Recommended dataset of Anthropogenic emissions for use in AEROCOM

Frank Dentener, Julian Wilson
(Climate Change Unit, IES, JRC, Italy)

Tami Bond (U. Washington, USA)

Judith Holzemann (MPI Hamburg, Germany)

Janusz Cofala (IIASA, Austria)

EUROPEAN COMMISSION
JOINT RESEARCH CENTRE

Goal:
To provide a single recommended data set for the year **2000**
of anthropogenic aerosol and precursor gas.

Large scale biomass burning:
Judith Hoelzemann, GWEM: a .5x.5 resolution, monthly dataset for the year **2000**, combining GLOBSCAR satellite data, with MODIS Landcover and with LPJ vegetation model

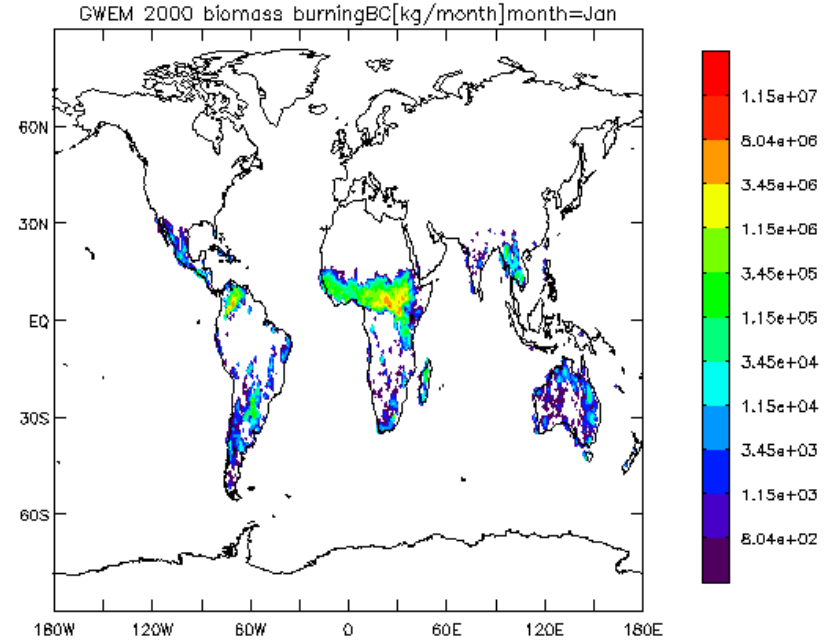
Fossil fuel related emissions:
Tami Bond: A technology based global inventory of black and organic carbon emissions from combustion. Base year **1996**.

SO2 emissions:
Janusz Cofala: Country based SO2 emissions for the year **2000**, using RAINS, gridded according the EDGAR3.2 1995 distribution (FD).

OTHER anthropogenic emissions (if needed):
use EDGAR 3.2 1995. Natural emissions (e.g. Volcanoes) conform GEIA.
Volcanoes. Andres scaled to recommended global amount of 8 Tg S/yr.

Large scale biomass burning:
Judith Hoelzemann, GWEM: a 0.5x0.5 resolution,
monthly data set for the year **2000**, GWEM-1.01 version
usingMODIS-MLCCA landcover (data from 15 /10/2000 - 15/10/2001)
Combining GLOBSCAR satellite data, and a vegetation model.
Paper submitted to JGR: The global Wildfire emissions model GWEM:
a new approach with global area burnt satellite data.
E-mail: hoelzemann@dkrz.de

