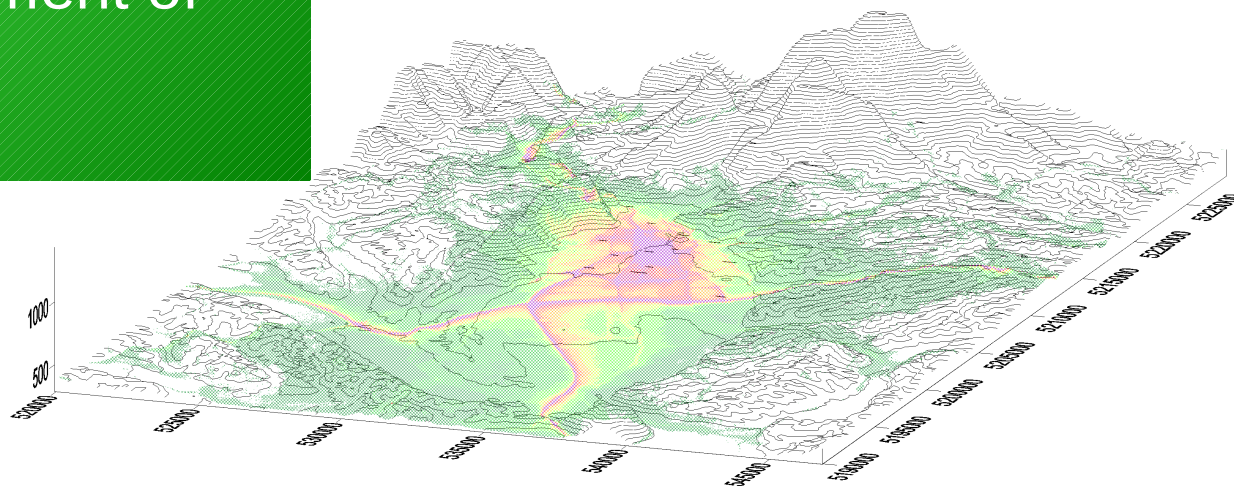


Modelling primary PM₁₀ concentrations for the city of Graz, Austria



Dietmar Öttl

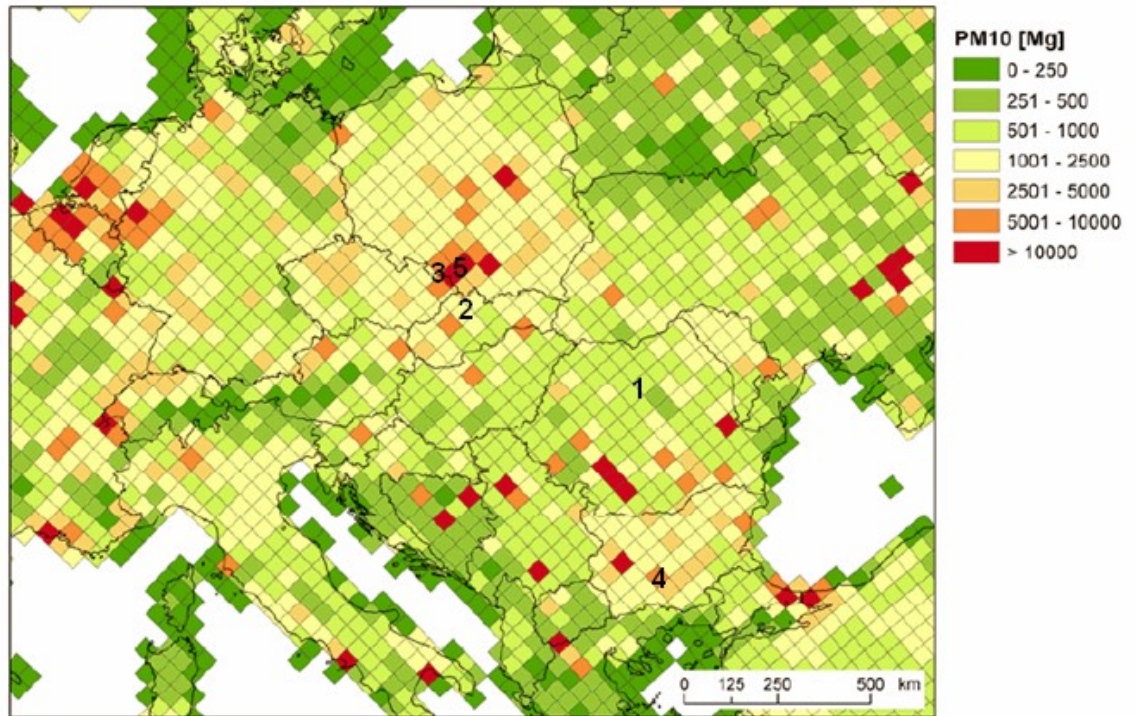
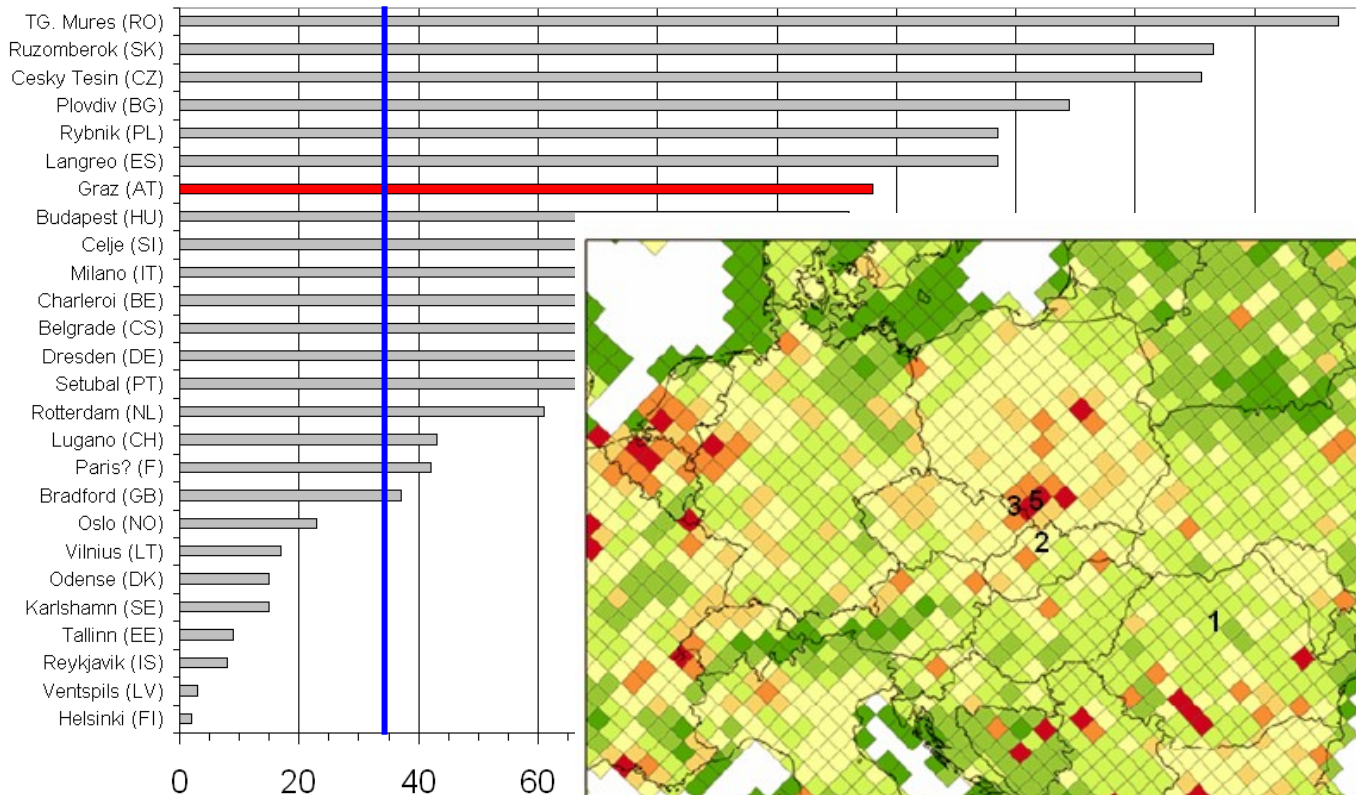
Air Quality Department of Styria



