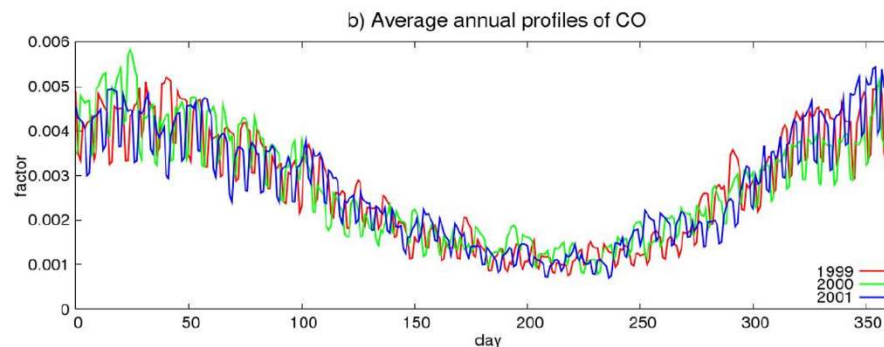
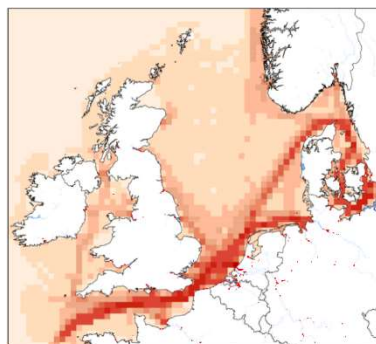


Modeling the temporal and spatial allocation of emission data

- Emission inventories are lacking details about the spatio-temporal distribution of emissions needed in chemistry transport models
- Emission models produce CTM ready data
- Emission models can be further developed (e.g. by using geo-referenced data sets) to improve the emission data fields for CTMs



From inventories to data sets

- Inventories provide annual data on fixed grids (0.1° to 0.5° resolution)
- CTMs need hourly data on multiple grids and projections
- Emission models are applied for
 - Regridding
 - Temporal distribution
 - Vertical distribution
 - Chemical speciation (e.g. VOCs)