Global total [Tg]:
OC 27.6
EC 3.65
Compare to estimate of T. Bond 'open burning':
OC 25.05
BC 3.29
*(*Similar emission factors, but climatological amounts burnt)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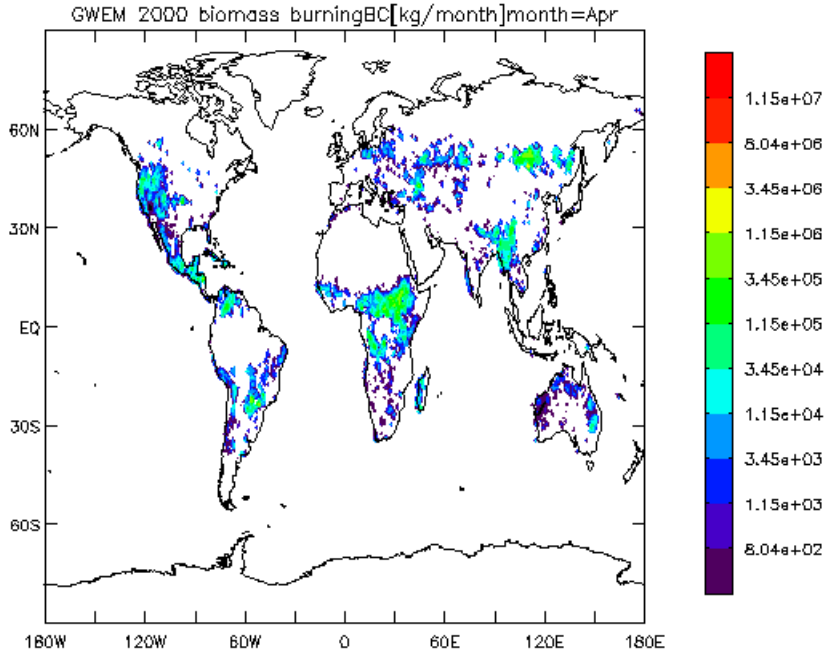
60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
1.15e+07
8.04e+06
3.45e+06
1.15e+06
3.45e+05
1.15e+05
3.45e+04
1.15e+04
3.45e+03
1.15e+03
8.04e+02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EQ
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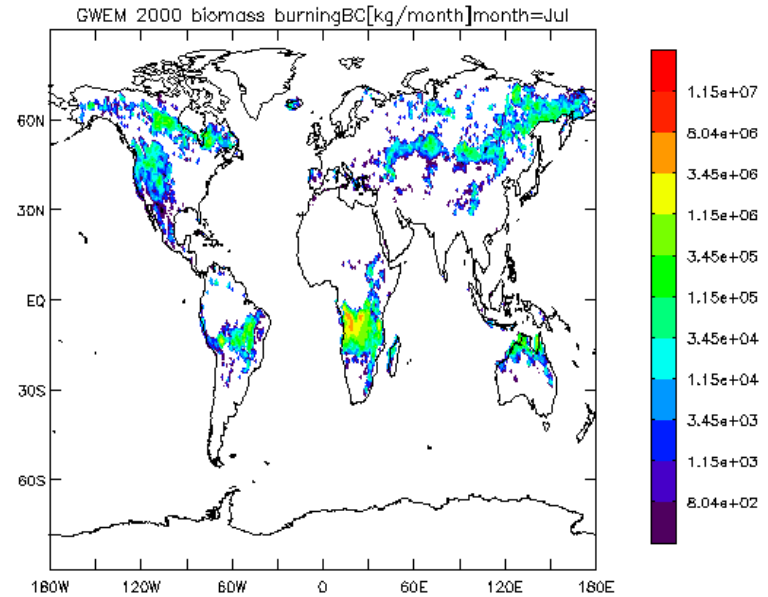
60S
180W
120W
60W
0
60E
120E
180E
1.15e+07
8.04e+06
3.45e+06
1.15e+06
3.45e+05
1.15e+05
3.45e+04
1.15e+04
3.45e+03
1.15e+03
8.04e+02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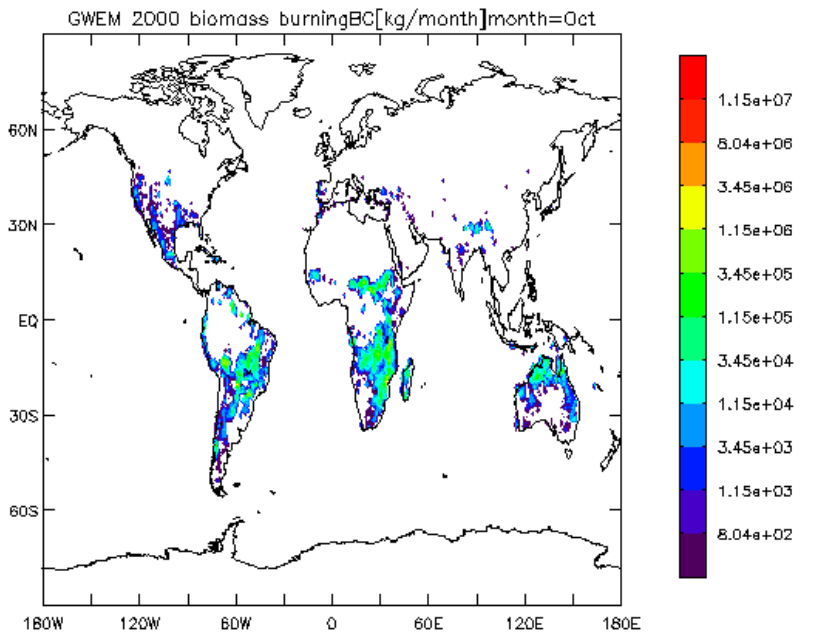
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
1.15e+07
8.04e+06
3.45e+06
1.15e+06
3.45e+05
1.15e+05
3.45e+04
1.15e+04
3.45e+03
1.15e+03
8.04e+02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60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
1.15e+07
8.04e+06
3.45e+06
1.15e+06
3.45e+05
1.15e+05
3.45e+04
1.15e+04
3.45e+03
1.15e+03
8.04e+02

Fossil fuel related emissions:

Tami Bond: A technology based global inventory of black and organic carbon emissions from combustion. Acronym SPEW.