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Motivation



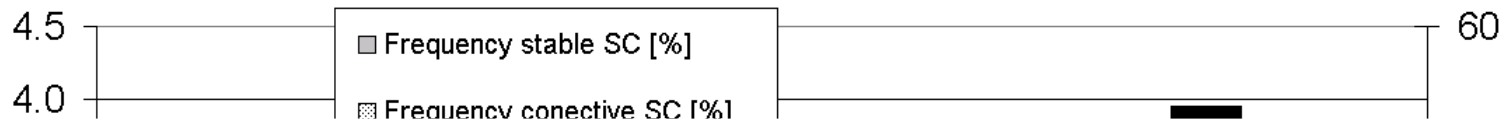
Source: <http://www.eea.europa.eu/themes/air/airbase>



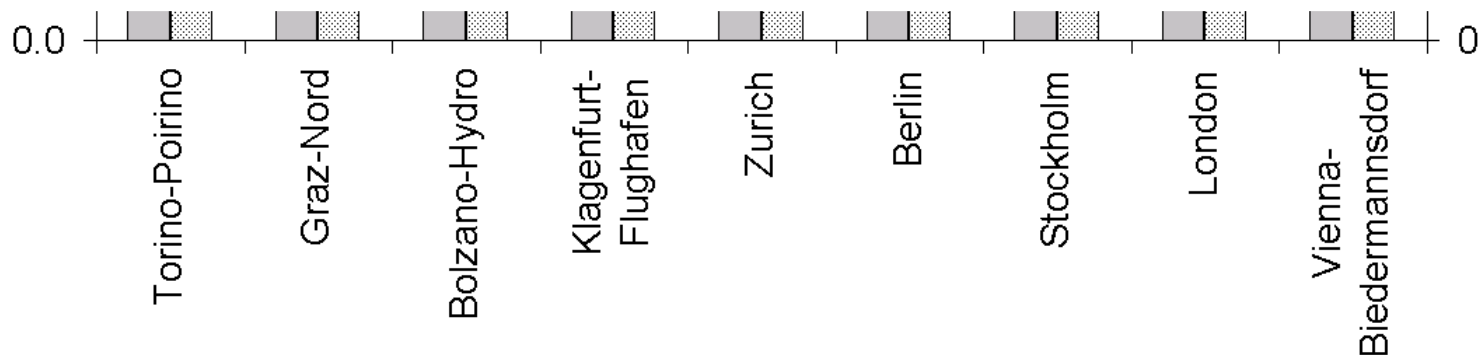
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Dispersion conditions

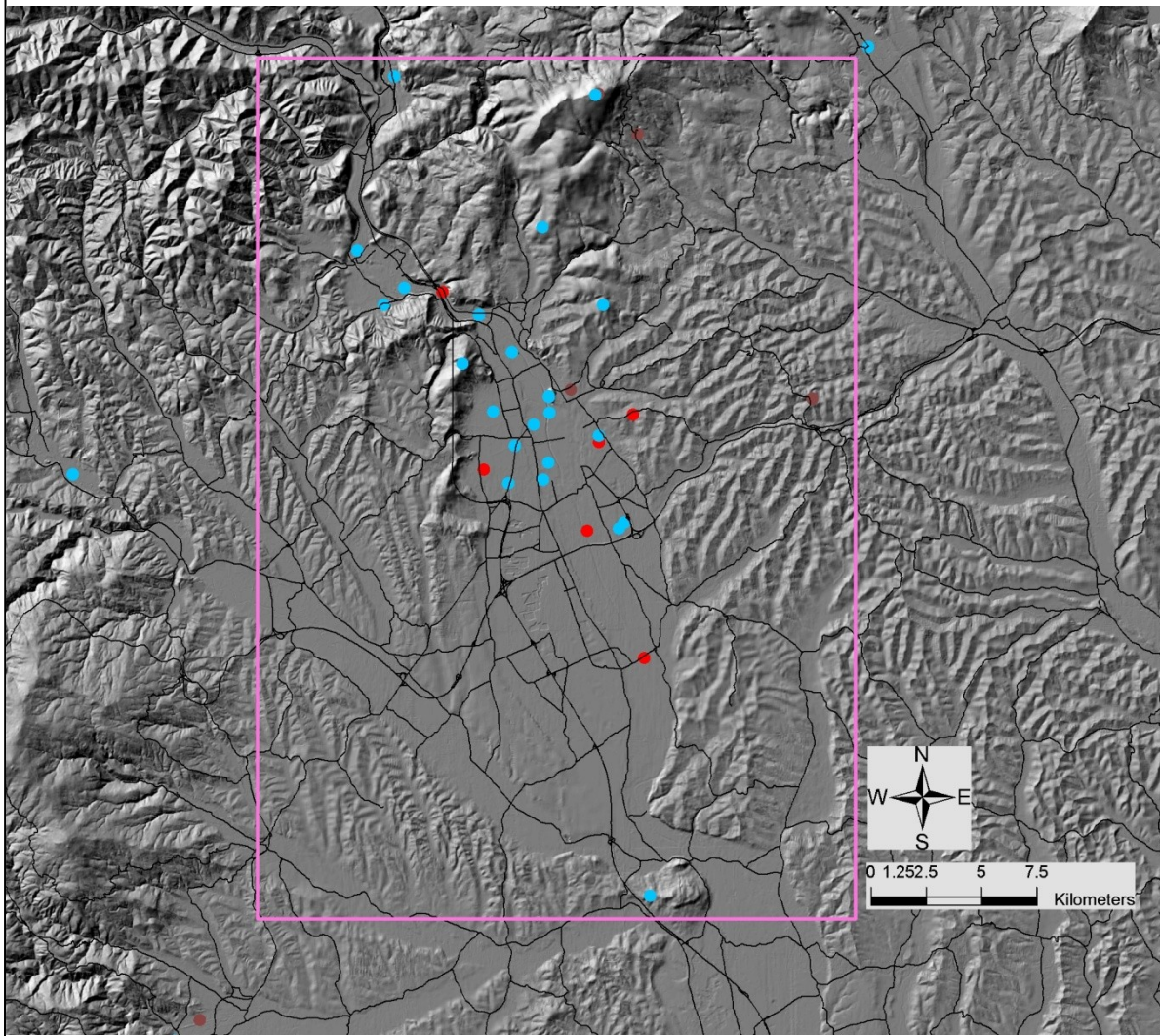


- What are the main sources for the observed high concentrations Graz?
- How high would the concentrations be, if the dispersion conditions are like that in Vienna?





