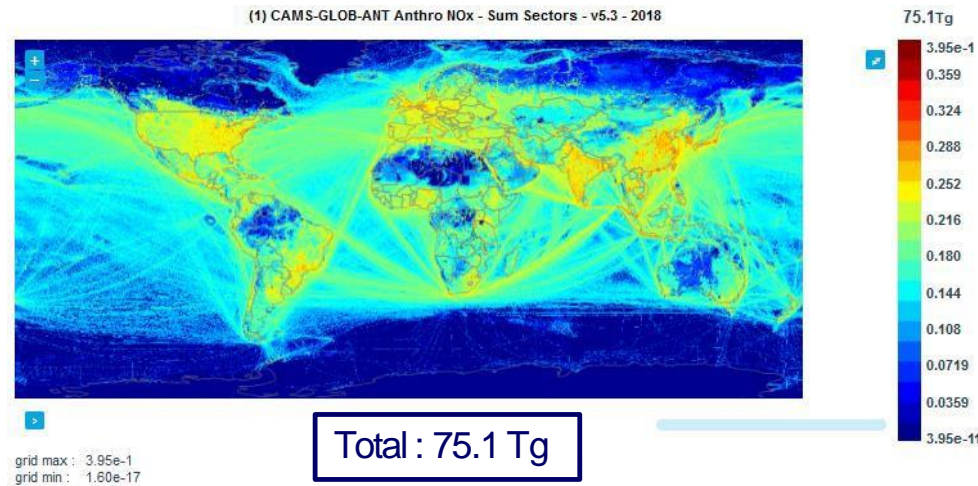
CAMS anthropogenic emissions – NOx for year 2022 and 2000



Example of high resolution map for France

Example of time series

CAMS European regional air pollutant and greenhouse gases emissions

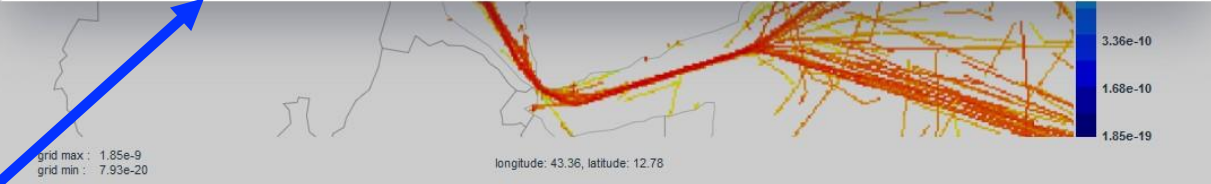
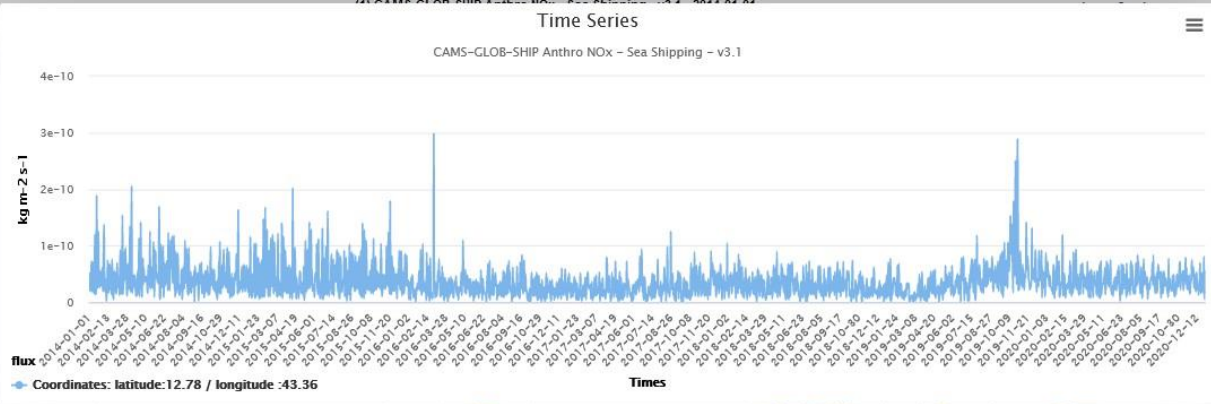


