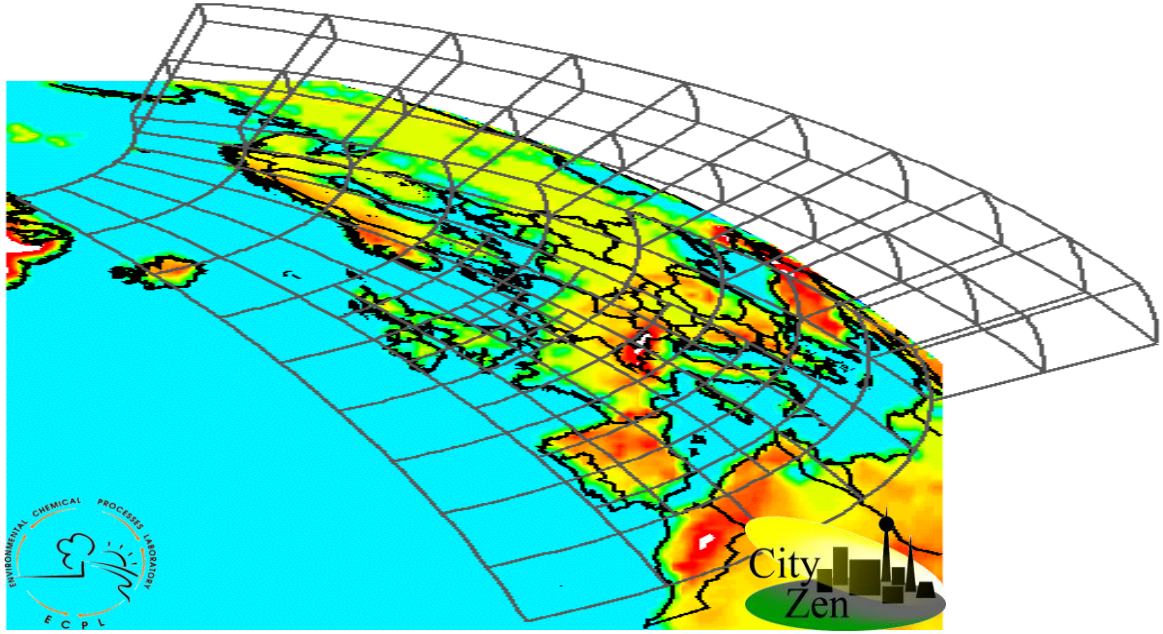
Ongoing and future TM modeling activities at ECPL



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TM4-ECPL Current Updates

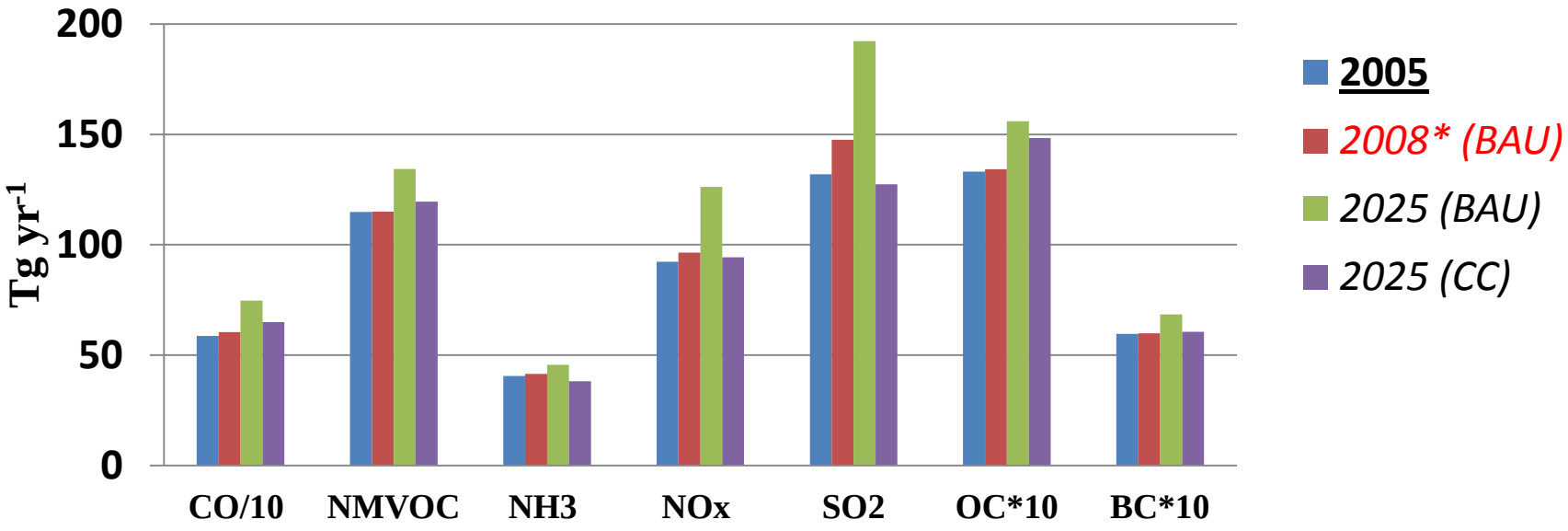
EMISSIONS

- Annual anthropogenic emissions (NMVOC, NO_x, CO, SO_2, NH_3, OC and BC) from CIRCE project (Doering et al., 2009)
- Biogenic emissions from the POET database (Granier et al., 2005) for 2000.
- Biomass burning emissions from the GFED v2 (Van der Werf et al., 2006)
- Marine emissions: online calculation (POA, hydrocarbons and sea-salt particles; see Myriokefalitakis et al., 2010 and DMS by Spiro et al.,1992)
- Dust emissions from AEROCOM (Dentener et al., 2006) updated up to the year 2010 (E. Vignatti, 2011, pers. com.)

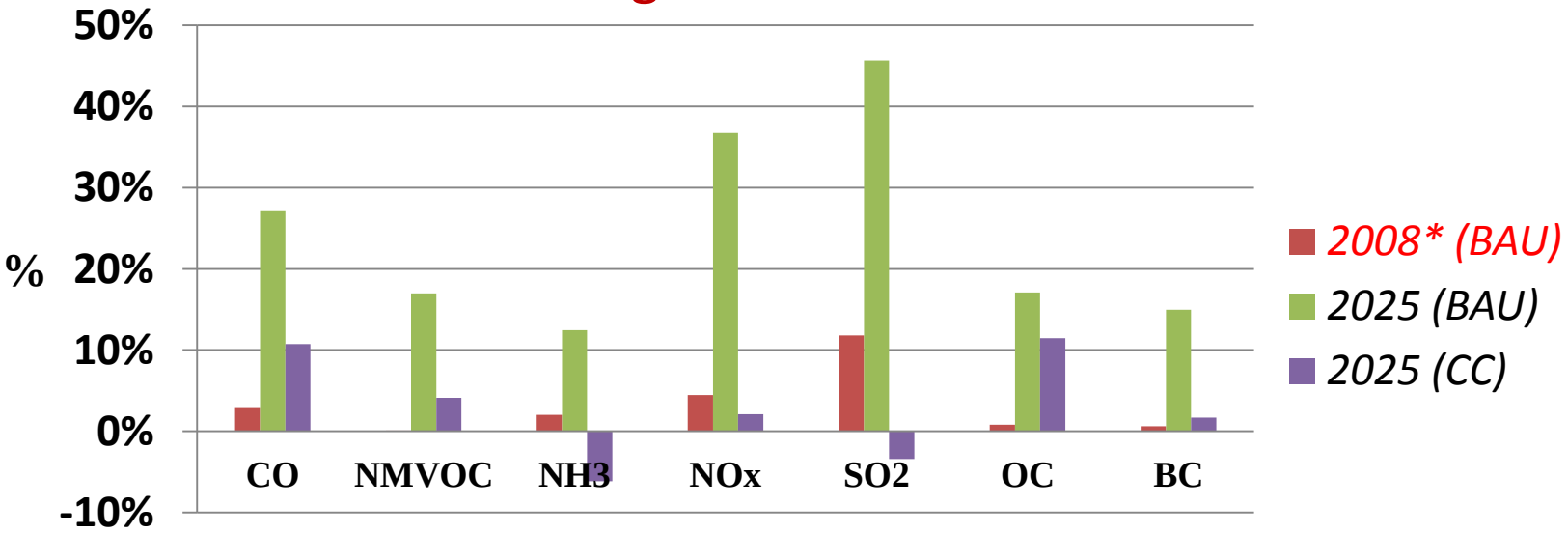
METEOROLOGY & RESOLUTION

- TM4-ECPL is now coupled with TM5 meteo-modules able to read meteorology in 1^ox1^o in latitude and longitude and 60 vertical hybrid layers from ECMWF (Arjo Segers, pers. com.)
- TM4-ECPL is driven by ERA-Interim meteorology for the years 2000-2010
- TM4-ECPL runs in two different resolutions;
  - 2^o lat x 3^o lon x 25/34 vertical hybrid layers up to 0.1 hPa, time-step 30 min
  - 4^o lat x 6^o lon x 34 vertical hybrid layers up to 0.1 hPa), time-step 1 hour.