Base year **1996**.

Submitted to JGR.

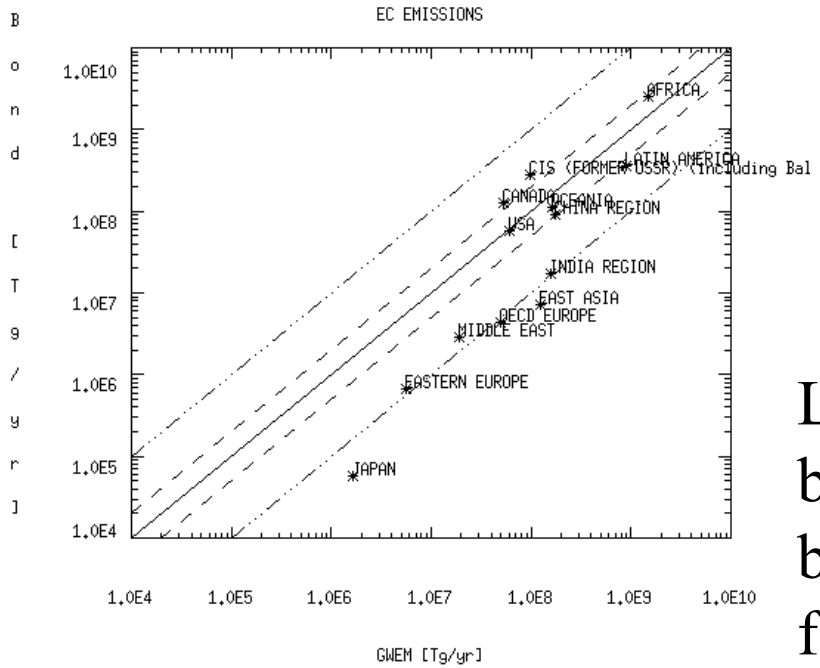
E-mail: yark@u.washington.edu

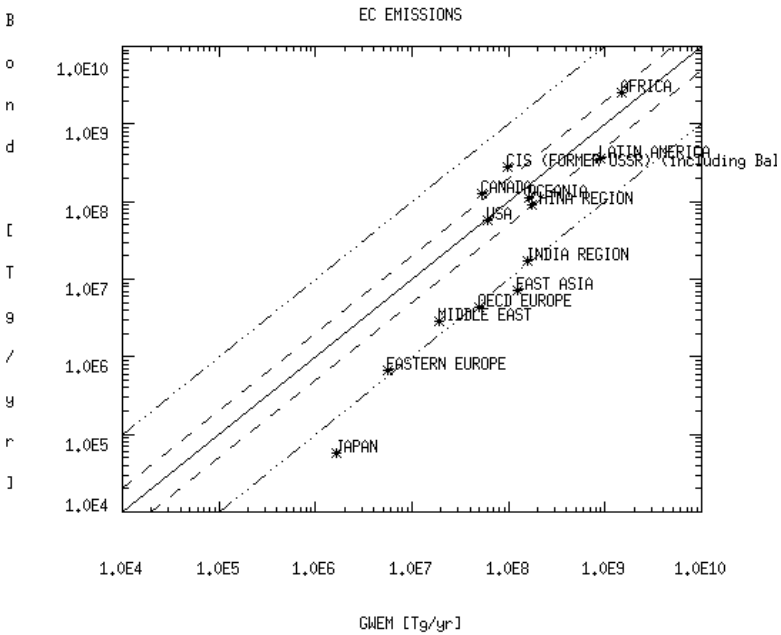
totals [Tg]:

	BC	OC
fossil	3.142	2.442
biofuel	1.630	6.498
(*open fires*	*3.297*	*25.08 not used for AERCOM*)
Total	**8.069**	**34.02**