[download netcdf file](#)

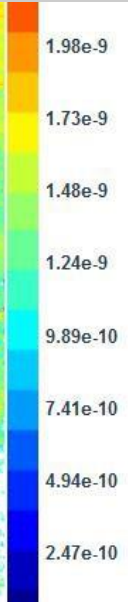
Map Compare

CAMS ship emissions: CAMS-GLOB-SHIP

(1) CAMS-GLOB-SHIP Anthro NOx - Sea Shipping - v3.1 - 2014



Time series at location



Emissions are provided at a 0.1x0.1 degree for 2000-2018, on a daily basis

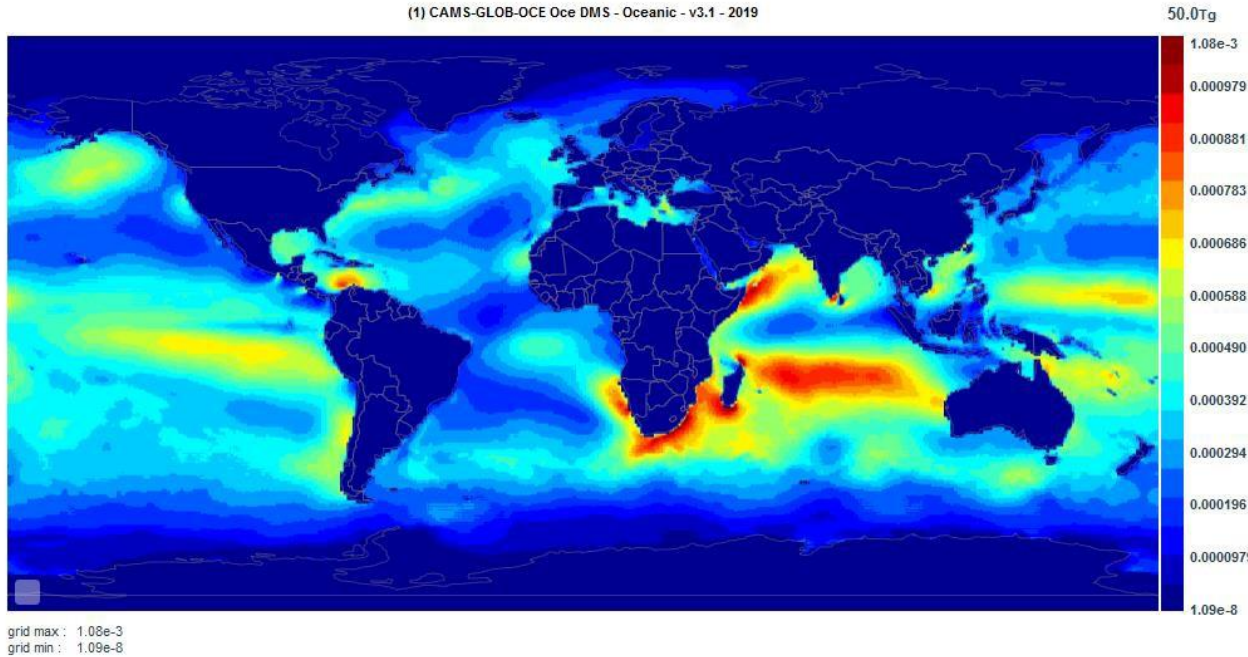
Oceanic emissions: CAMS-GLOB-OCE

Emissions of DMS, OCS and halogens (CHBr_3 , CH_3I , CH_2Br_2)