Model domain



GRAMM:

27 km x 39 km

300 m x 300 m x 10 m

15 vertical levels

GRAL:

10 m x 10 m x 2 m

~350.000 inhabitants



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HARMO 08, Cavtat, Croatia

→ Luftgüteüberwachung

Methodology

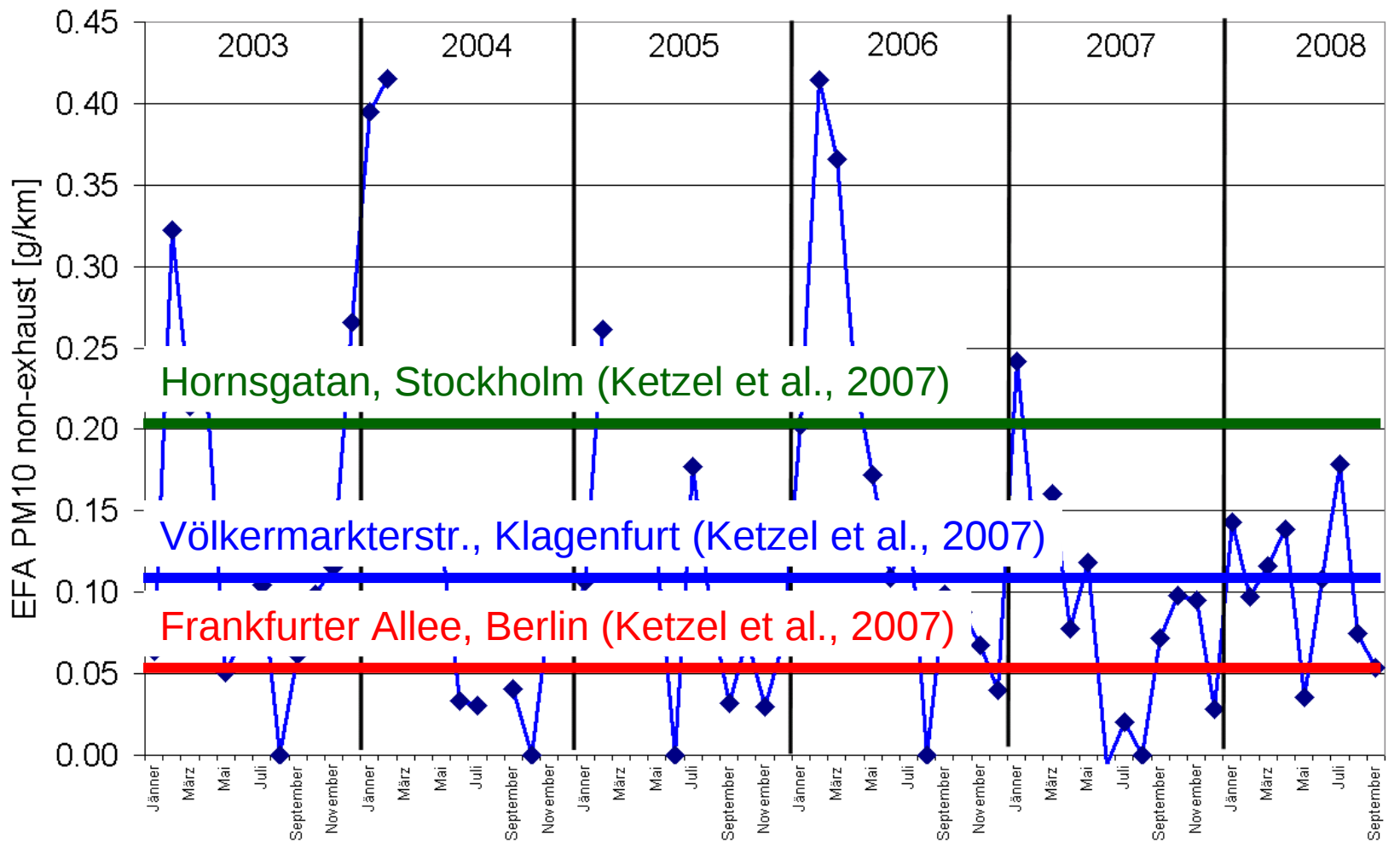


- Establishment of meteorological statistics (PGT classes, 5 wind speed classes, 36 wind sectors)
 - ~80 % below 1.5 ms^{-1}
 - ~50 % stable classes
- Computation of **quasi-steady state wind fields with GRAMM** (Oettl, 2000) and **steady-state concentration fields with GRAL** (Oettl, 2008: www.umwelt.steiermark.at->Luft>Publikationen) separated by user defined source groups (traffic, heating, etc.) for each classified situation.
- Computation of concentration statistics (annual mean, etc.) by applying different emission modulations (daily, monthly) for each source group.



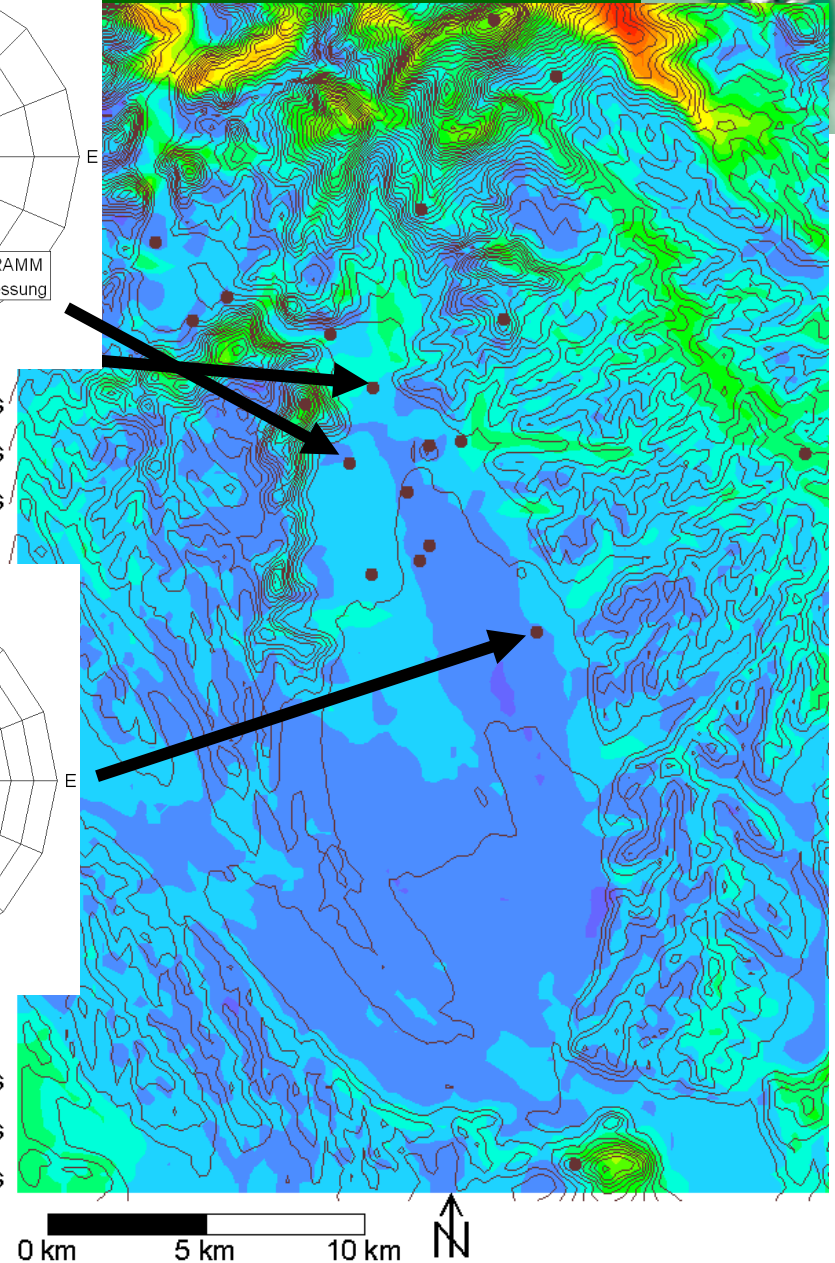
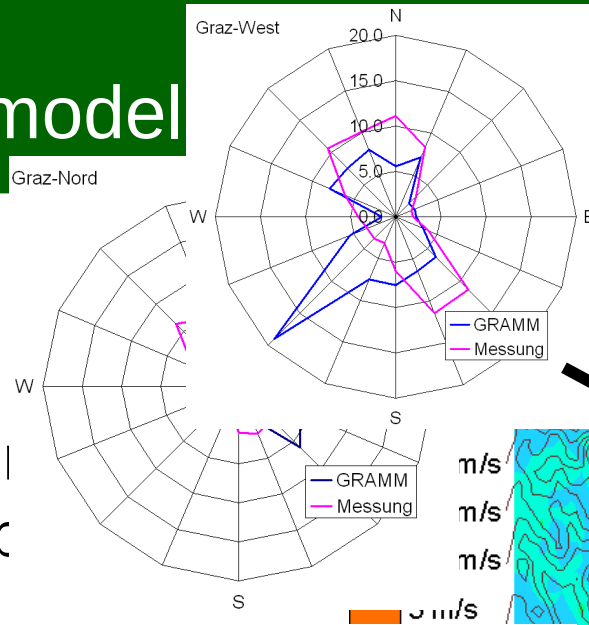
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A few words on non-exhaust emissions from traffic....