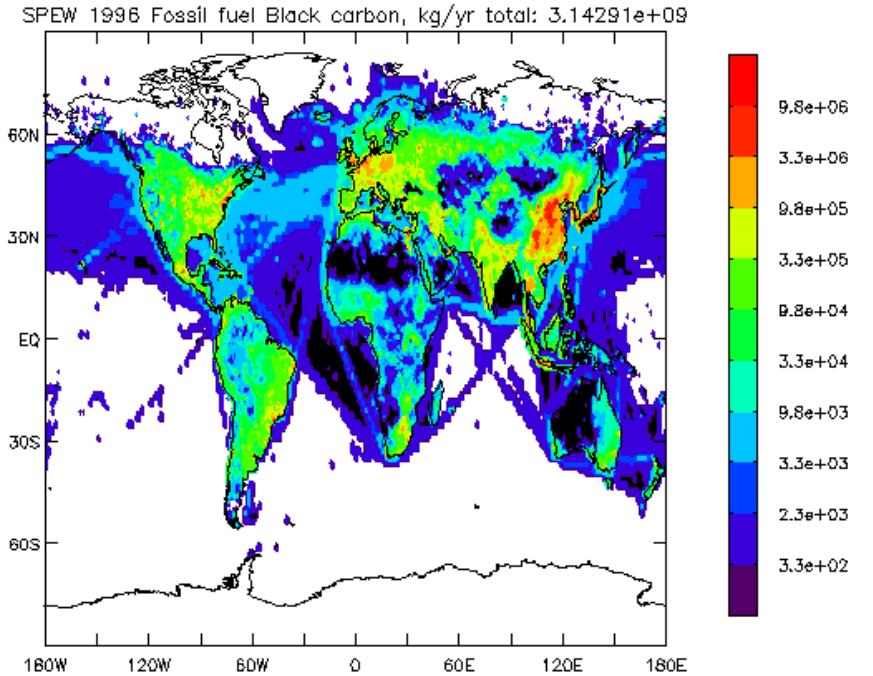
This is 35 % lower than previous inventory, which was based on 1984 statistics

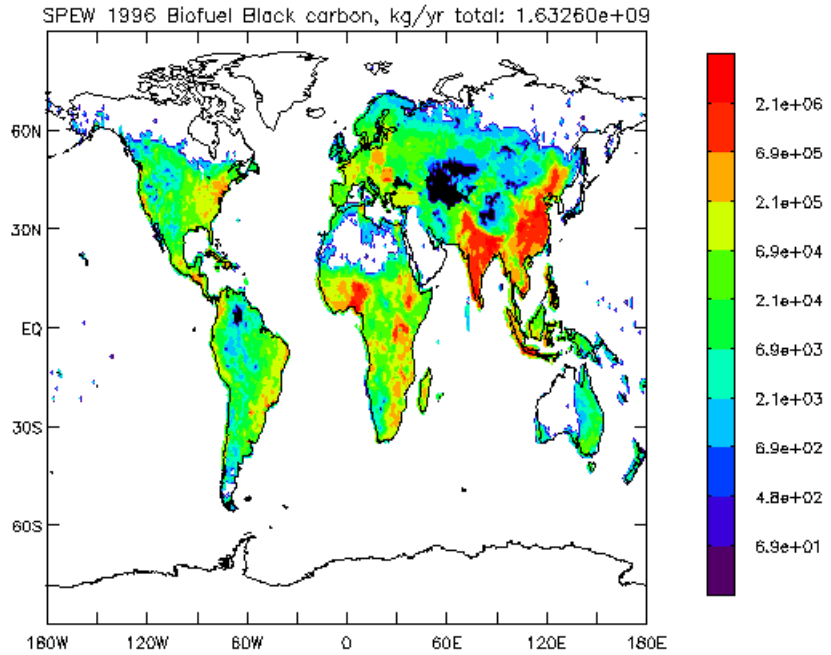
regio	bc1bfuel	bc1ff	bc1open	oc1bfuel	oc1ff	oc1open	BC_gwem	OC_gwem
OPEN OCEAN	1.34e+06	2.94e+07	7.67e+05	5.03e+06	9.33e+07	5.86e+06	2.23e+05	1.67e+06
CANADA	7.86e+06	3.84e+07	5.25e+07	4.27e+07	2.22e+07	6.34e+08	1.28e+08	1.57e+09
USA	6.33e+07	3.06e+08	6.01e+07	3.45e+08	1.55e+08	8.31e+08	5.85e+07	4.86e+08
LATIN AMER	1.08e+08	3.10e+08	9.06e+08	5.18e+08	3.33e+08	6.72e+09	3.62e+08	2.58e+09
AFRICA	3.48e+08	1.34e+08	1.47e+09	1.33e+09	1.74e+08	1.05e+10	2.58e+09	1.82e+10
OECD EUROP	2.93e+07	2.91e+08	4.98e+07	1.59e+08	1.47e+08	6.40e+08	4.39e+06	3.57e+07
EASTERN EU	3.34e+07	1.00e+08	5.54e+06	1.95e+08	7.49e+07	3.80e+07	6.63e+05	8.51e+06
CIS (FORME	1.78e+07	1.76e+08	9.77e+07	1.04e+08	1.19e+08	1.24e+09	2.84e+08	2.92e+09
MIDDLE EAS	1.73e+07	1.36e+08	1.89e+07	5.42e+07	2.12e+08	1.30e+08	2.85e+06	2.06e+07
INDIA REGI	4.27e+08	1.93e+08	1.57e+08	1.63e+09	1.22e+08	9.94e+08	1.68e+07	1.32e+08
CHINA REGI	4.52e+08	1.02e+09	1.74e+08	1.62e+09	7.10e+08	1.15e+09	8.90e+07	7.95e+08
EAST ASIA	1.22e+08	2.12e+08	1.26e+08	4.67e+08	1.93e+08	9.28e+08	7.14e+06	5.27e+07
OCEANIA	4.31e+06	3.14e+07	1.64e+08	1.44e+07	1.62e+07	1.13e+09	1.14e+08	8.02e+08
JAPAN	3.00e+04	1.70e+08	1.65e+06	1.39e+05	7.34e+07	9.02e+06	5.70e+04	5.72e+05
WORLD	1.63e+09	3.14e+09	3.28e+09	6.48e+09	2.44e+09	2.49e+10	3.65e+09	2.76e+10