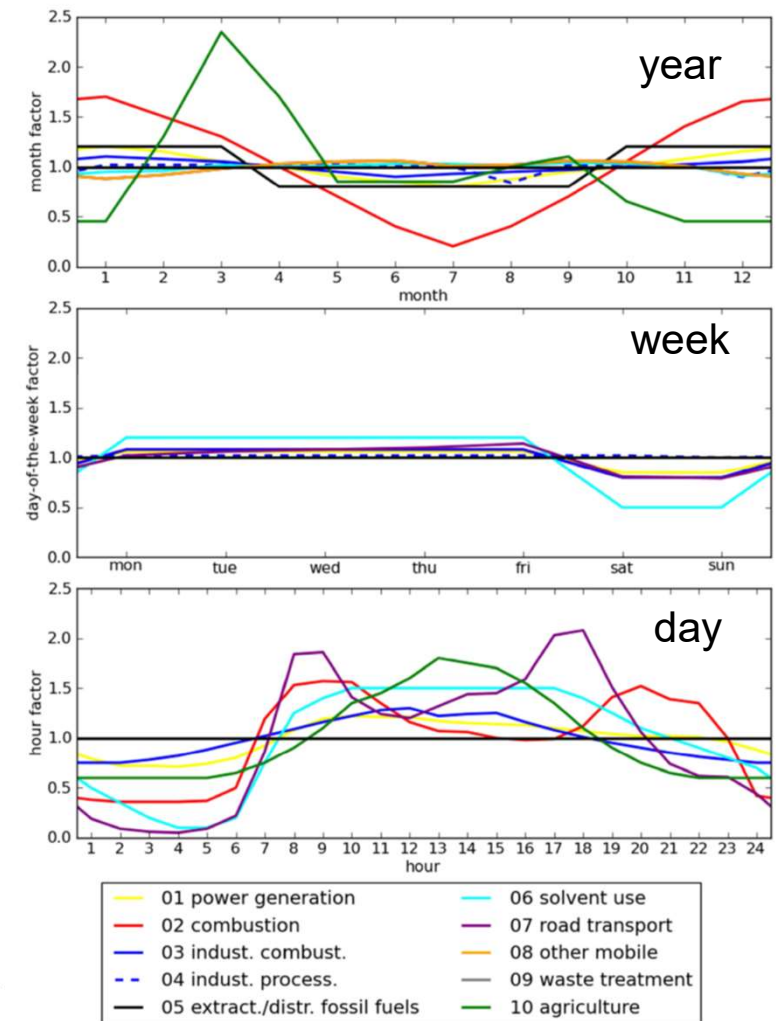
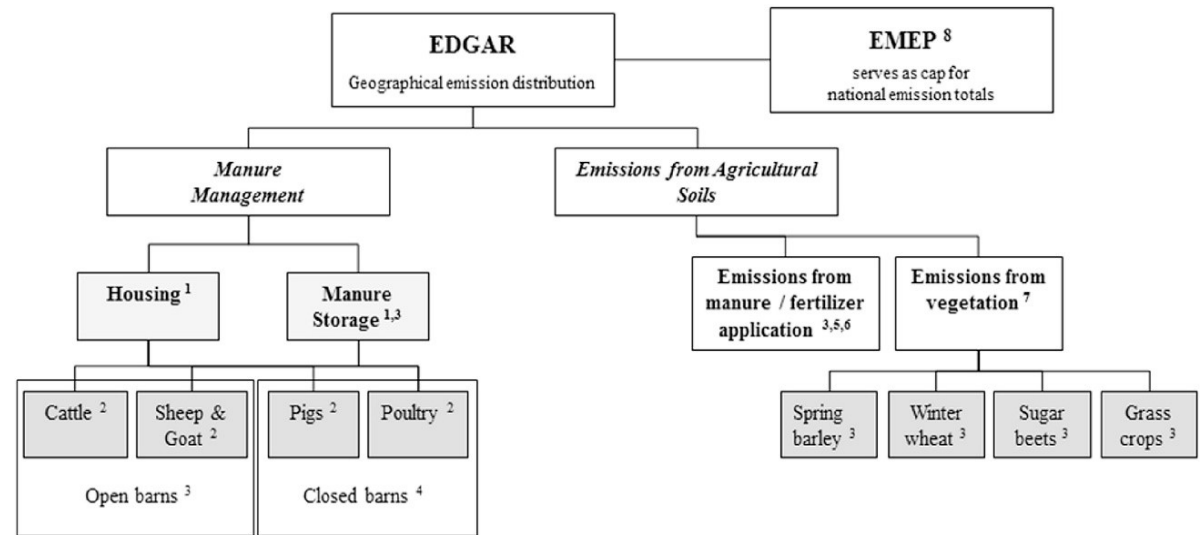


Figure from H. Denier van der Gon, et al.:
EU FP7 MACC deliverable report D_D-EMIS_1, 3, 2011.