Anthropogenic Global Land Emission Scenarios



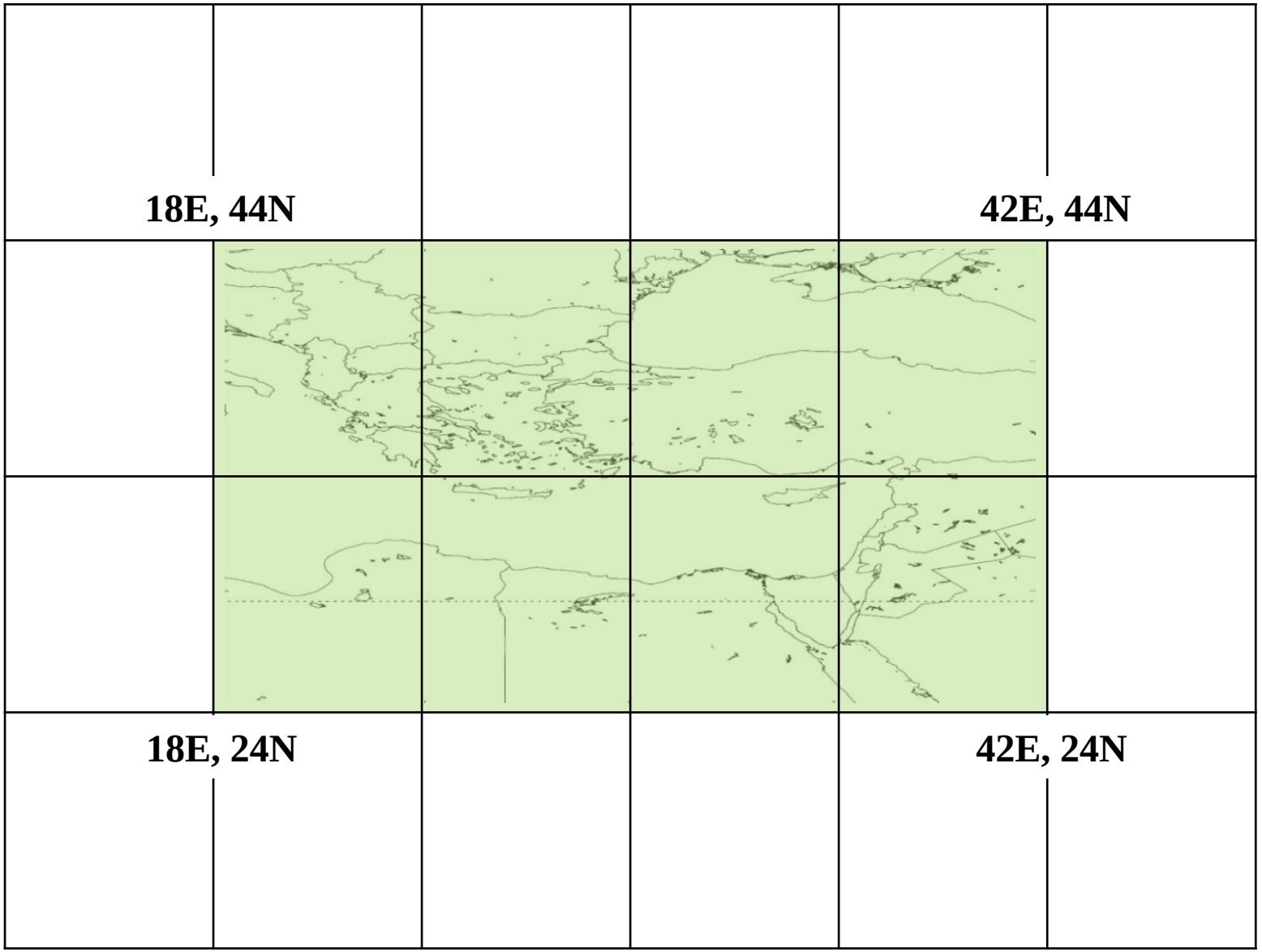
Percent change relative to 2005



*Linear projection of 2005 CIRCE emissions based on 2010 (BAU) emission scenario

Part A: *The importance of the long-range transport (LRT) for the Eastern Mediterranean (EM) air pollution*

DOMAIN of the study – Eastern Mediterranean



Sensitivity Simulations

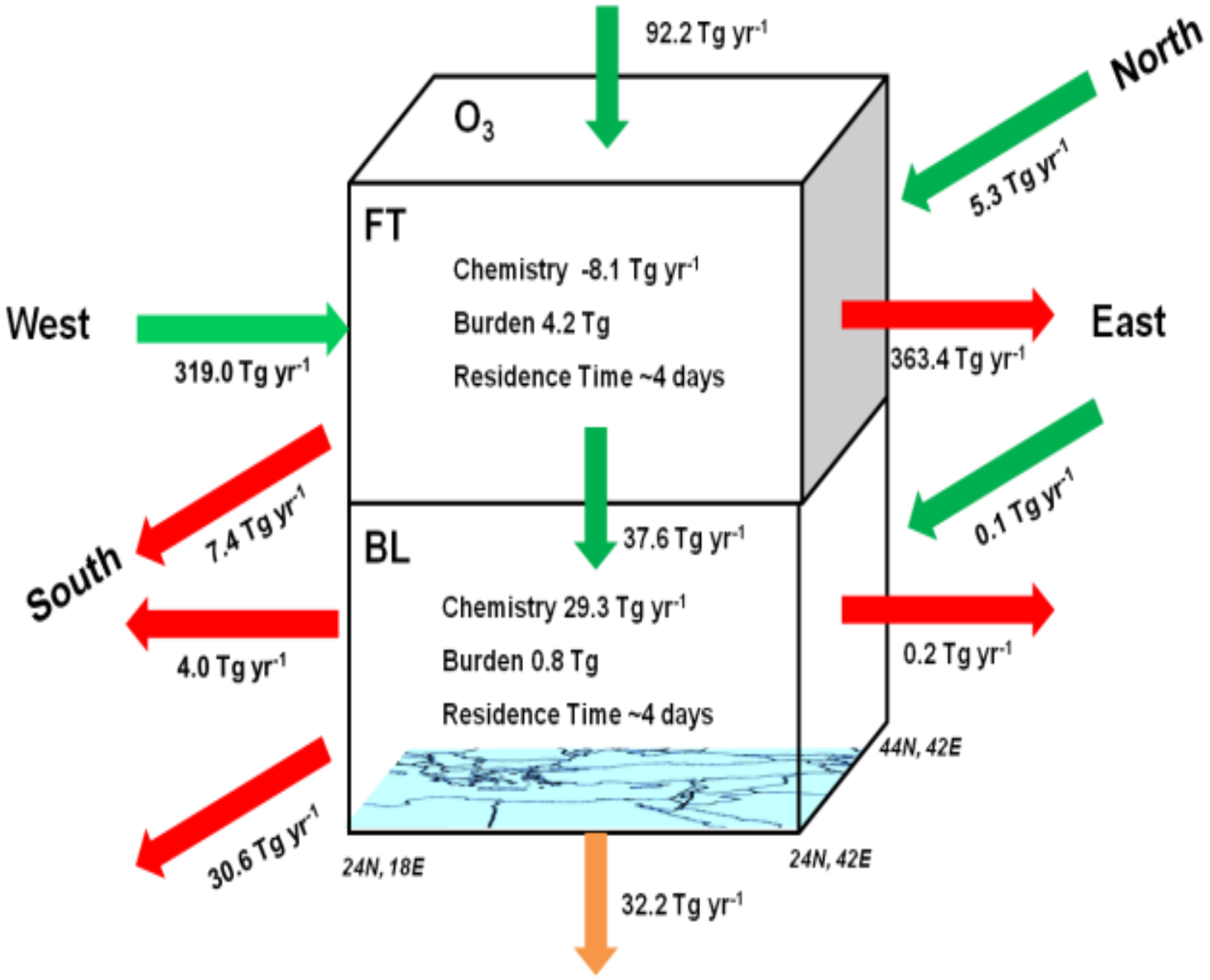
Simulation	Description
S0	The base case simulation in 6º in longitude x 4º in latitude resolution and in 34 vertical layers from surface up to 0.1hPa. The model takes into account all anthropogenic, biogenic and natural emissions.
S1	As for S0, but neglecting **the anthropogenic emissions** in the Eastern Mediterranean domain
S2	As for S1, but also neglecting **the biomass burning emissions** in the Eastern Mediterranean domain
S3	As for S2, but also neglecting **the biogenic contribution** in the Eastern Mediterranean domain
S4	As for S0, but taking into account **anthropogenic emission** of the **year 2025** (CIRCE; BAU scenario)

Eastern Mediterranean contribution to the Global Budget

S0 - GL	EMIS. (Tg/yr)	NET Chem. (Tg/yr)	BURDEN (Tg)	DD (Tg/yr)	WD (Tg/yr)	SED. (Tg/yr)	ST. FLUX (Tg/yr)
O_3	0	-2181	3107	756	0	0	2921
NOy	53	10	1	10	0	0	0
SS	6527	0	5	994	556	4979	0
DU	1090	0	17	367	76	650	0
PM_{-SS-DU}	67	131	3	37	161	0	0