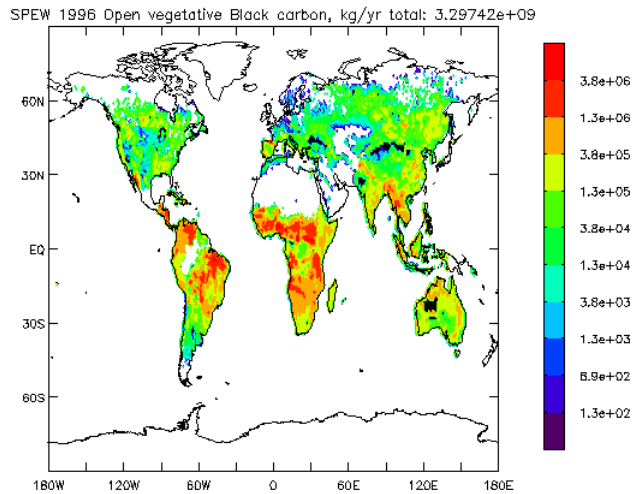


Large regional differences between 'Bond/SPWE' open burning and 'GWEM' vegetation fire category. Dashed lines indicate
factor 2 and 10, respectively.





BB not used
for Aerocom



SO2 emissions:

Janusz Cofala (IIASA):

Country based SO2 emissions for the year **2000**, using RAINS, gridded according the EDGAR3.2 1995 distribution (FD). Manuscripts in preparation. Ships 2000 use 1.5 % p.y. increase since 1995. 7 categories. The Other category is mainly large scale biomass burning: recommend to scale GWEM 2000 with this amount.

Totals:	kg SO2	Tg S
Powerplants	4.84006e+10	24.2
Industry	3.92203e+10	19.6
Domestic	9.54789e+09	4.77
RoadTransport	1.92250e+09	0.96
Off-road	1.56237e+09	0.78
Other (mostly biomass burning)	4.86152e+09	2.43
International_Shipping	7.75291e+09	3.86