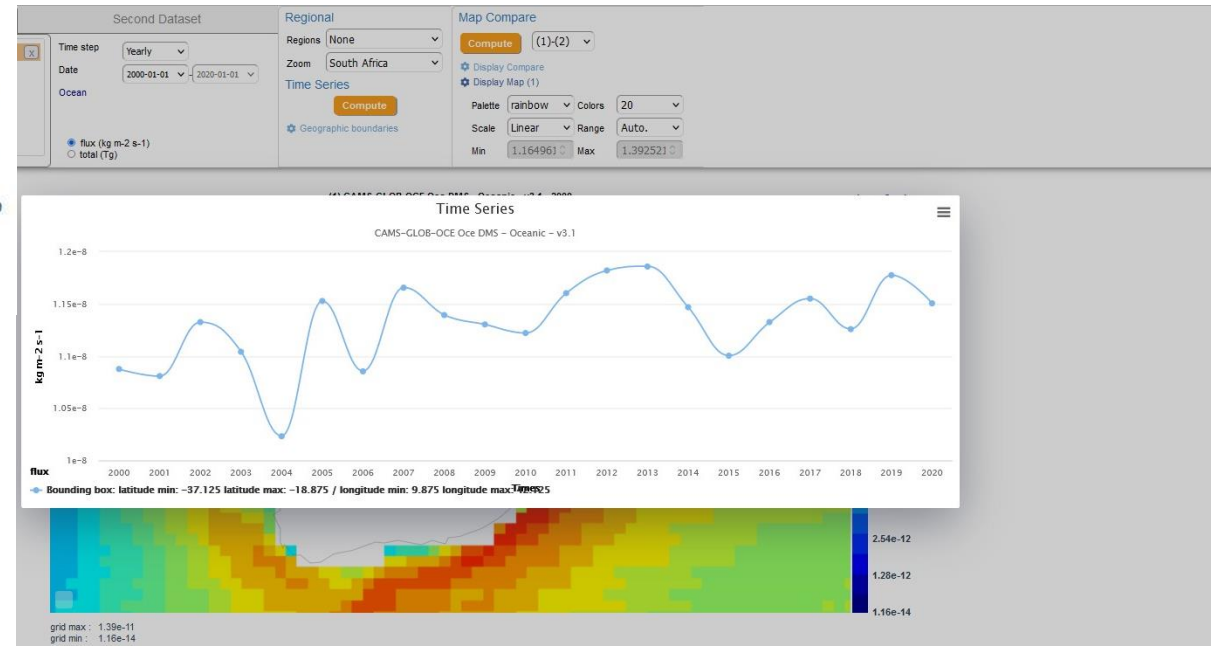
-> based on a climatology concentrations in sea water measured in different oceans

+ ECMWF meteorology

(1) CAMS-GLOB-OCE Oce DMS - Oceanic - v3.1 - 2019