Wind field model

Simulated and
mean wind speed
GRAMM

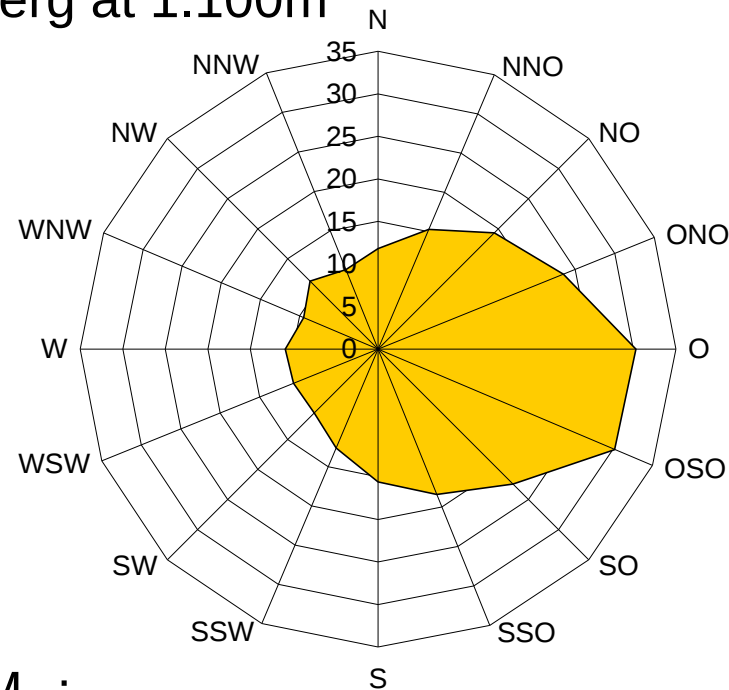


Background concentration



Assumptions:

Long range PM_{10} : AQM Masenberg at 1.100m
($16\mu\text{g}/\text{m}^3$)



Locally generated secondary PM_{10} :

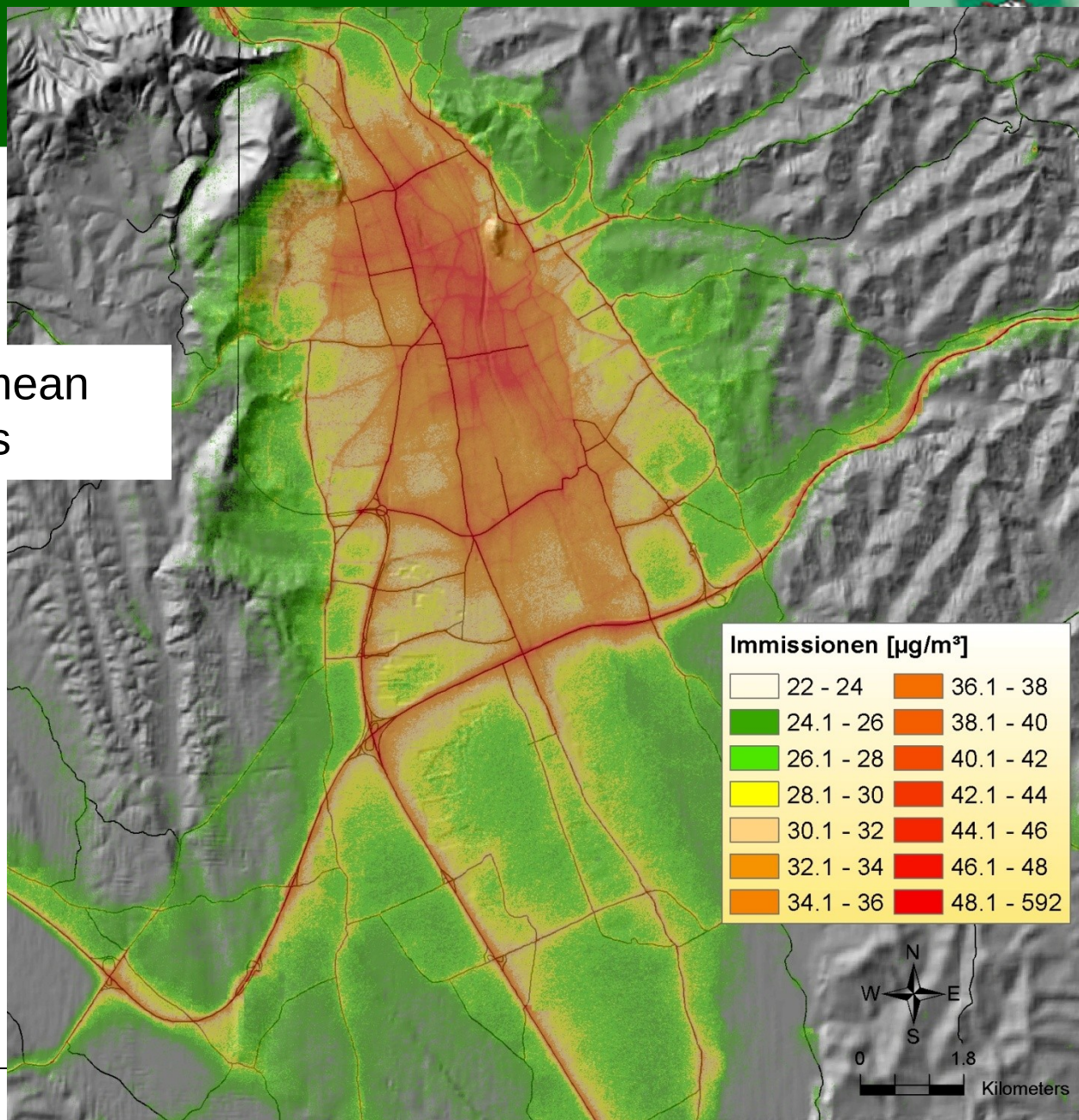
Conc. in Graz (AQUELLA, Bauer et al. 2007)
minus conc. at AQM Masenberg (estimated
from Hüglin et al., 2005 – 34 %)