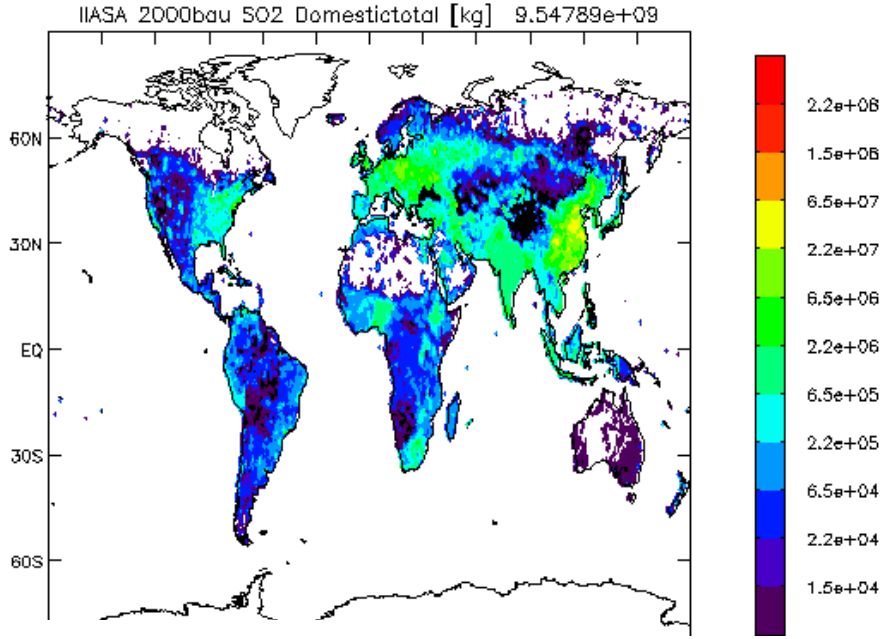
Total Tg SO2	**1990**	**1995**	**2000**
IIASA:	131.6	118.5	113.2
EDGAR3.2	154.9	141.19	-

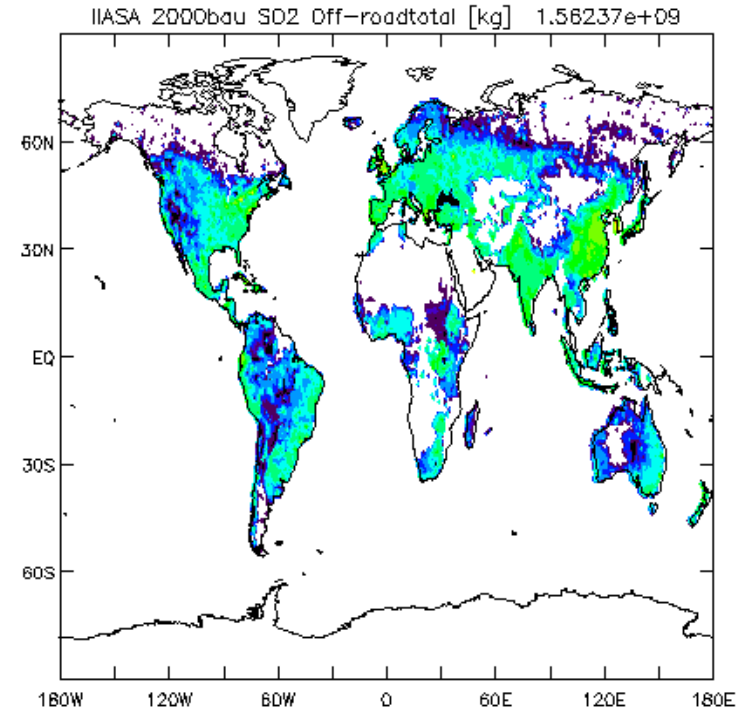
Decrease between 1990 and 1995 similar between EDGAR and IIASA; but in general IIASA 15 % lower than EDGAR