Time series over South Africa region



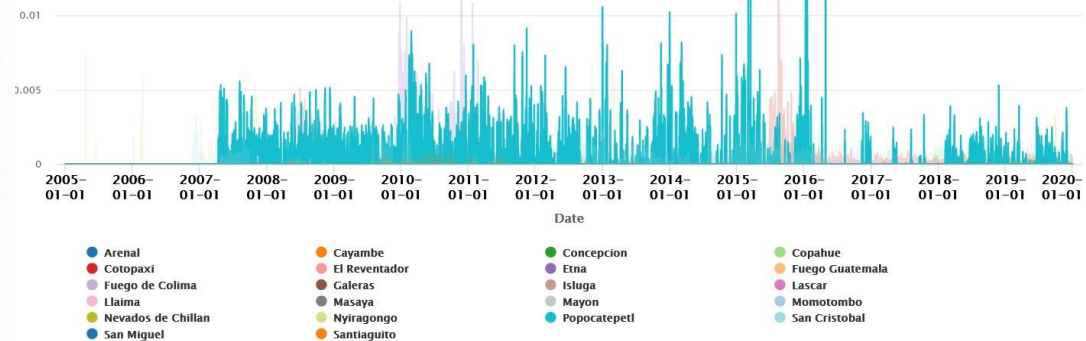
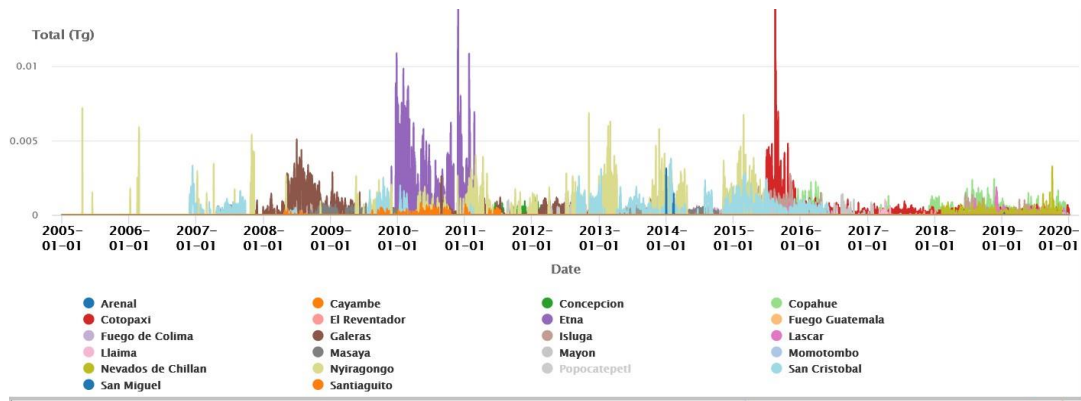
DMS: 2000-2015, 0.5x0.5 degree, daily