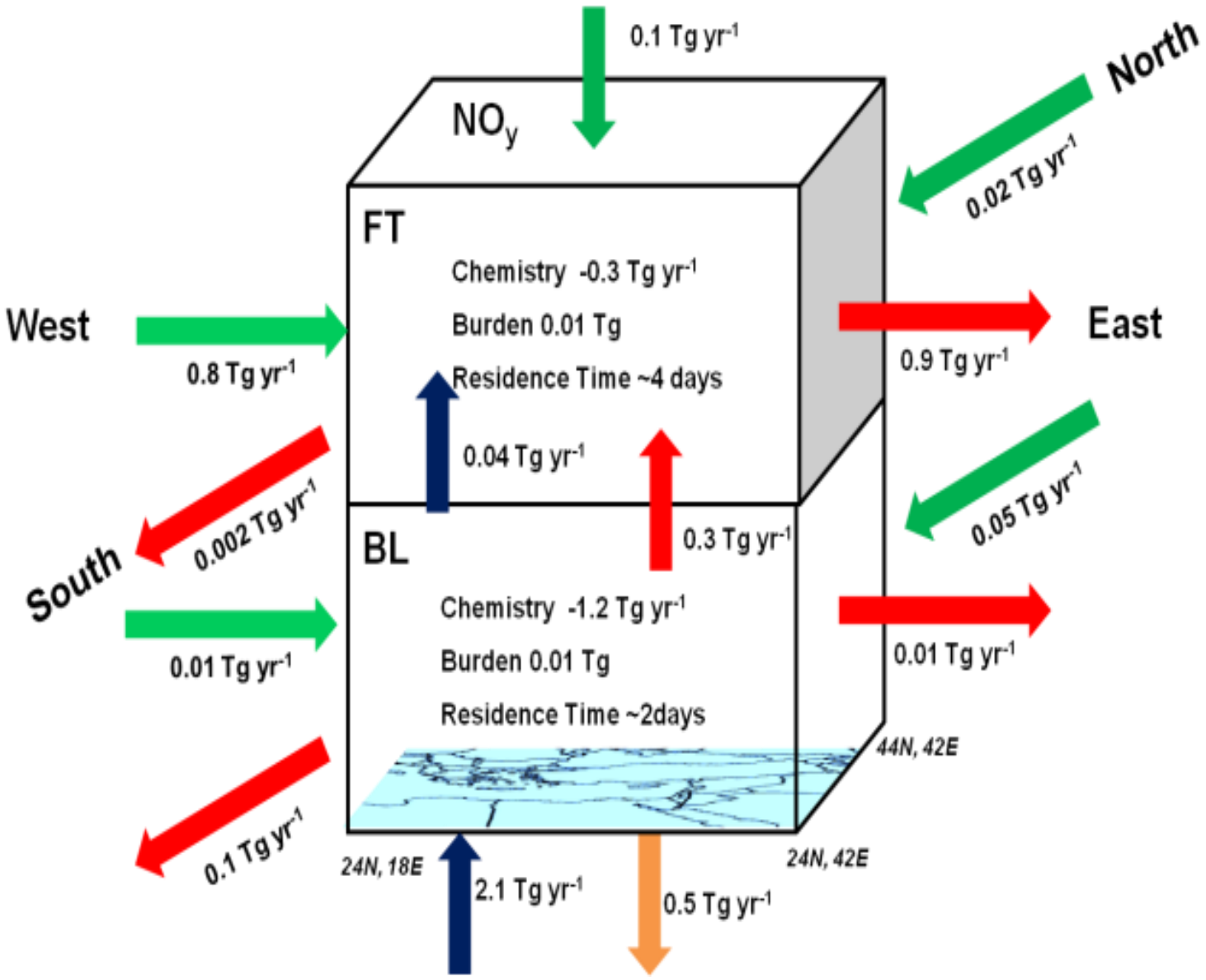
S0 – EM / GL	EMIS.	NET Chem.	BURDEN	DD	WD	SED.	ST. FLUX
O_3		0%	2%	4%			2%
NOy	4%	6%	3%	5%	1%		
SS	0%		0%	0%	0%	0%	
DU	4%		3%	3%	1%	4%	
PM_{-SS-DU}	1%	3%	2%	3%	1%	0%	

O_3 Schematic Budget in Eastern Mediterranean – S0



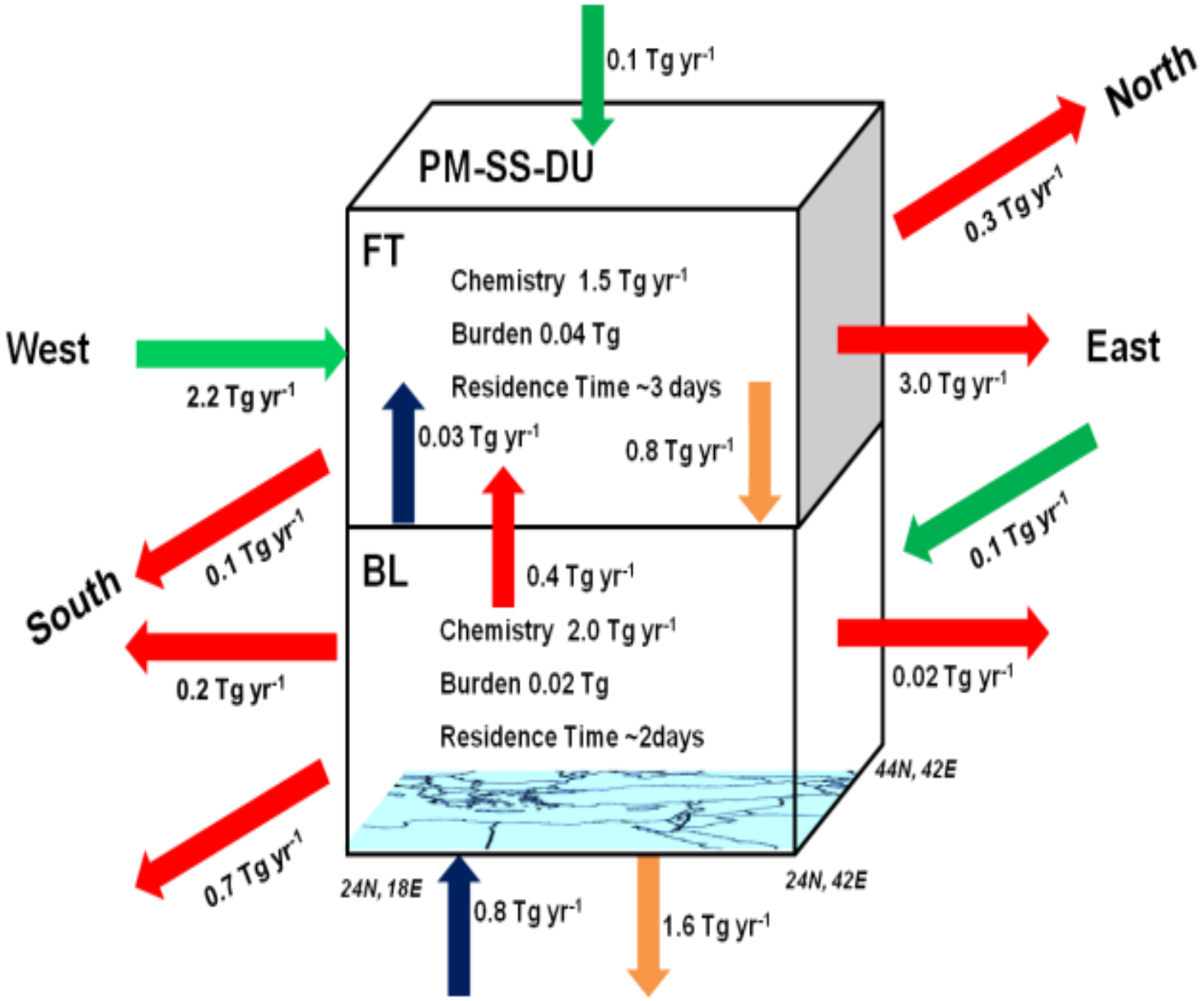
Burdens (Tg) are averages of monthly samples, residence times (days) are burdens divided by total sinks and all budget terms and fluxes (Tg yr^{-1}) are annual totals.

NO_y Schematic Budget in Eastern Mediterranean – S0



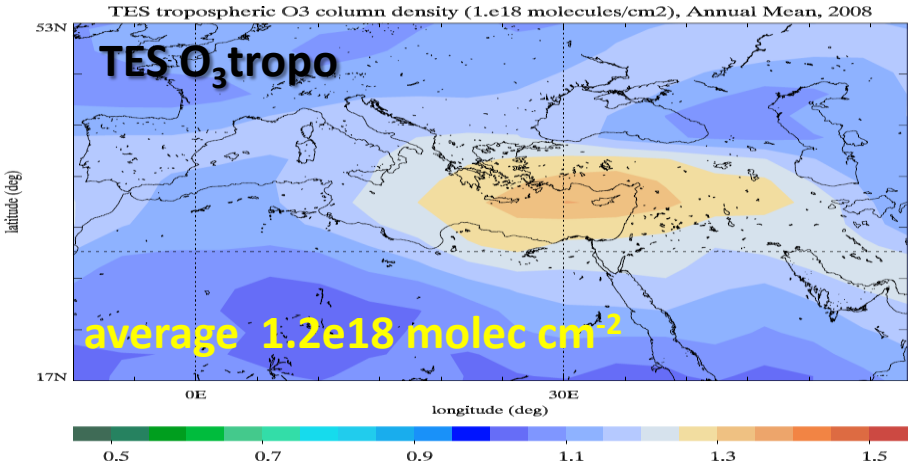
Burdens (Tg) are averages of monthly samples, residence times (days) are burdens divided by total sinks and all budget terms and fluxes (Tg yr^{-1}) are annual totals.

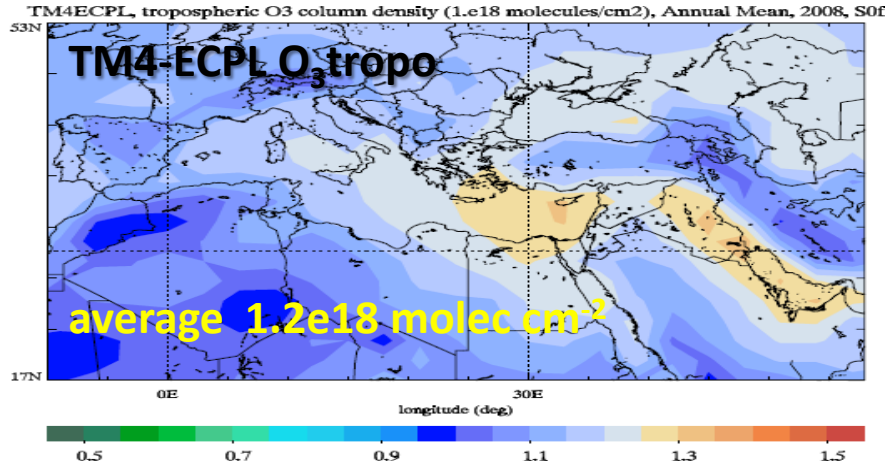
PM_{SS-DU} Schematic Budget in Eastern Mediterranean – S0