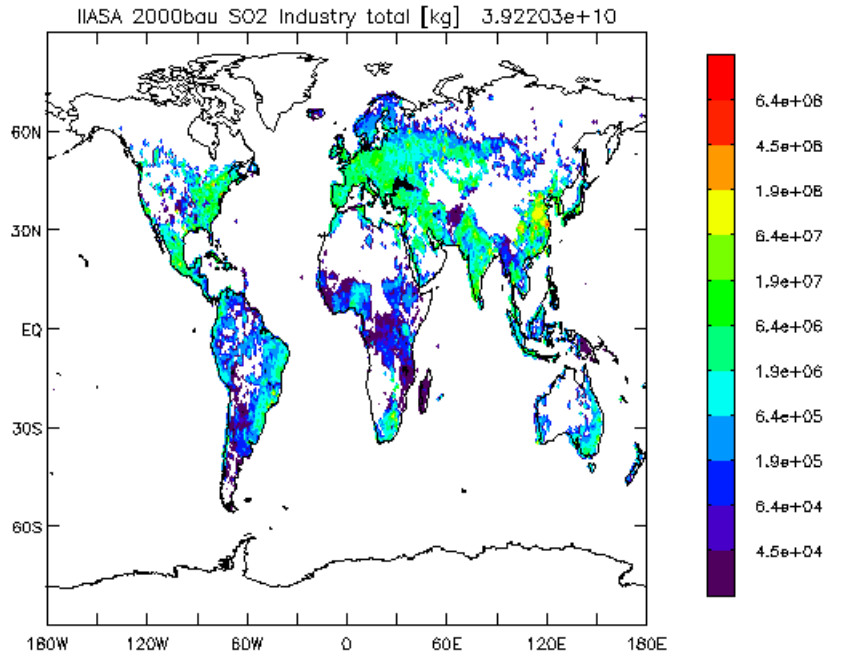
REGIONAL ESTIMATES: Tg SO2

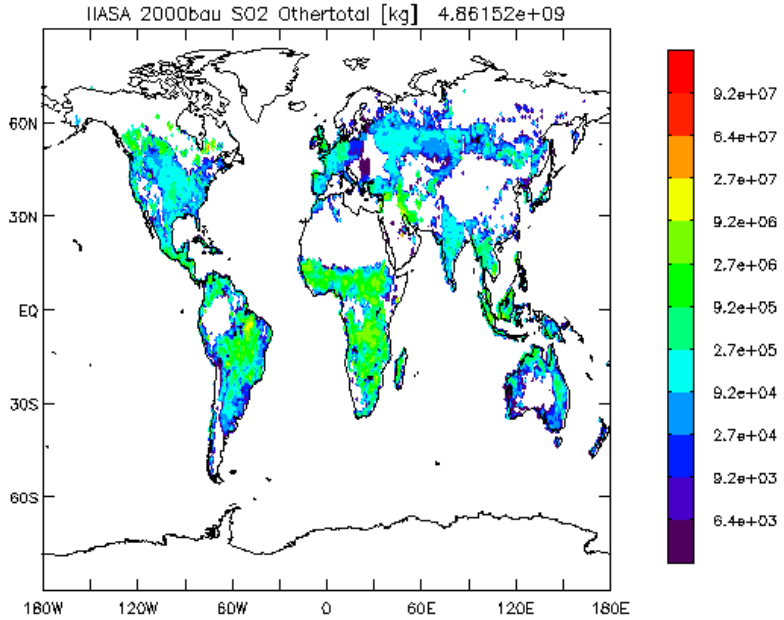
regio	Domestic_2	Industry_2	Internatio	Off-road_2	Other_2000	Powerplant	RoadTransp
OPEN OCEAN	0.00e+00	0.00e+00	5.05e+09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
CANADA	7.16e+07	1.19e+09	2.90e+07	5.30e+07	5.44e+08	5.44e+08	1.35e+07
USA	3.11e+08	3.12e+09	8.45e+07	1.11e+08	1.80e+08	1.25e+10	1.67e+08
LATIN AMER	1.96e+08	2.96e+09	1.71e+08	1.99e+08	1.01e+09	2.37e+09	2.98e+08
AFRICA	3.95e+08	1.50e+09	2.54e+08	6.90e+07	1.85e+09	2.56e+09	1.79e+08
OECD EUROP	4.42e+08	2.05e+09	1.64e+09	1.89e+08	9.71e+07	3.47e+09	1.43e+08
EASTERN EU	6.70e+08	1.01e+09	7.73e+07	3.63e+07	8.90e+05	4.20e+09	2.96e+07
CIS (FORME	1.16e+09	3.99e+09	0.00e+00	1.23e+08	1.59e+08	5.61e+09	5.82e+07
MIDDLE EAS	5.17e+08	2.44e+09	2.32e+08	6.30e+07	4.41e+08	2.80e+09	2.48e+08
INDIA REGI	5.95e+08	2.90e+09	1.93e+07	1.34e+08	6.95e+07	3.49e+09	4.36e+08
CHINA REGI	4.76e+09	1.47e+10	1.93e+07	3.45e+08	1.16e+08	8.73e+09	1.24e+08
EAST ASIA	3.50e+08	2.08e+09	1.26e+08	1.55e+08	2.86e+08	1.09e+09	1.52e+08
OCEANIA	8.30e+06	8.06e+08	7.24e+06	4.29e+07	1.02e+08	8.50e+08	3.67e+07
JAPAN	6.76e+07	4.79e+08	4.10e+07	4.09e+07	9.30e+06	2.45e+08	3.71e+07
WORLD	9.55e+09	3.92e+10	7.75e+09	1.56e+09	4.86e+09	4.84e+10	1.92e+09

total world 2000: 113.2


IIASA 2000bau SO2 Domestictotal [kg] 9.54789e+09
60N
30N
EQ
30S
60S
2.2e+08
1.5e+08
6.5e+07
2.2e+07
6.5e+06
2.2e+06
6.5e+05
2.2e+05
6.5e+04
2.2e+04
1.5e+04