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GRAL

Simulated annual mean
 PM_{10} concentrations

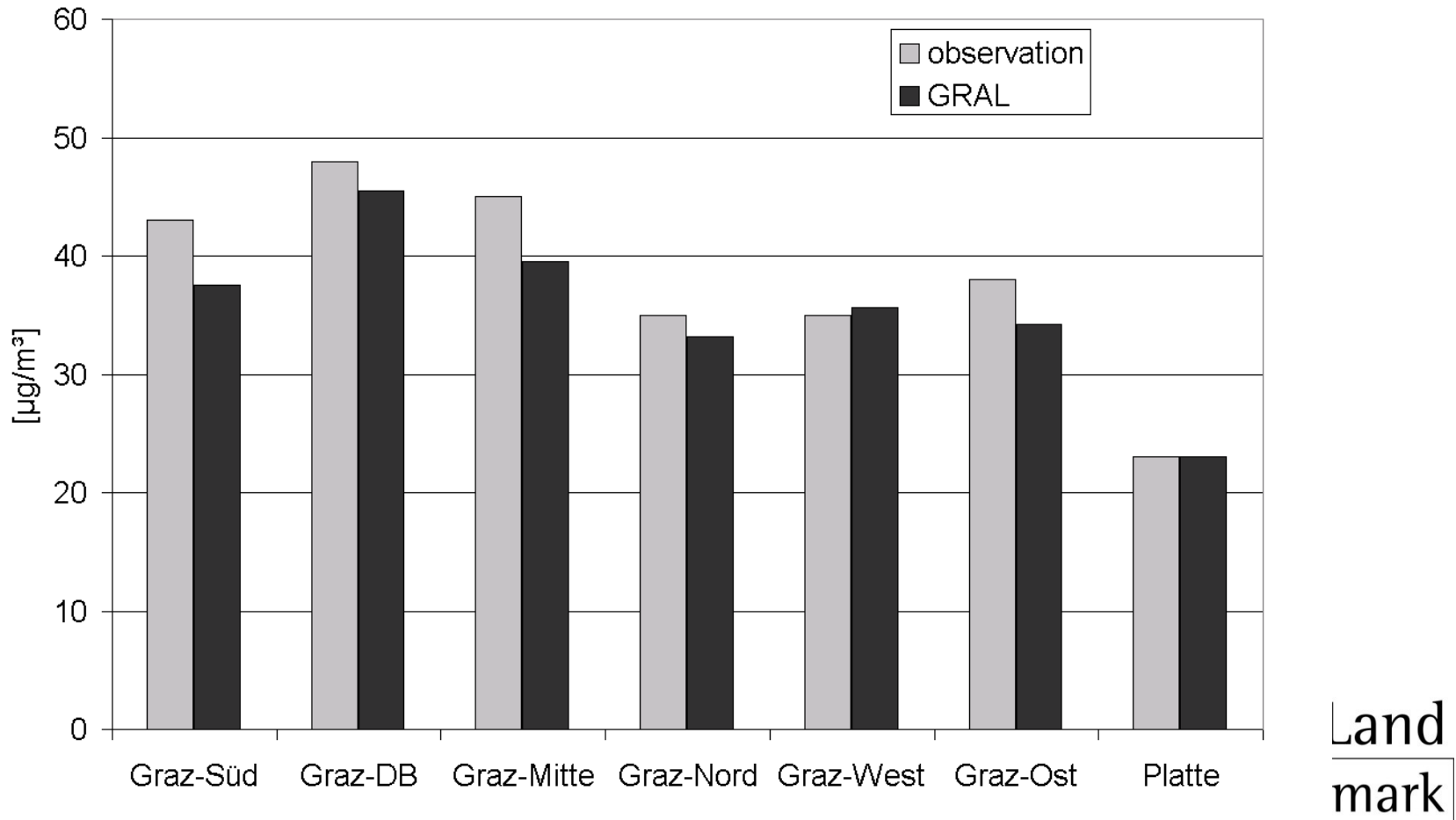


HARMO 08, Cavtat, Croatia

GRAL results



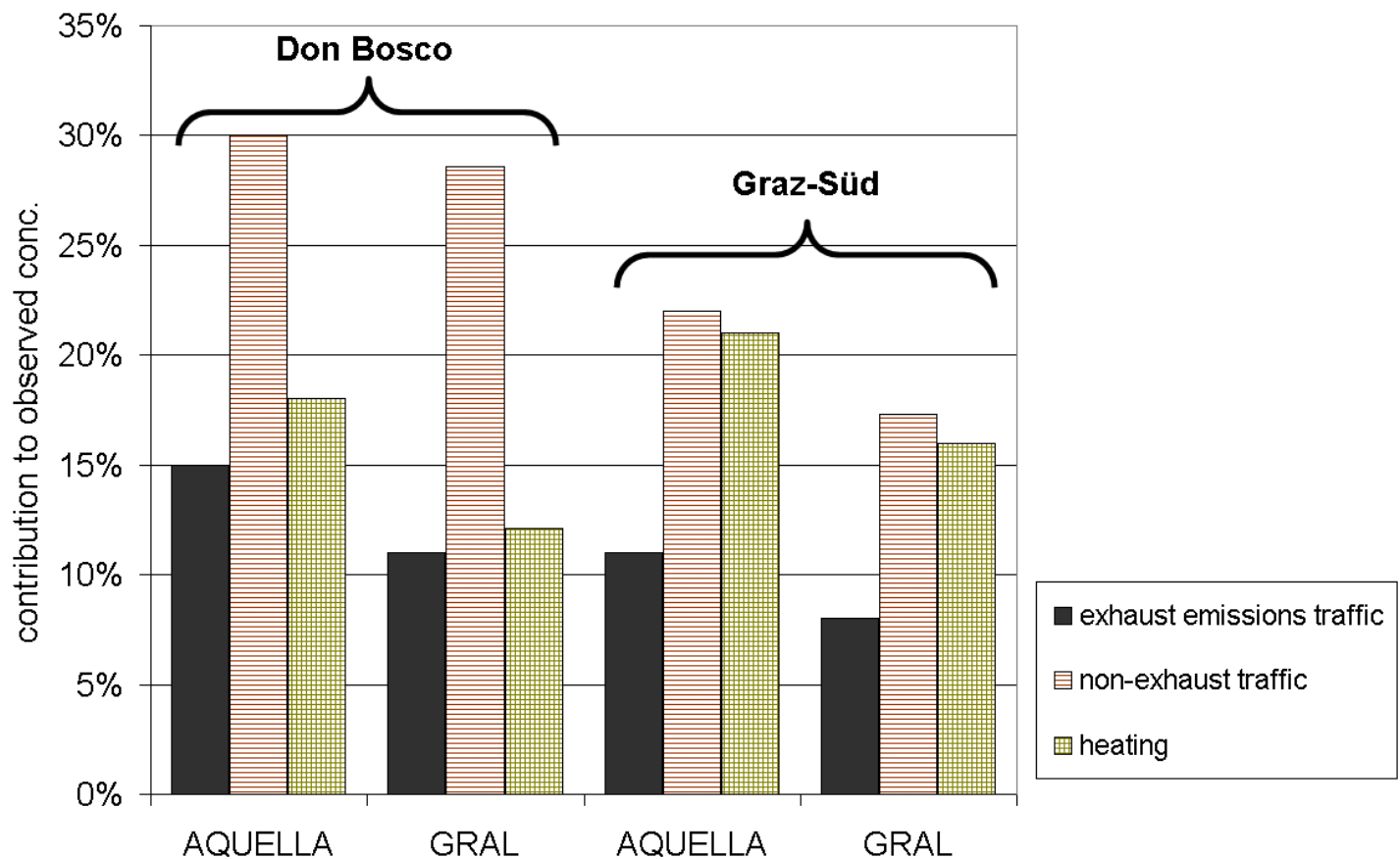
Comparison of observed and modelled annual mean PM₁₀ concentrations





GRAL results

Comparison with chem. analysis (Bauer et al., 2007; Jan.-Apr.-Jun.-Oct. 04)