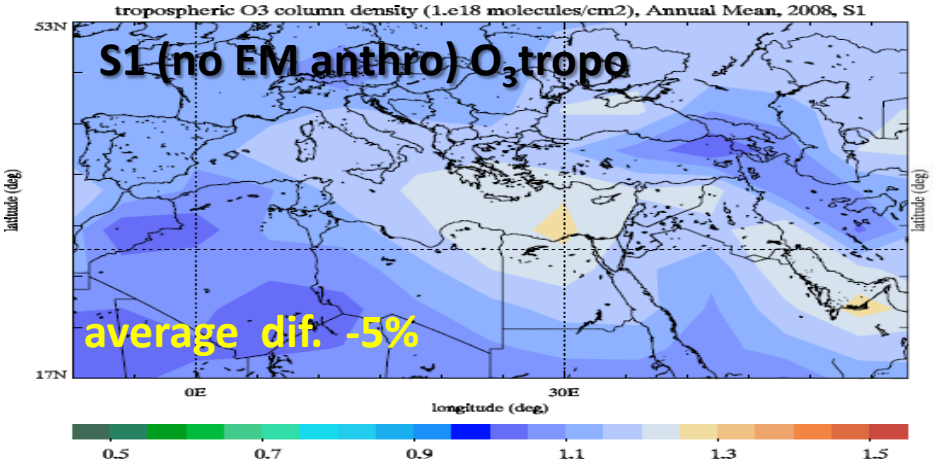


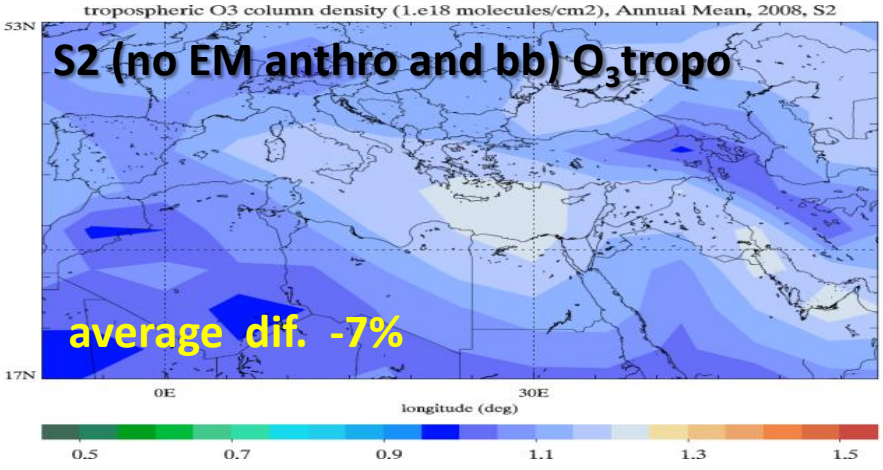
Burdens (Tg) are averages of monthly samples, residence times (days) are burdens divided by total sinks and all budget terms and fluxes (Tg yr^{-1}) are annual totals.

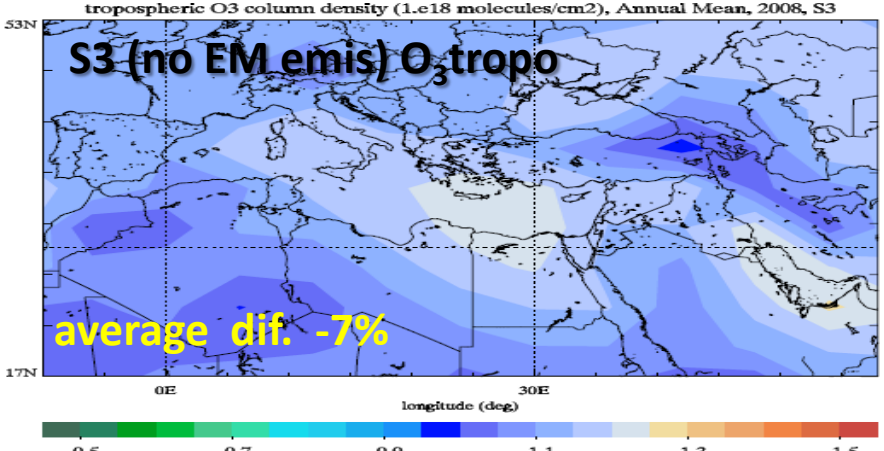
Tropospheric O_3 Column ($1.e8$ molec cm^{-3}) – TES vs TM4ECPL