IIASA 2000bau SO2 Off-roadtotal [kg] 1.56237e+09
60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
3.5e+07
2.4e+07
1.0e+07
3.5e+06
1.0e+06
3.5e+05
1.0e+05
3.5e+04
1.0e+04
3.5e+03
2.4e+03


IIASA 2000bau SO2 Industry total [kg] 3.92203e+10
60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
6.4e+08
4.5e+08
1.9e+08
6.4e+07
1.9e+07
6.4e+06
1.9e+06
6.4e+05
1.9e+05
6.4e+04
4.5e+04


IIASA 2000bau SO2 Othertotal [kg] 4.86152e+09
60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
9.2e+07
6.4e+07
2.7e+07
9.2e+06
2.7e+06
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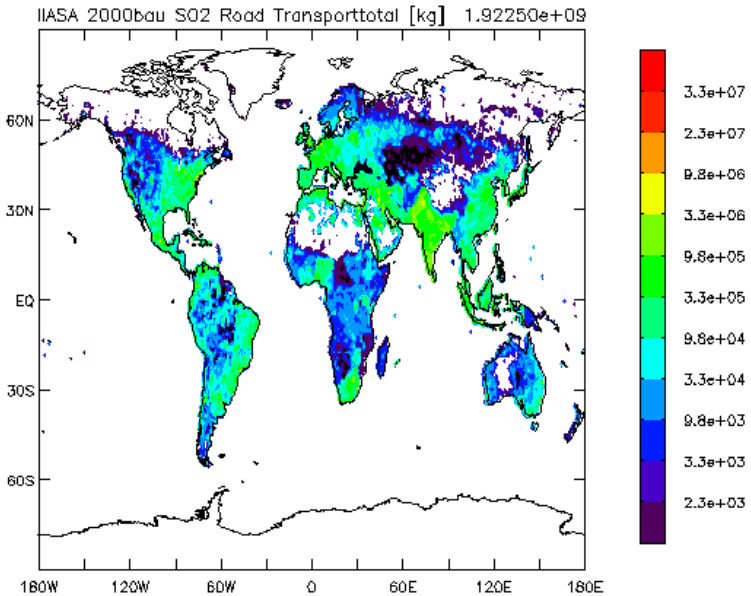
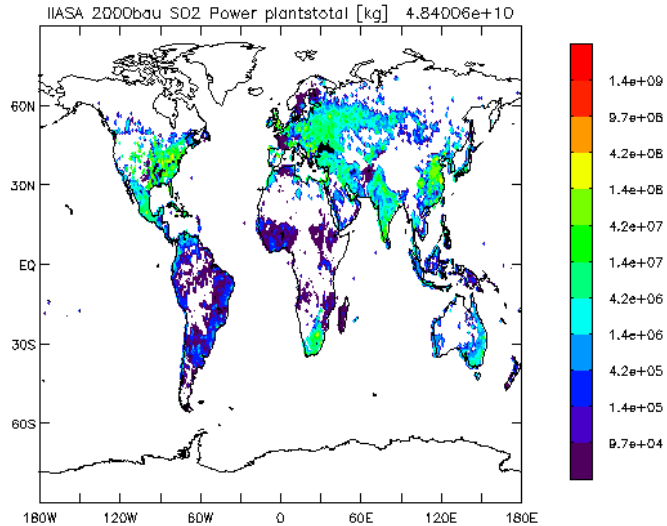
2.7e+04
9.2e+03
6.4e+03


IIASA 2000bau SO2 Road Transporttotal [kg] 1.92250e+09
60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
3.3e+07
2.3e+07
9.8e+06
3.3e+06
9.8e+05
3.3e+05
9.8e+04
3.3e+04
9.8e+03
3.3e+03
2.3e+03


IIASA 2000bau SO2 Power plantstotal [kg] 4.84006e+10
60N
30N
EQ
30S
60S
180W
120W
60W
0
60E
120E
180E
1.4e+09
9.7e+08
4.2e+08
1.4e+08
4.2e+07
1.4e+07
4.2e+06
1.4e+06
4.2e+05
1.4e+05
9.7e+04

•Data format: hdf format (on request could also provide 'EDGAR format').
•Units: kg per 1x1 gridbox. Kg SO2; and kg BC/OC

•Download:
ftp.ei.jrc.it
cd pub/dentener/AEROCOM
mget *tar.gz

• Is it worth to update BC/OC from 1996 to 2000; CO emissions changed in this period +/- 10 %. Recommend: Not.

•Discuss co-authorship issues; largely unpublished material (or submitted)
•Some further analysis and integration needed. (Tables)
•Further request?