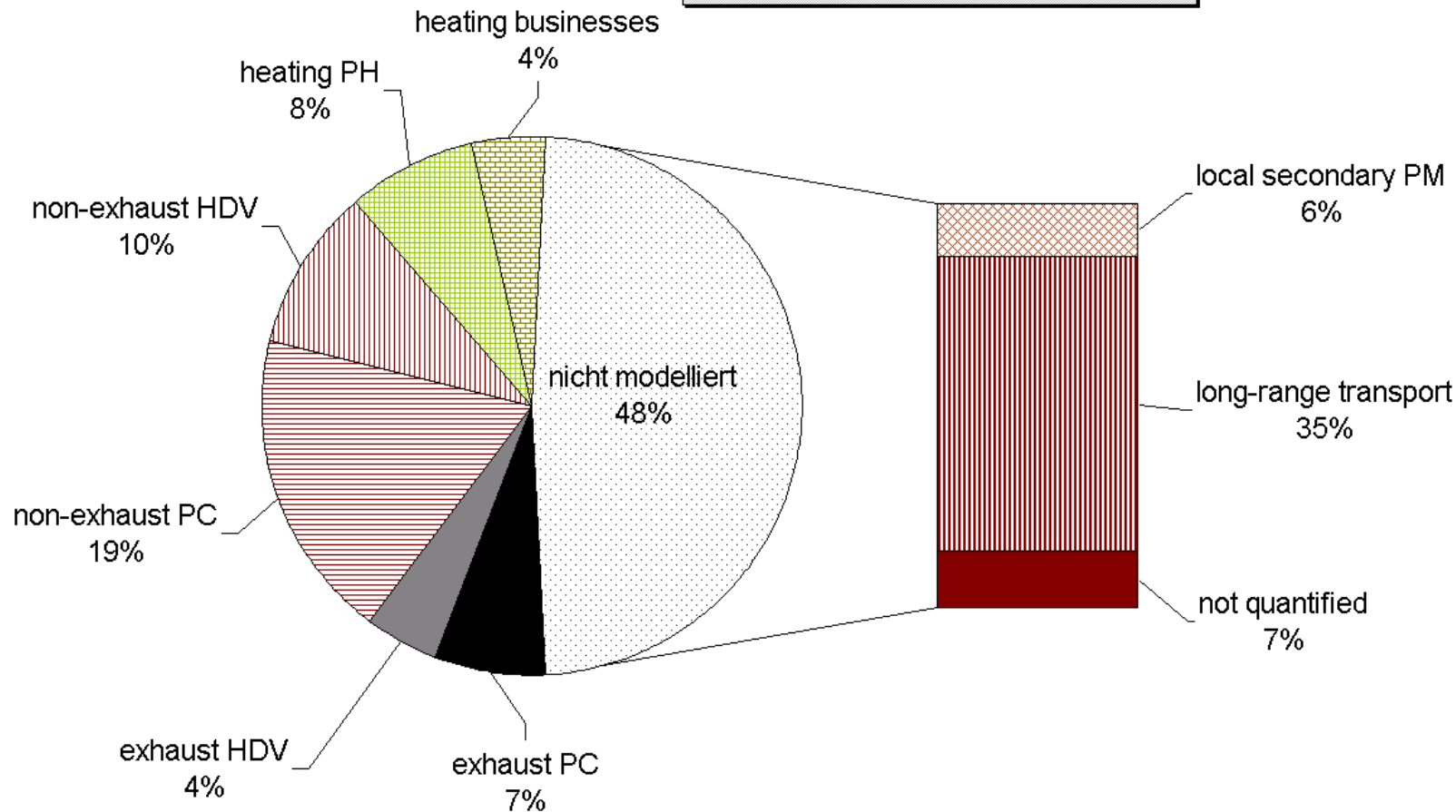


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Source apportionment annual mean



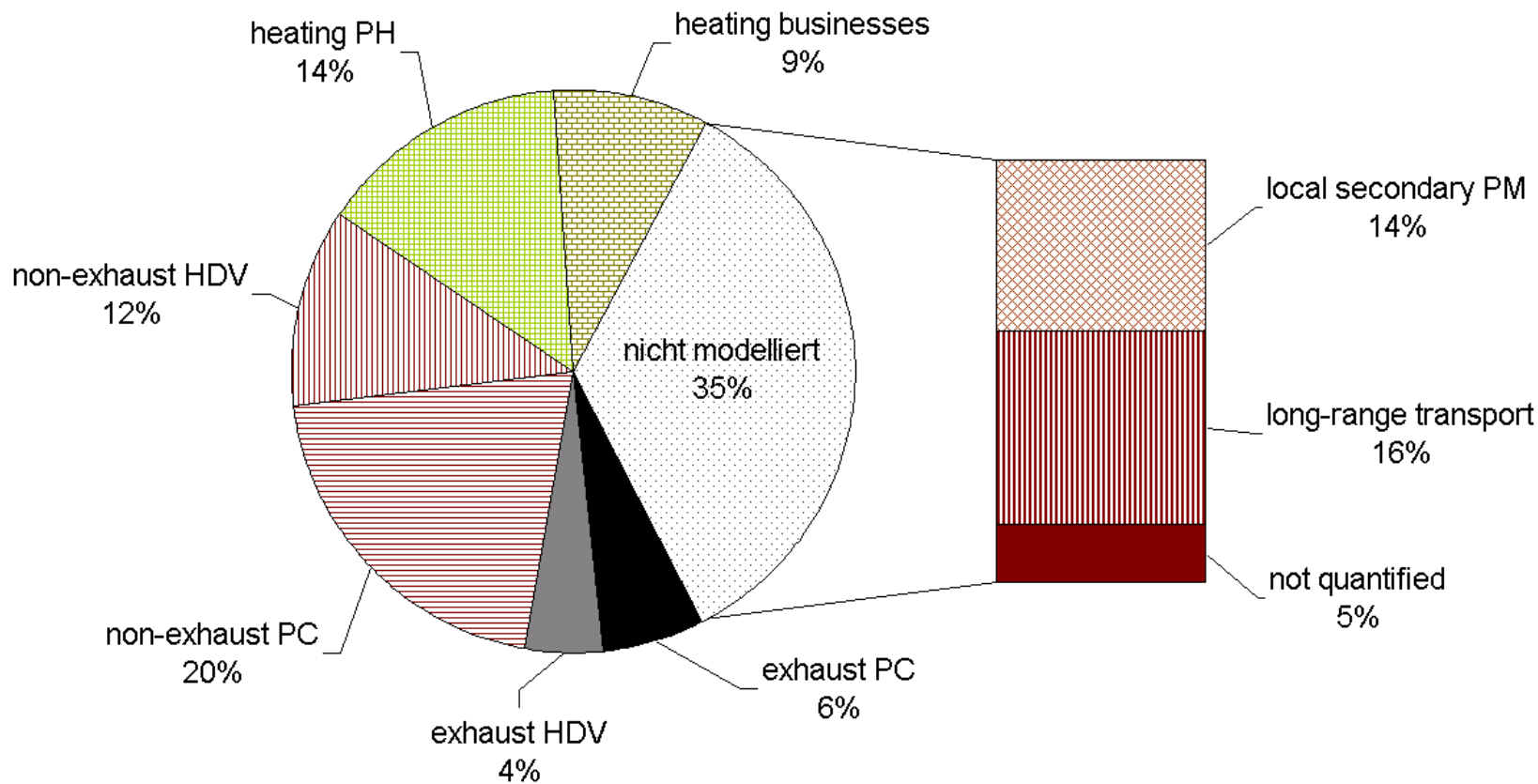
Source apportionment Graz-Don Bosco
annual mean: $48 \mu\text{g}/\text{m}^3$