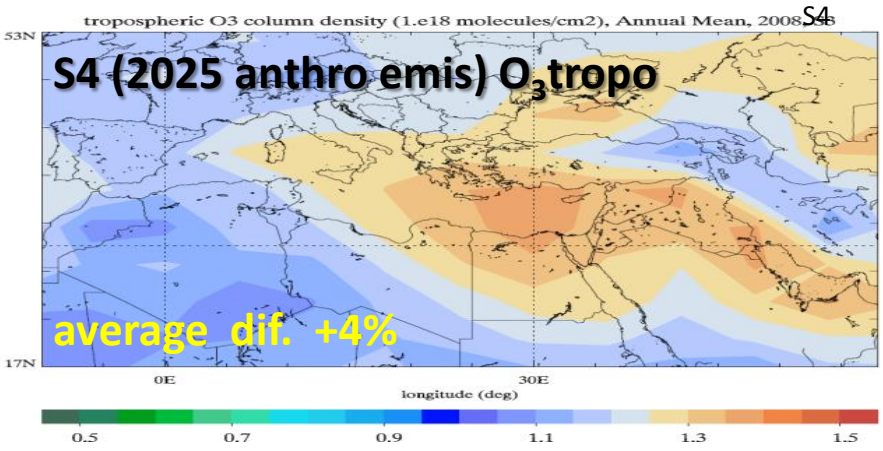




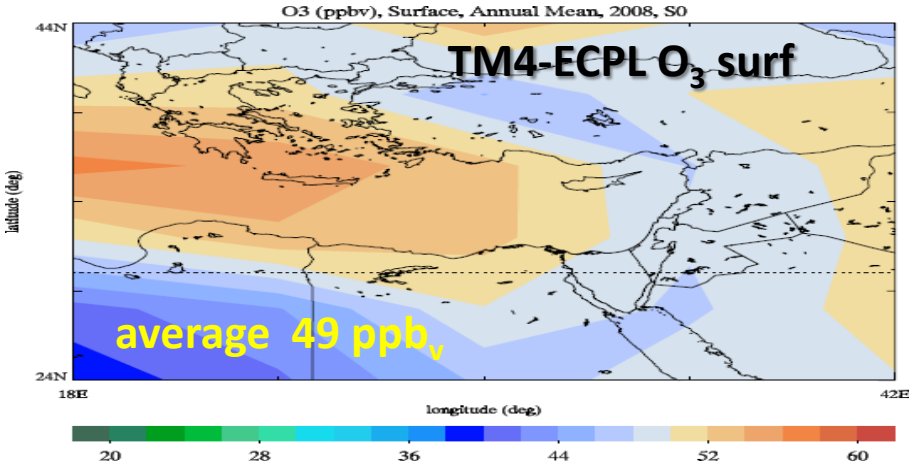


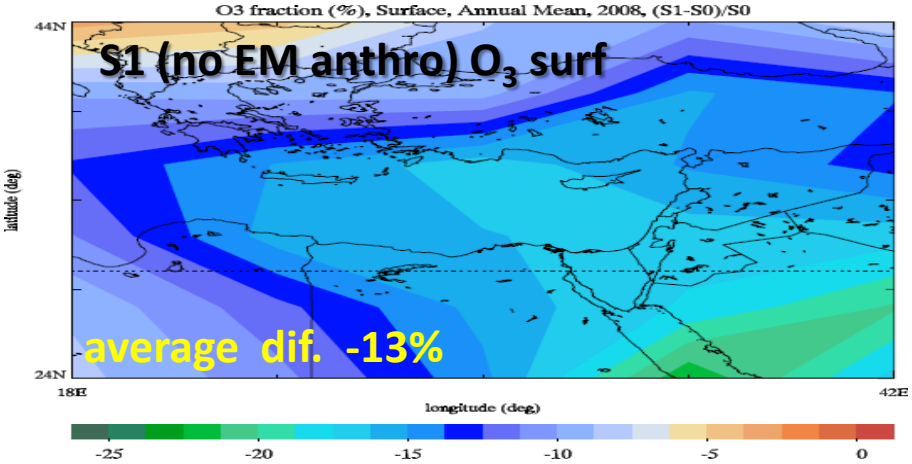


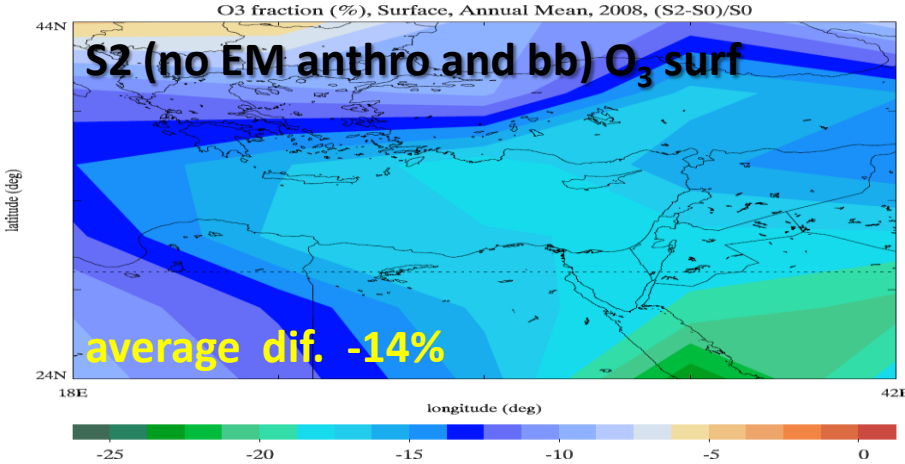


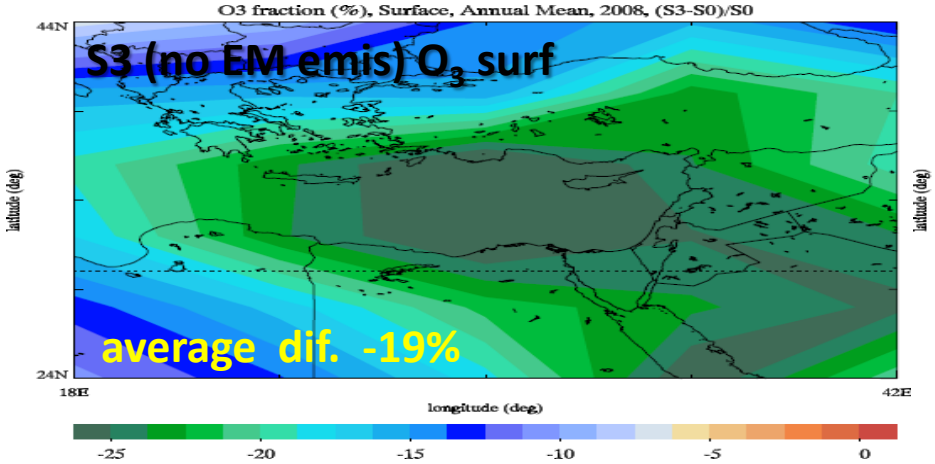


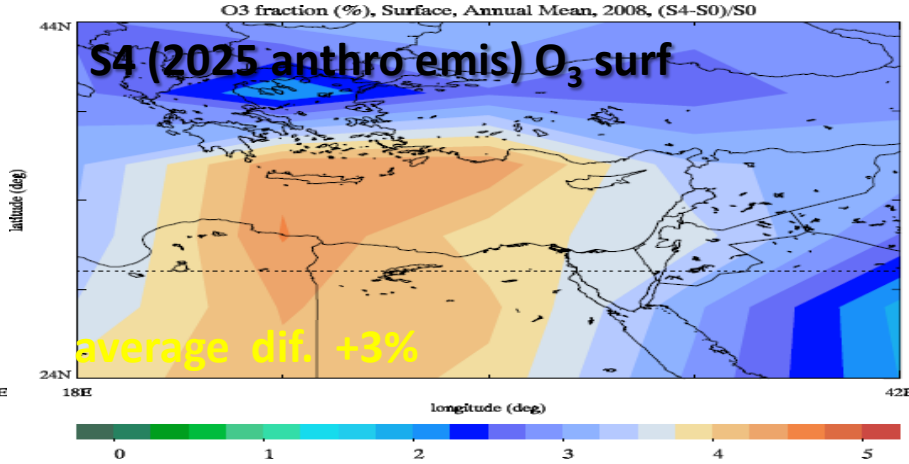
O_3 Surface concentration (ppb_v) and Differences (%)



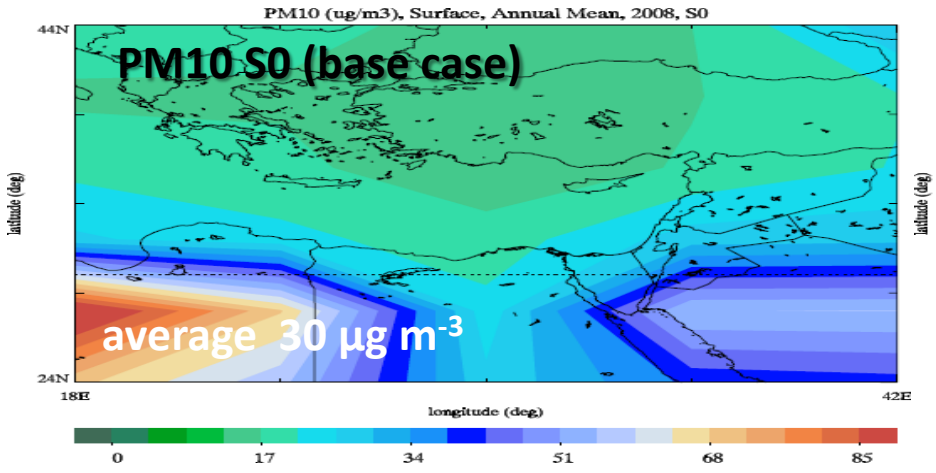


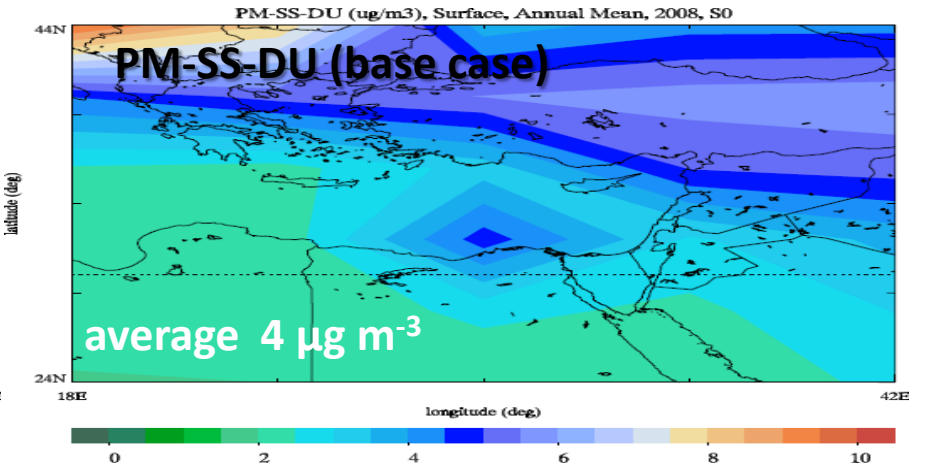


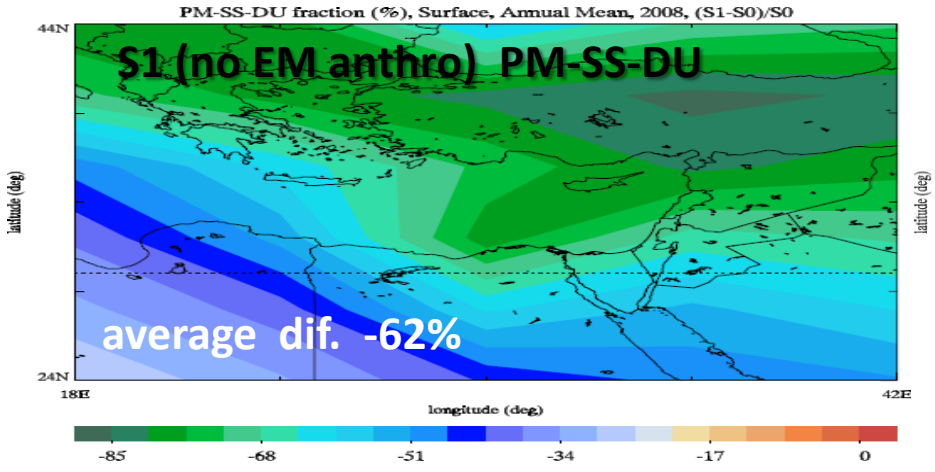


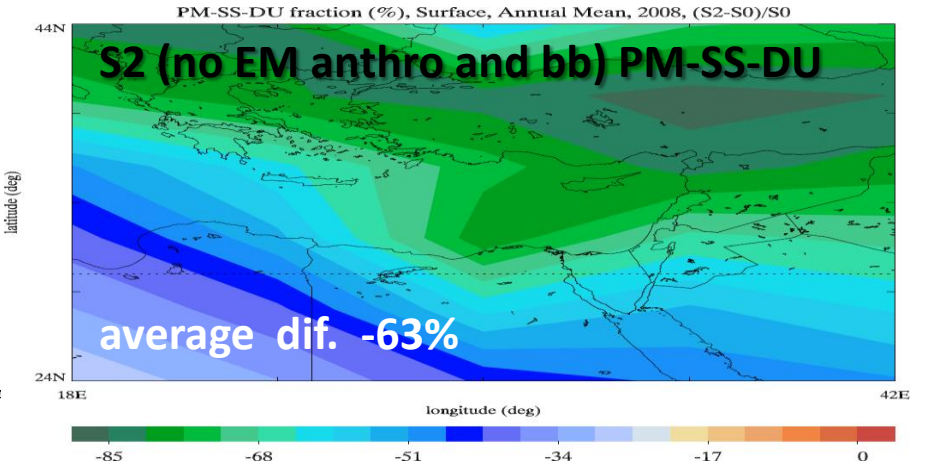


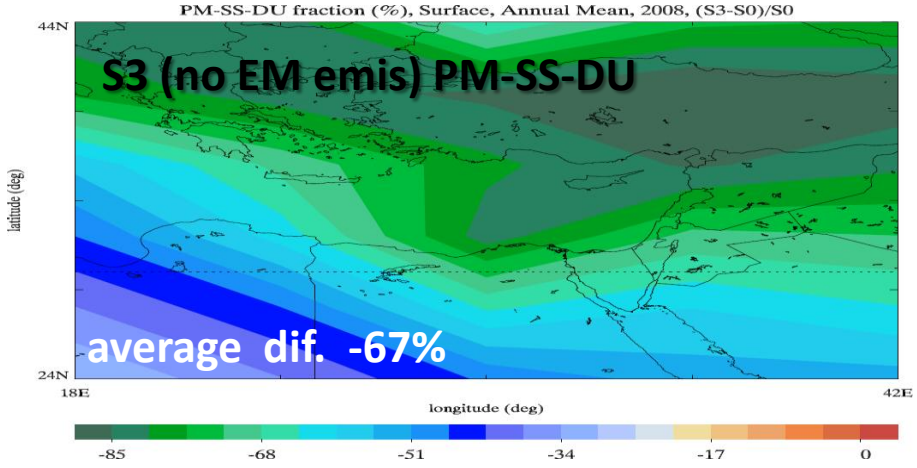
PM (without SS and DU) Surface concentration (µg m^{-3})