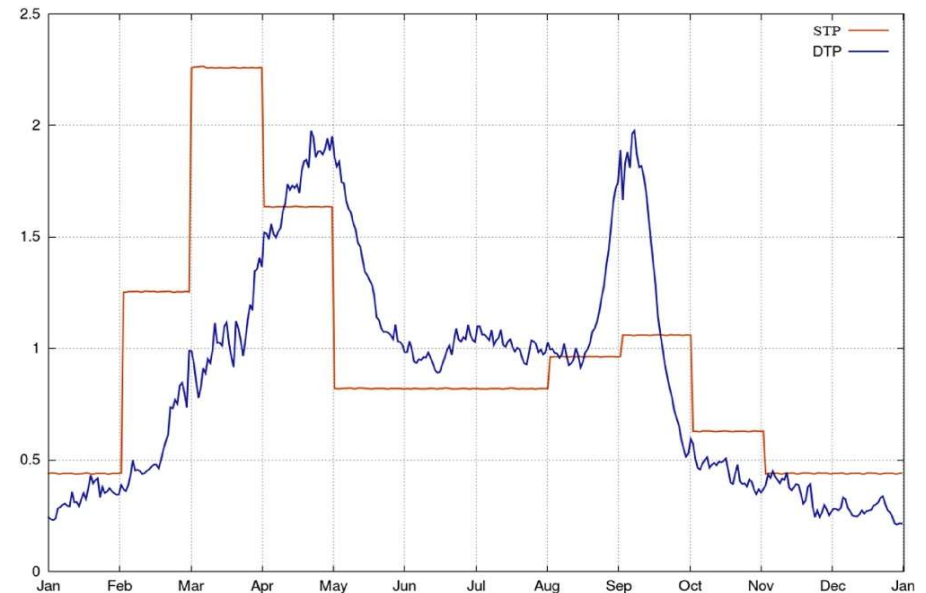
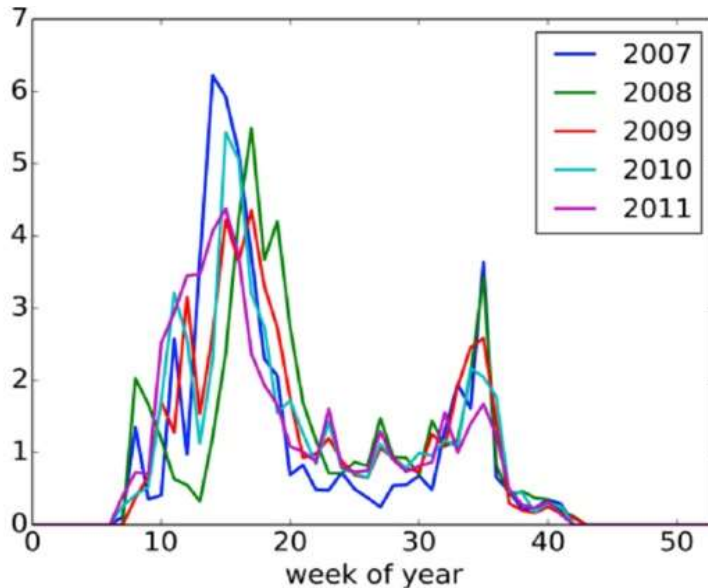
Example 1: Ammonia from agriculture

- Manure and fertilizers dominate
- Manure emissions depend on animal type and densities, temperature and wind
- Fertilizer emissions depend on application times, soil type and temperature



Backes et al., AtmEnv 131, 2016

Hendriks et al., AtmEnv 131, 2016



Backes et al., AtmEnv 131, 2016

Example 2: CO from residential heating

- Activity depends on ambient temperature
- Emission factors depend on fuel used
- Availability of gas or wood dominates spatial distribution