Source apportionment winter mean



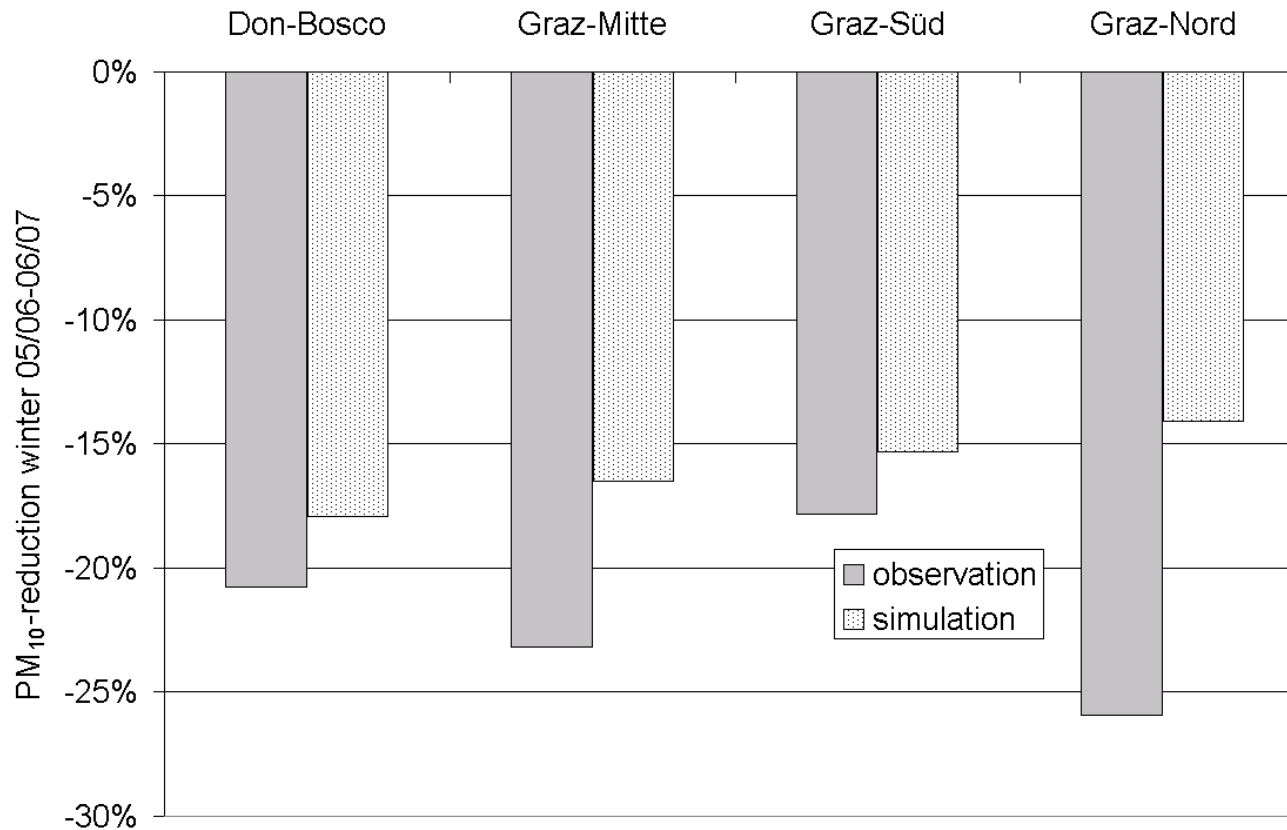
Source apportionment Graz-Don Bosco
winter mean: 80 $\mu\text{g}/\text{m}^3$





Results

Observed and modelled PM10 reductions due to the mild winter 06/07 (less salting; less heating)



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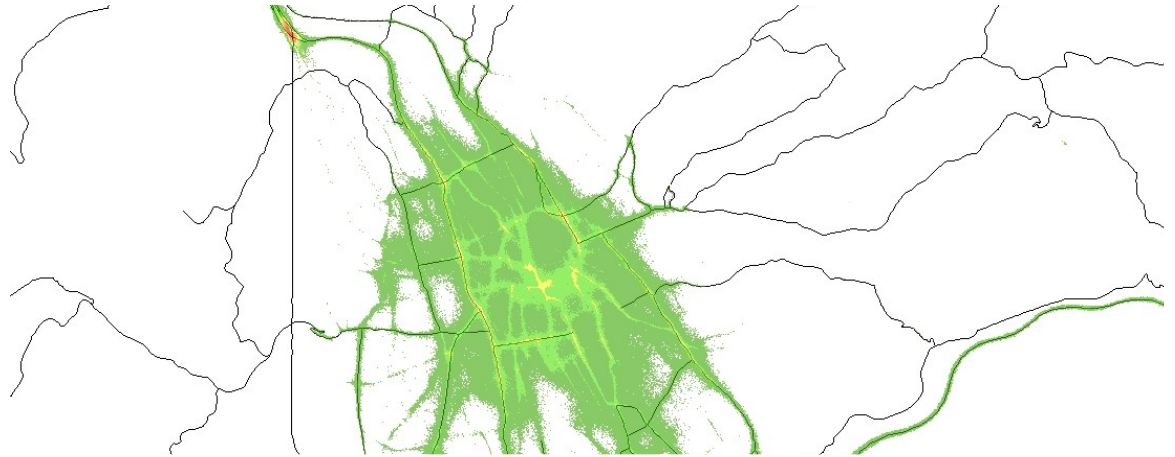
Sensitivity analysis



Assumptions:

Flat terrain

Met. Data from Vienna



About a factor of 3-4 lower concentrations
(without background)



Conclusions



➤ Scenarios to meet AQS.....

- Don-Bosco: -100 % traffic & -60 % heating
- Graz-Süd: -100 % traffic & -100 % heating
- Graz-Nord: -35 % traffic & -100 % heating



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Wishes towards EU



- Financial support from EU for strong measures (railway, tramway, P&R, remote heating, stove replacements, etc.)
- To postpone penalties to the EU, due to violating PM10 air quality standards in regions with similar dispersion conditions in Styria (e.g. Carinthia, Slovenia, South Tyrol, Torino, Milano, etc.)



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The End....



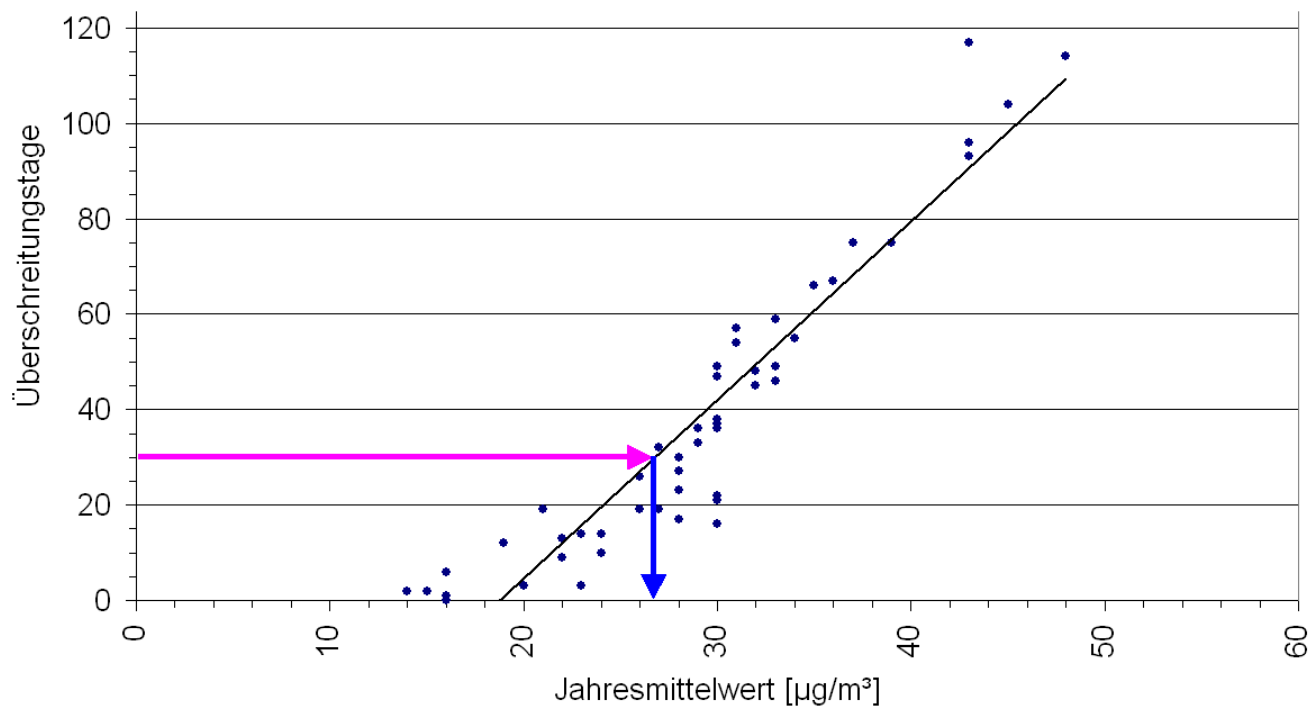
Thanks for your attention!