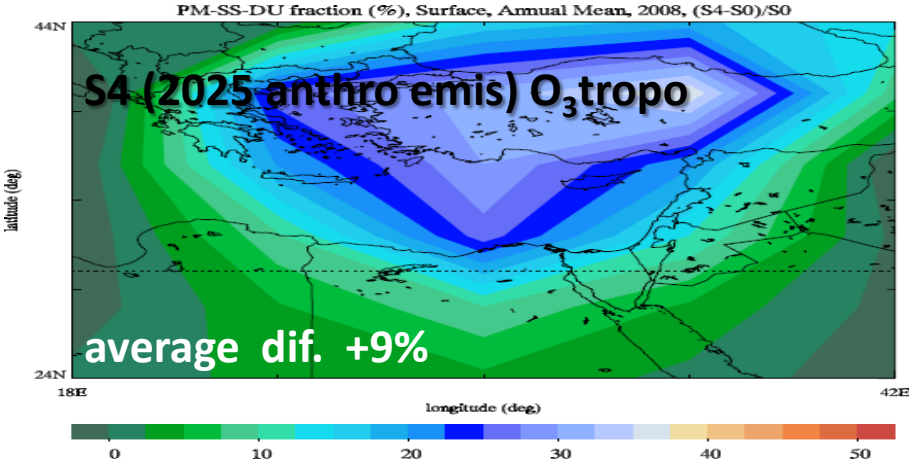








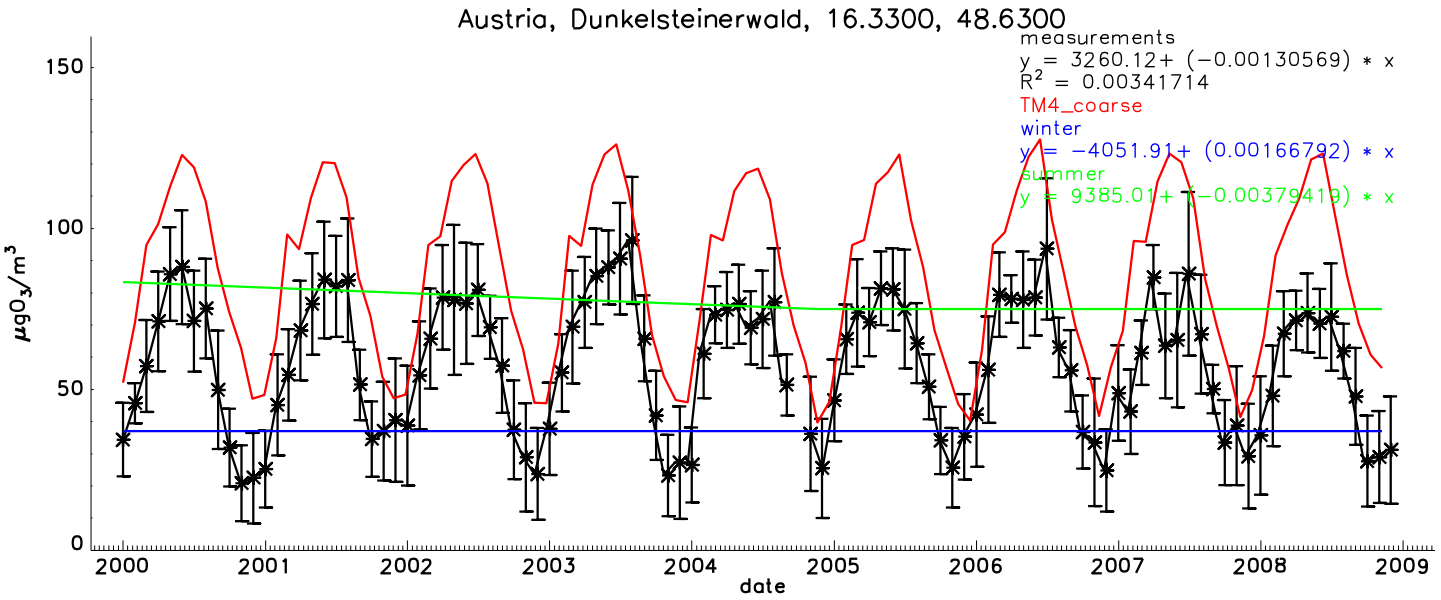




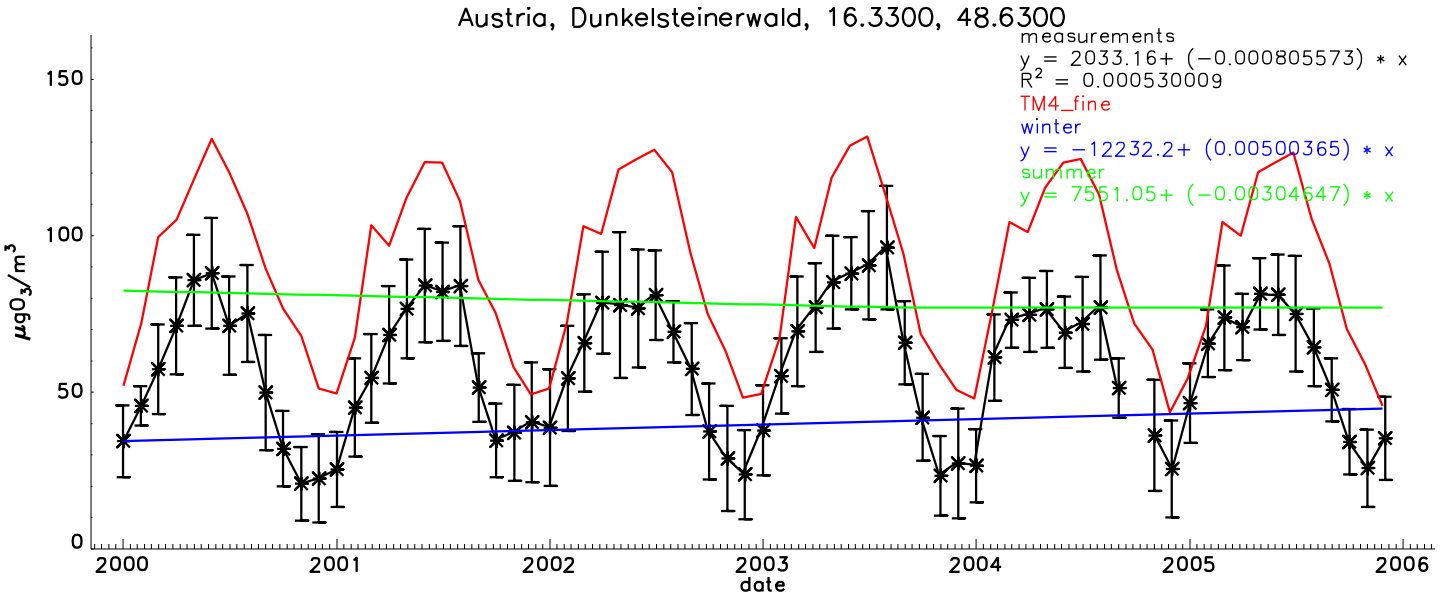
Part B: *Observed and simulated ozone over Europe the past decade*

Ozone de-seasonalized trends over Europe - Austria

6x4x34



3x2x25



Ozone de-seasonalized trends over Europe - France

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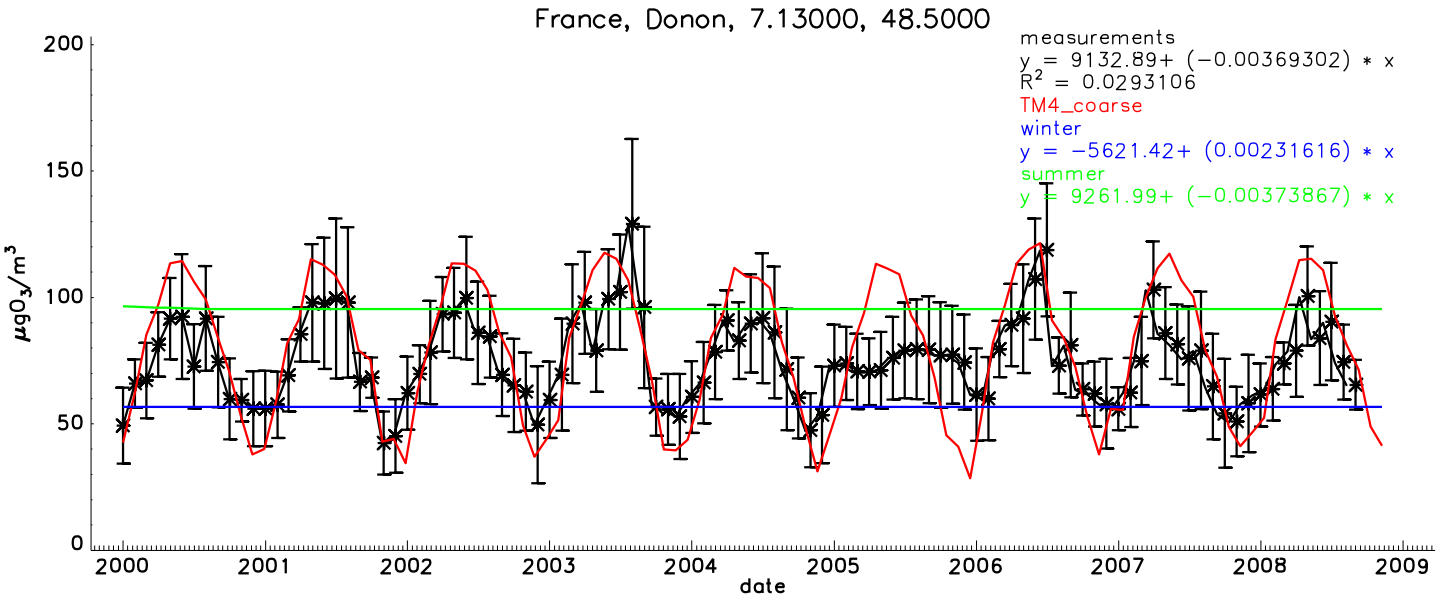