OCS: avg for 2002-2014, 0.1°x0.1°, monthly

Halogenes: 2000-2015, 0.5x0.5, daily

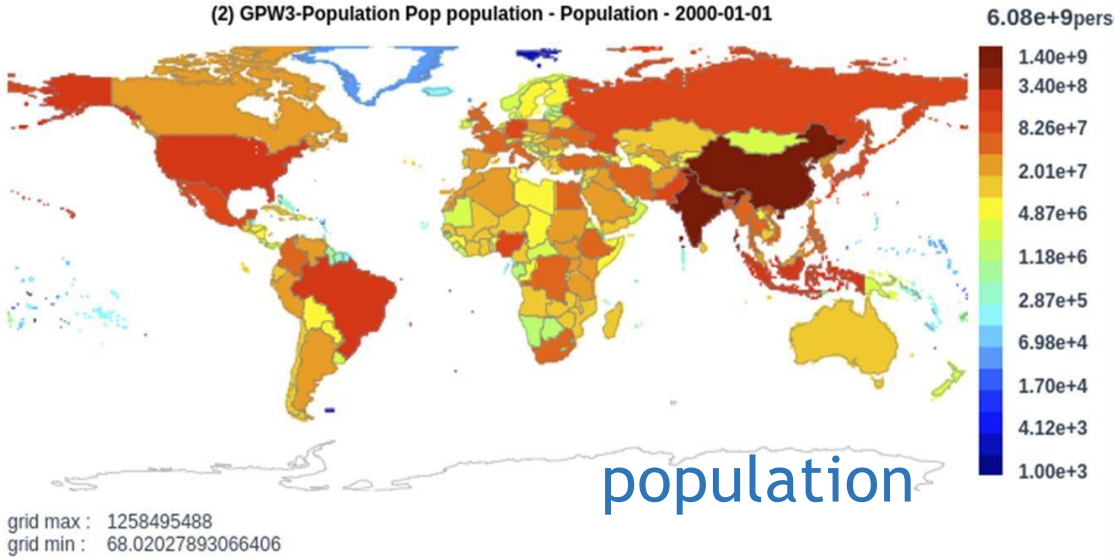
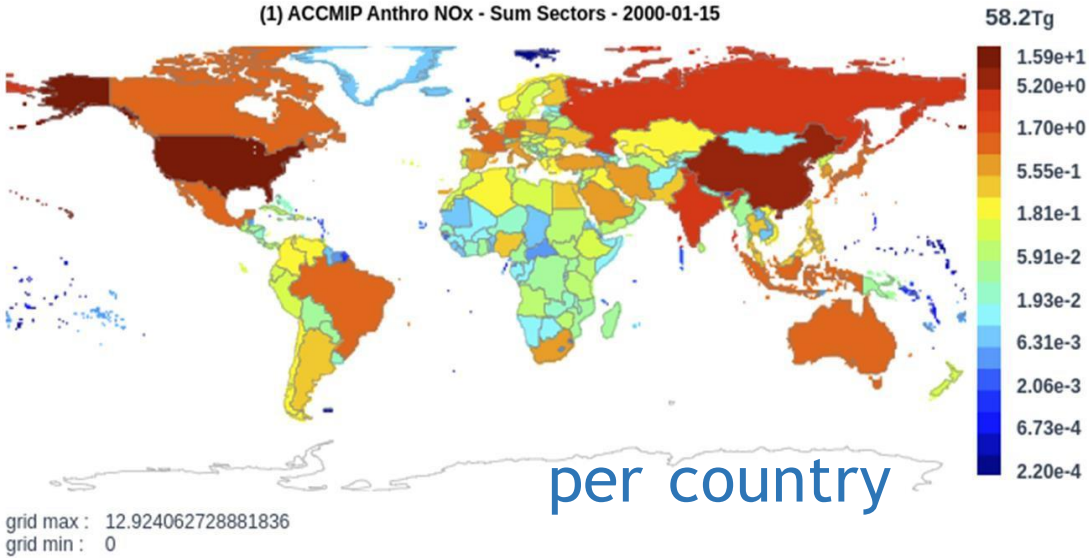
Volcanic emissions: CAMS-GLOB-VOLC