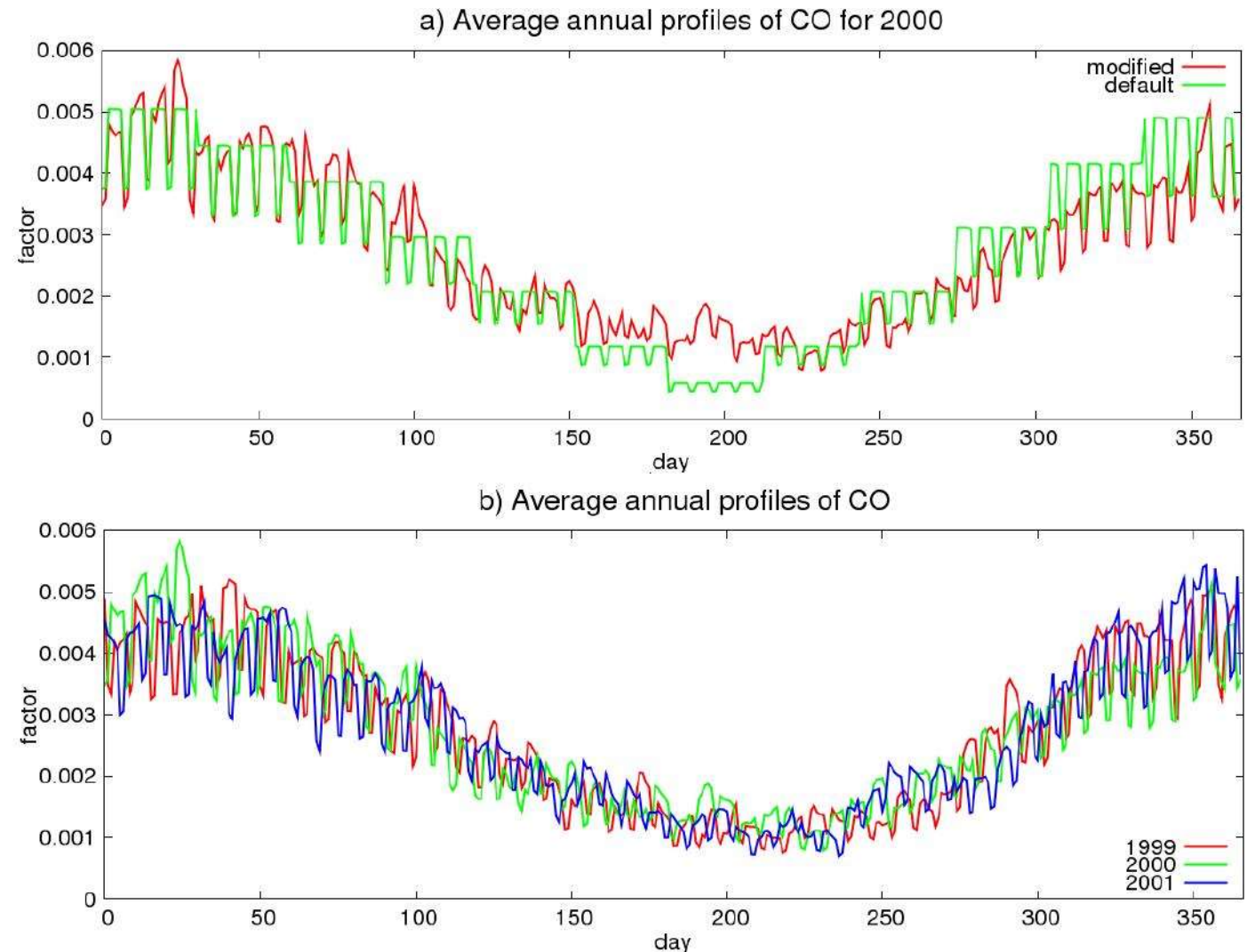
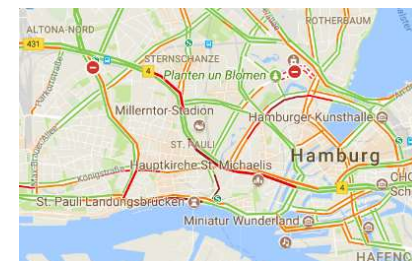


Figure from J. Bieser et al.: *Geos. Mod. Dev.*, 4(1):47–68, 2011

Future possibilities

Detailed georeferenced datasets can help to improve the temporal and spatial allocation of emissions, today and in the future, e.g.

- AIS data from ships
- car densities from toll roads
- traffic jam information
- use of fireworks on special occasions
- operation times of power plants and industrial facilities



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V. Matthias, J. Arndt, A. Auling, J. Bieser, H. Denier van der Gon, R. Kranenburg, J. Kuenen, D. Neumann,
G. Pouliot, M. Quante: ***Modeling emissions for three-dimensional chemistry transport models***