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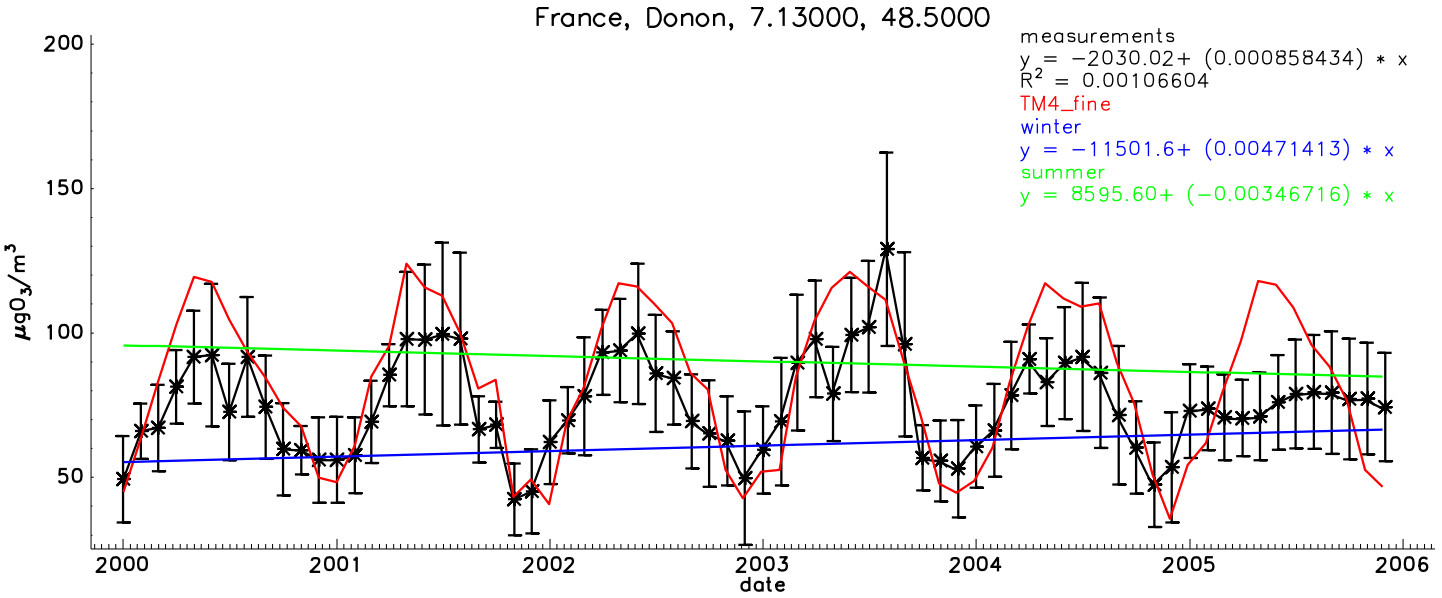
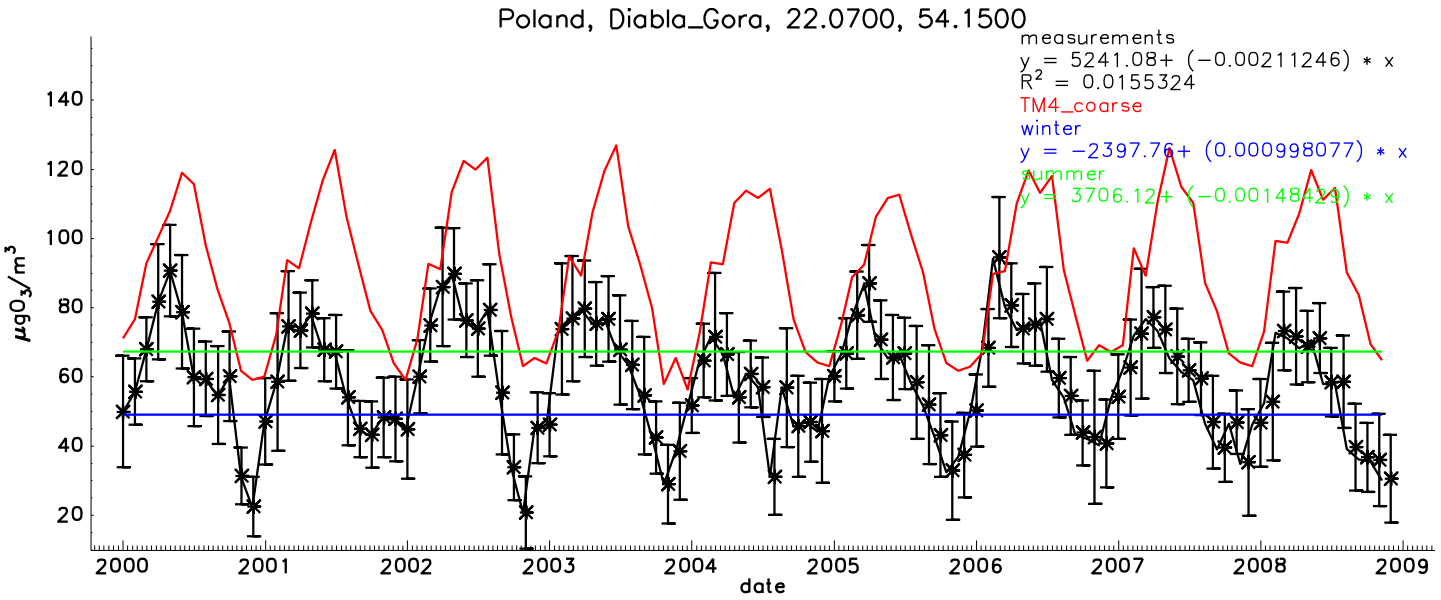


Ozone de-seasonalized trends over Europe - Poland

6x4x34



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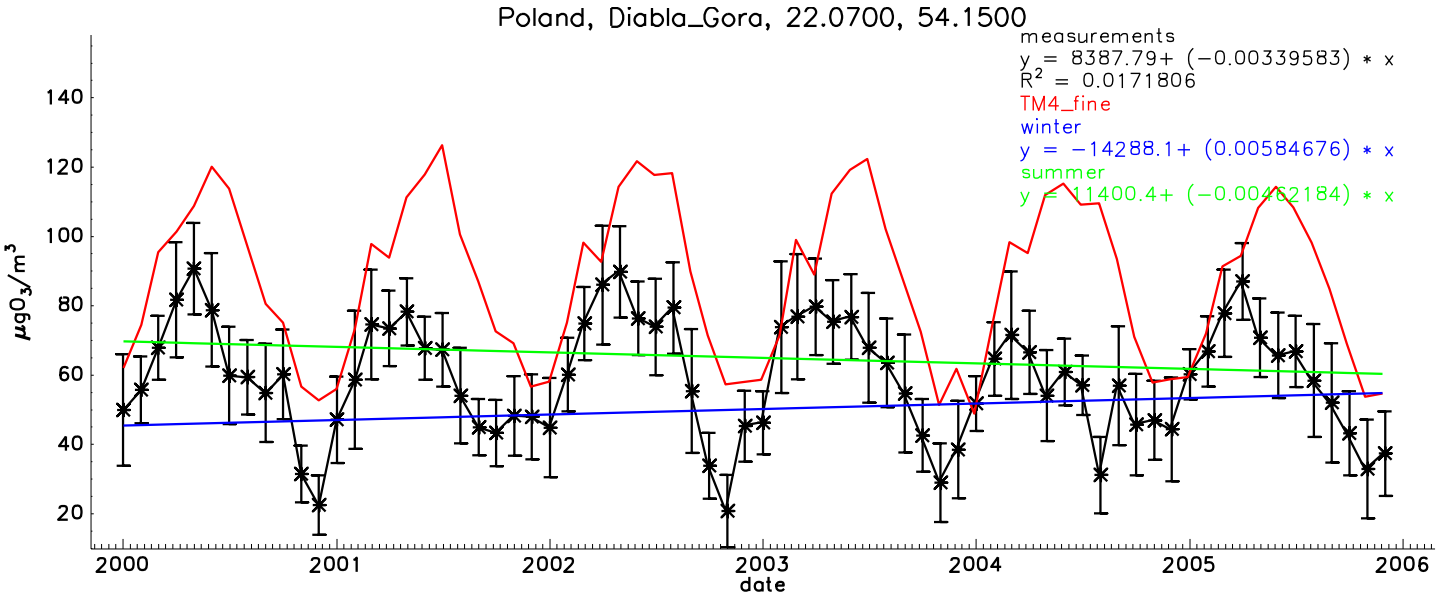
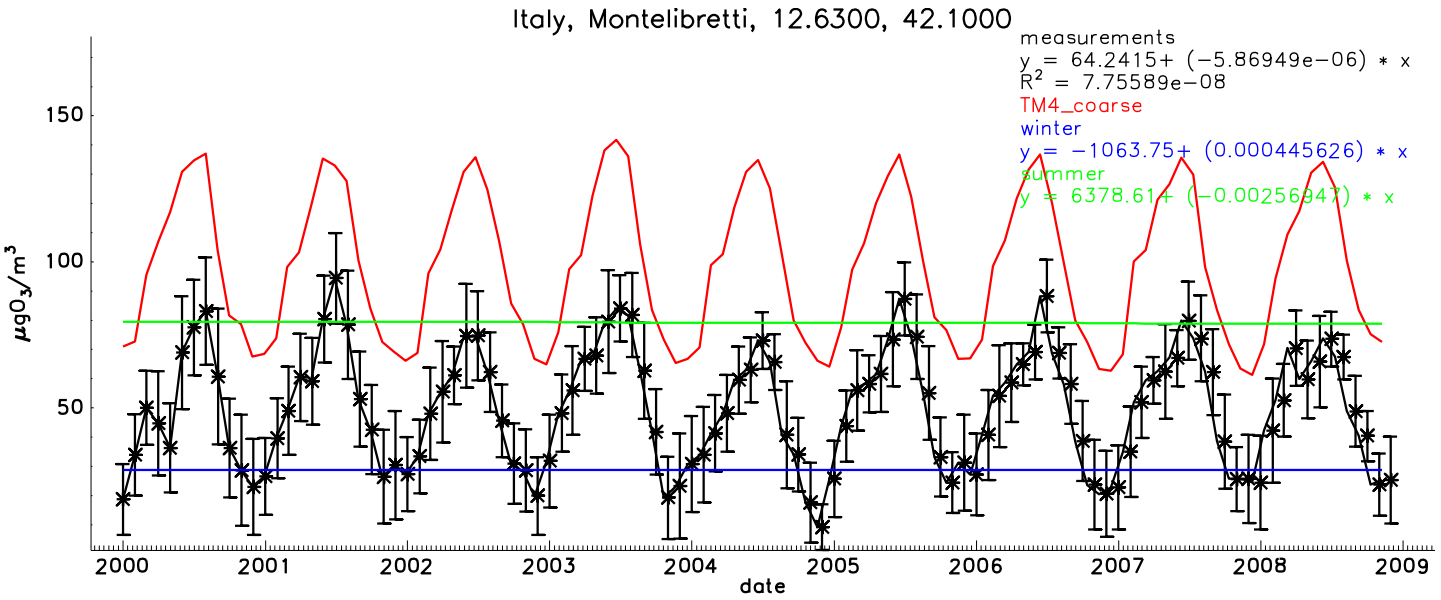