SO₂ emissions from continuously degassing volcanoes
Observations from the NOVAC network

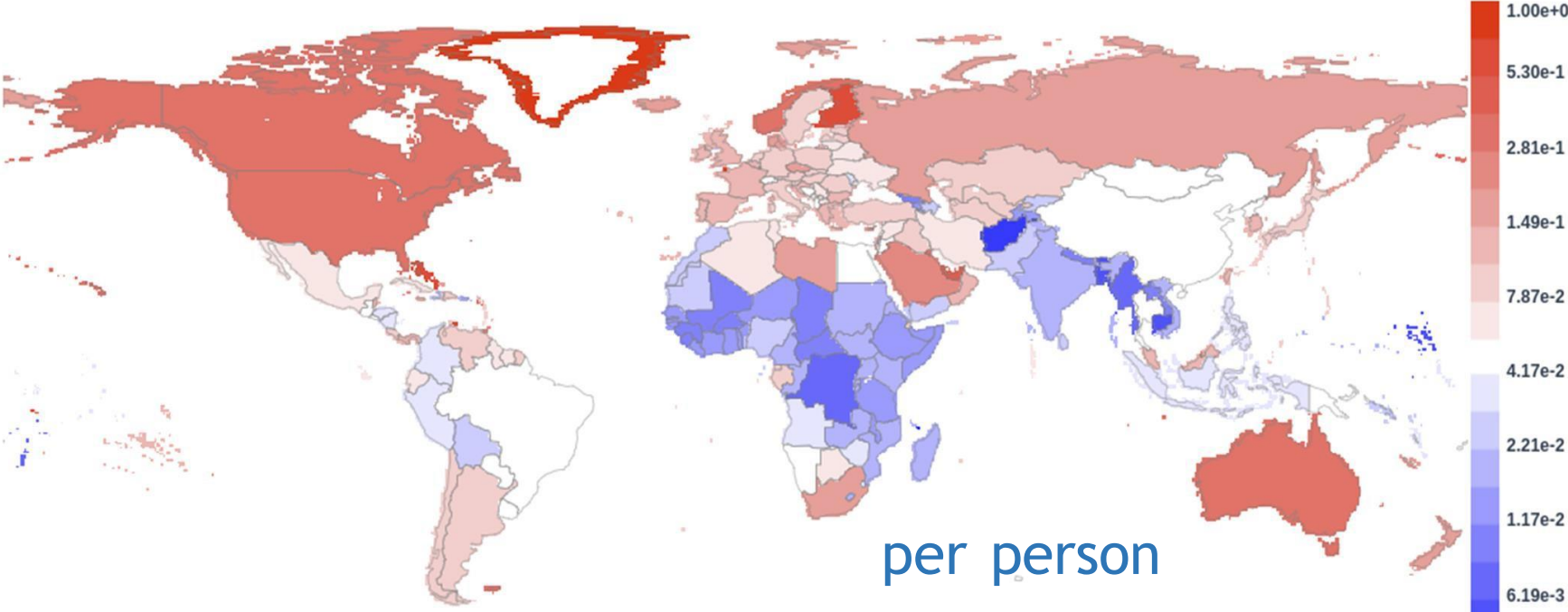


Daily times series 2005-2020 emissions from various volcanoes

NOx Emissions per country and per person

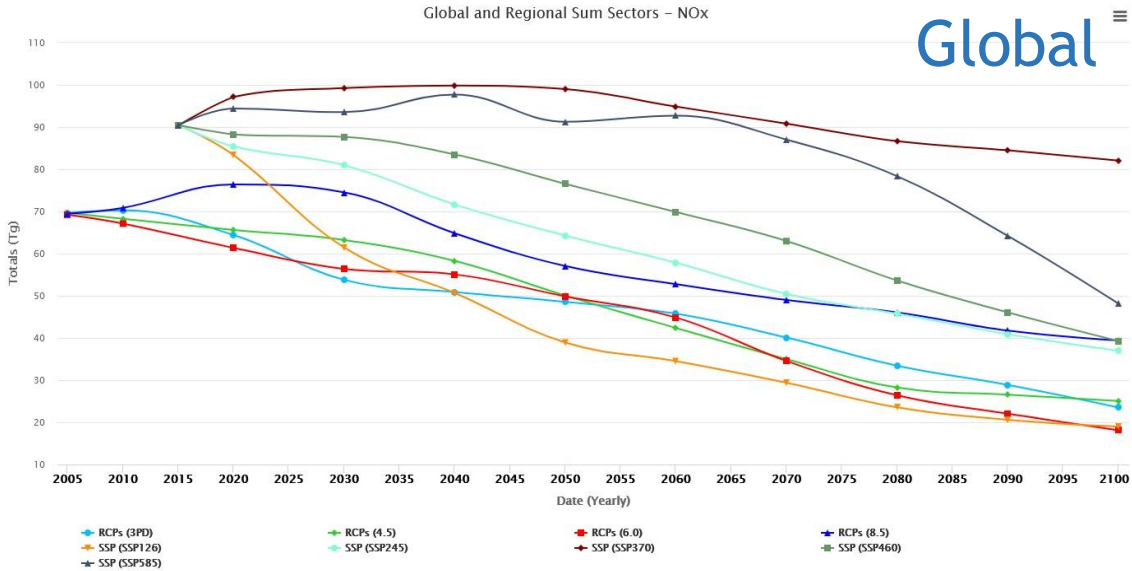


[ACCMIP Anthro NOx - Sum Sectors - Sum Sectors - 2000-01-15] / [GPW3-Population Pop population - Population - Population - 2000-01-01]

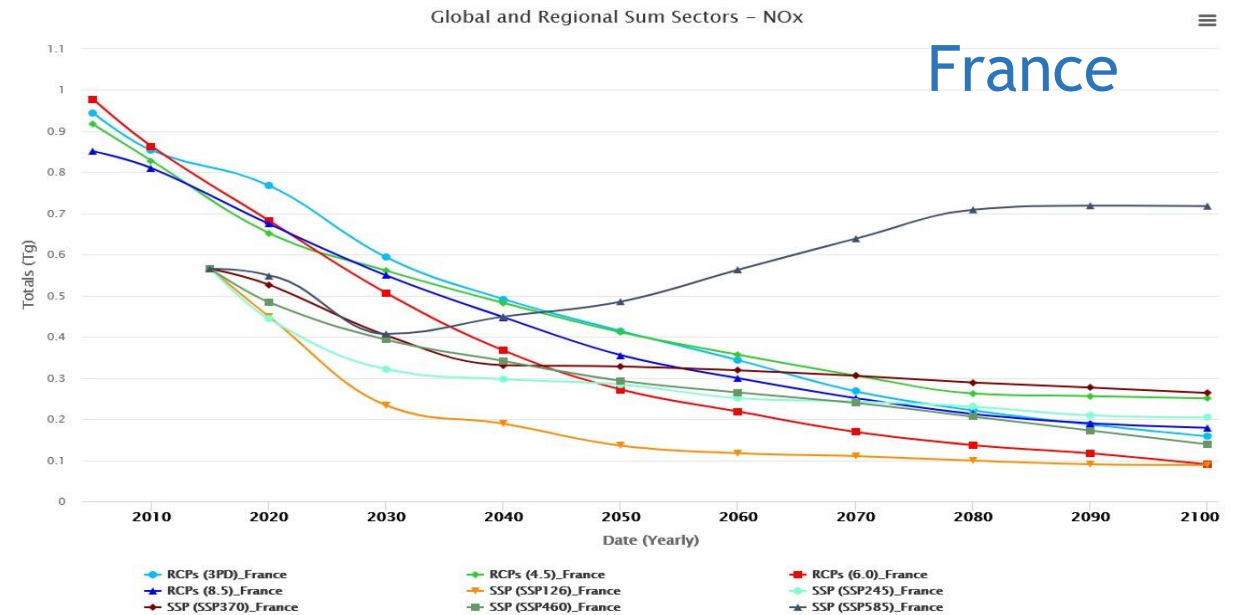
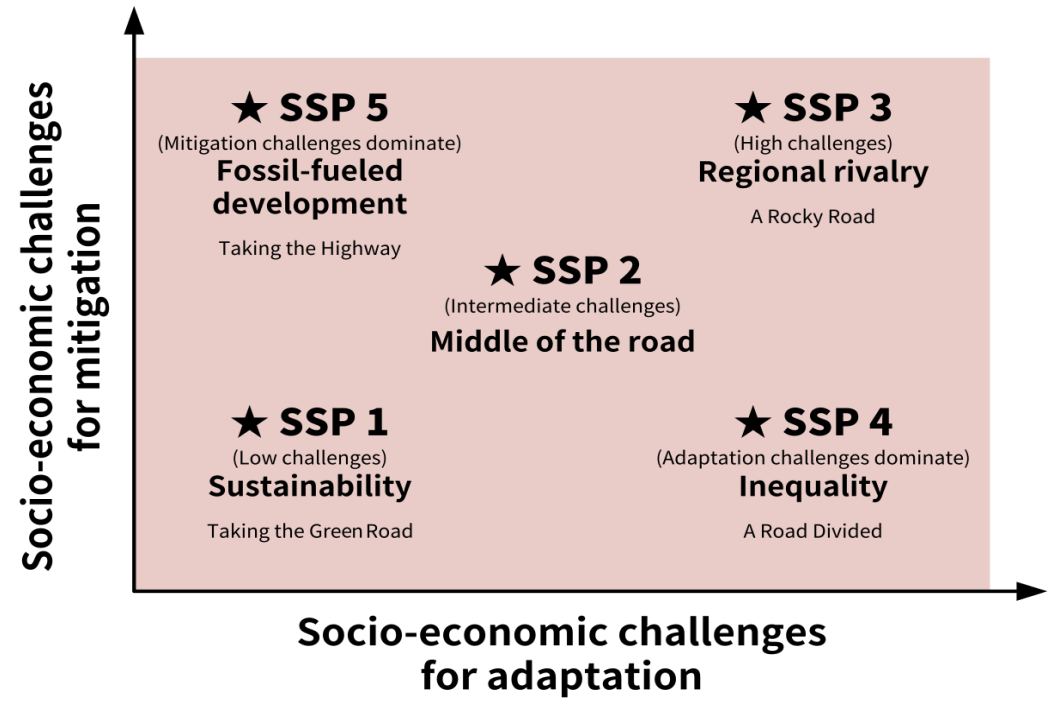


SSPs and RCPs are on ECCAD and can be compared

NOx futur emissions global and per region



Time series for NOx 2005 - 2100 totals
For the RCPs and SSPs



Summary

- High quality emissions information is critical to understand the atmosphere and make good decisions about how to manage it
- An easy access to all datasets is essential for understanding the causes of climate and air composition changes
- The GEIA international project brings together people, data and tools and organizes activities to discuss, develop and evaluate emissions
- Most publicly available inventories are accessible through the ECCAD database
- Training on the ECCAD database can be arranged through videoconferences (contact me if you are interested)

Thank you for your attention

Questions, comments:

Send me an email: sabine.darras@obs-mip.fr