Ozone de-seasonalized trends over Europe - Italy

6x4x34



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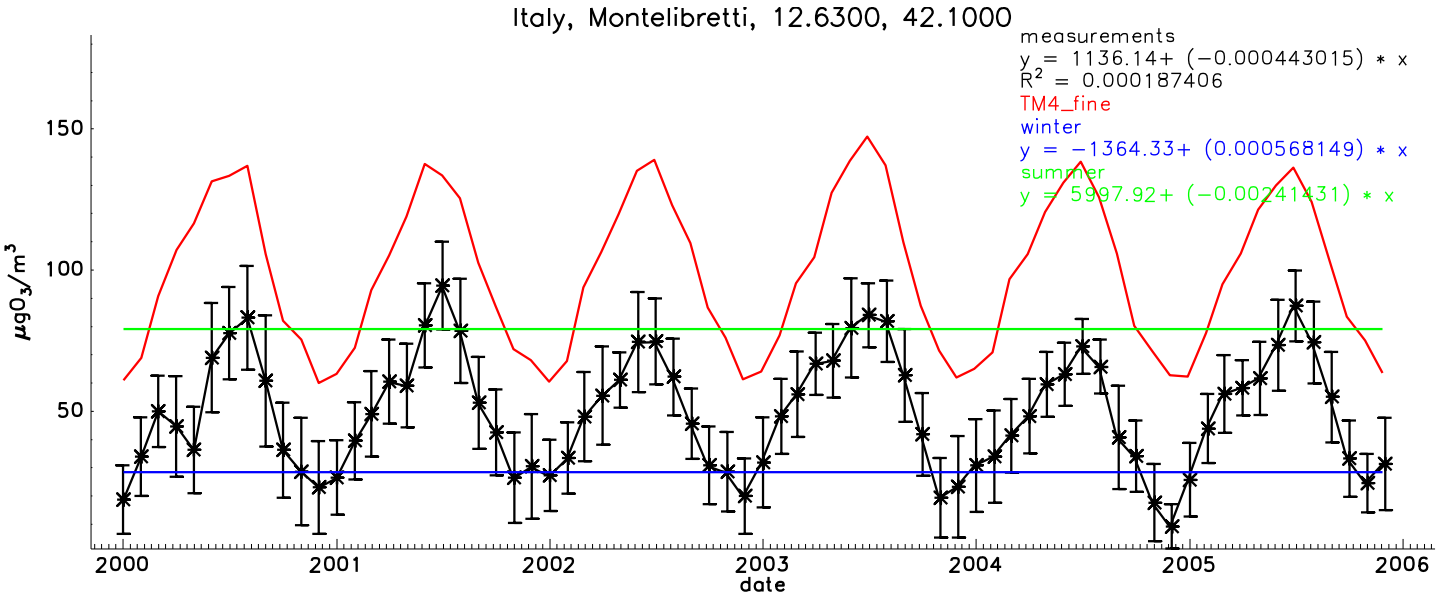

Ozone de-seasonalized trends over Europe – United Kingdom

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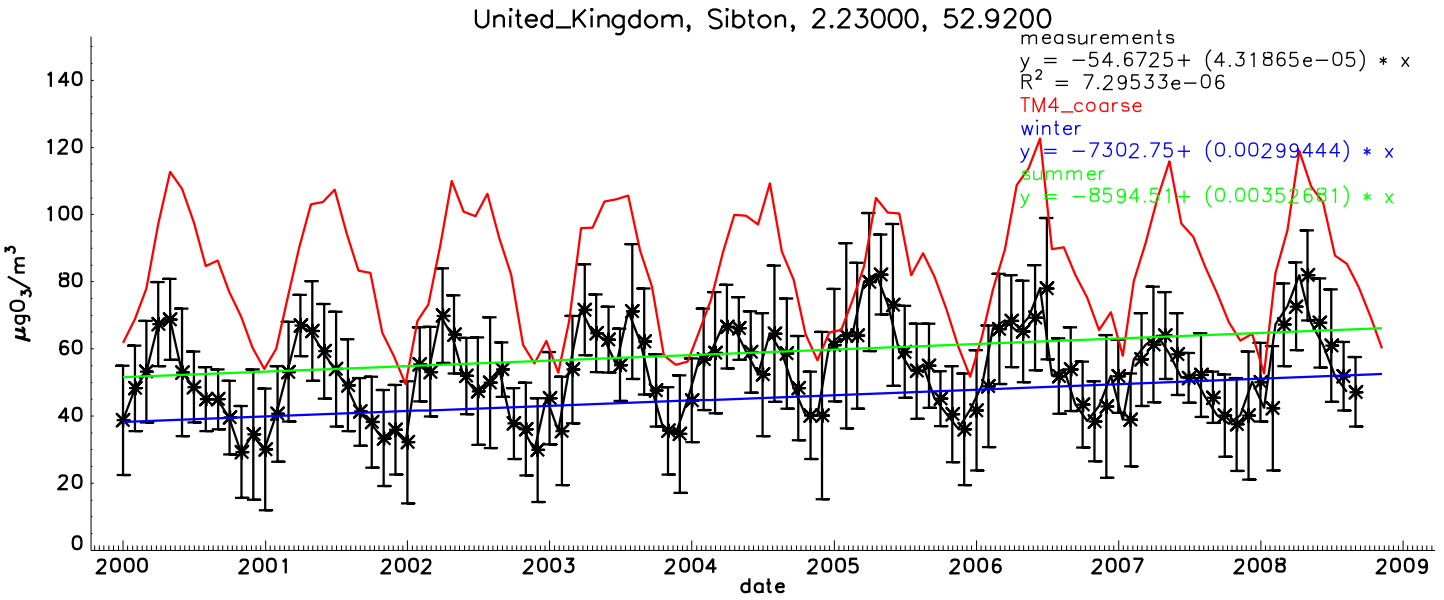

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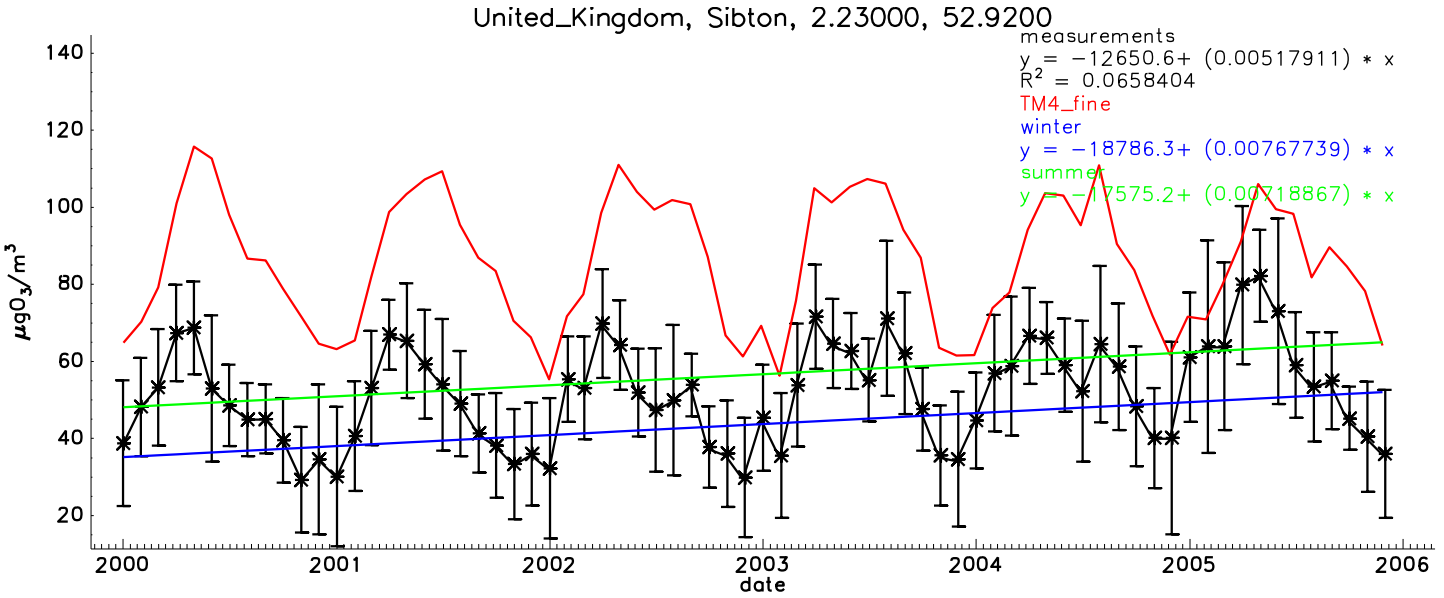

Part C: *Ongoing and future activities at ECPL*

Ongoing activities at ECPL (contact Maria K)

1- AEROCOM OC

2- PEGASOS (HOX recycling, SOA , multiphase chemistry, hindcasts experiments, model evaluation)

3- ECLIPSE (uncertainties related to short lived species simulation, model evaluation of seasonal behaviour, lifetime s and emissions distributions)

4- Atmospheric deposition modeling