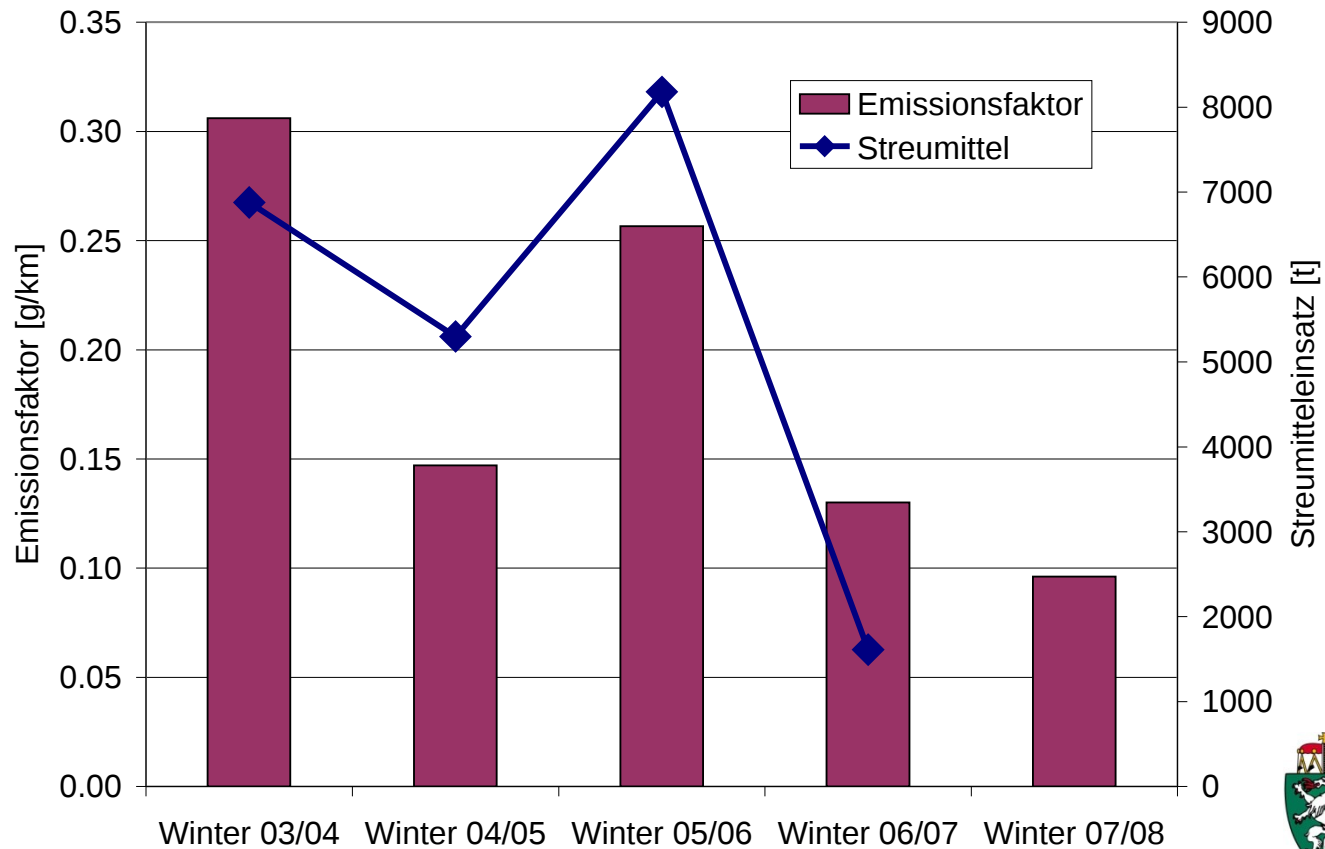
Modellierung

Zusammenhang Überschreitungstage – Jahresmittelwert auf Basis steirischer Messwerte



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Emissionen



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Emissions



Overview:

Traffic

exhaust	57 t/a
non-exhaust	123 t/a

Heating

private households	70 t/a
businesses and industry	44 t/a

Missing sources

- fugitive dust (construction, industry)
- Offroad vehicles and equipment
- Agriculture



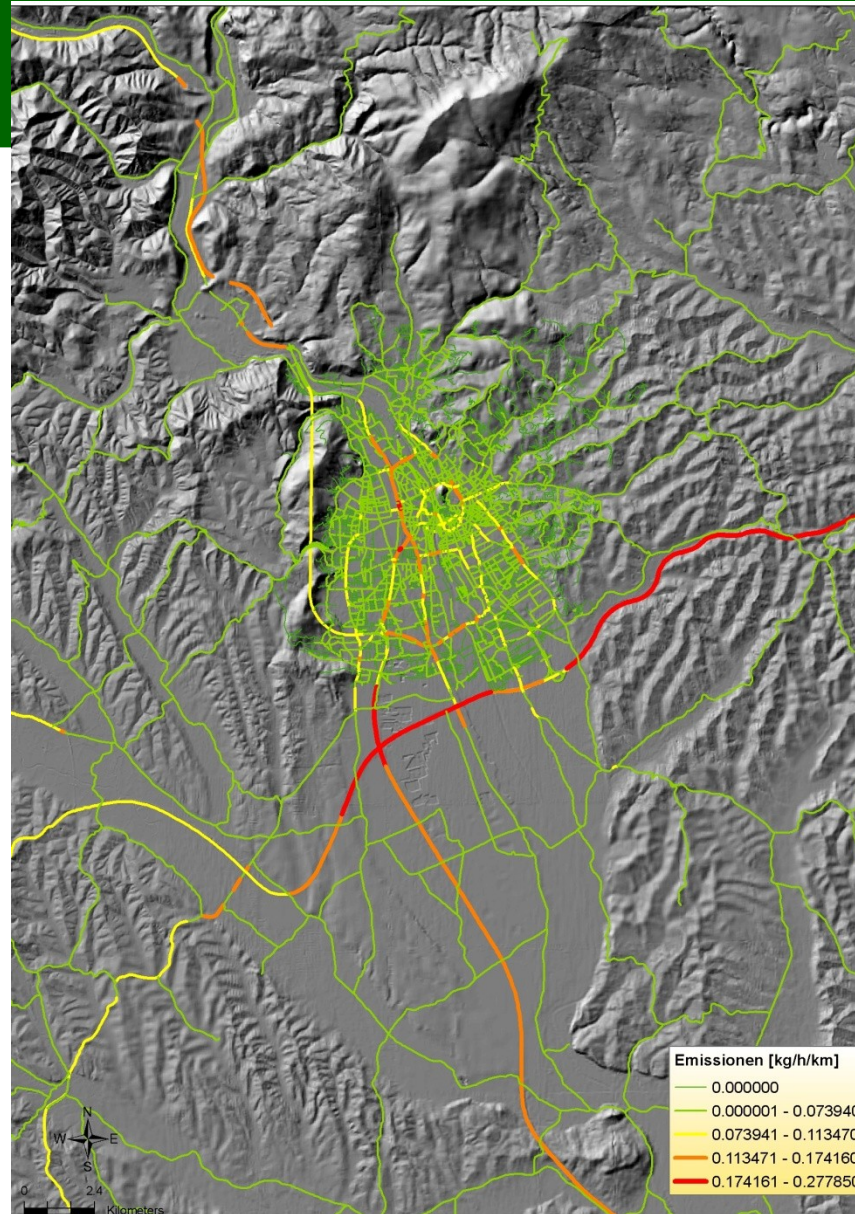
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Emissions



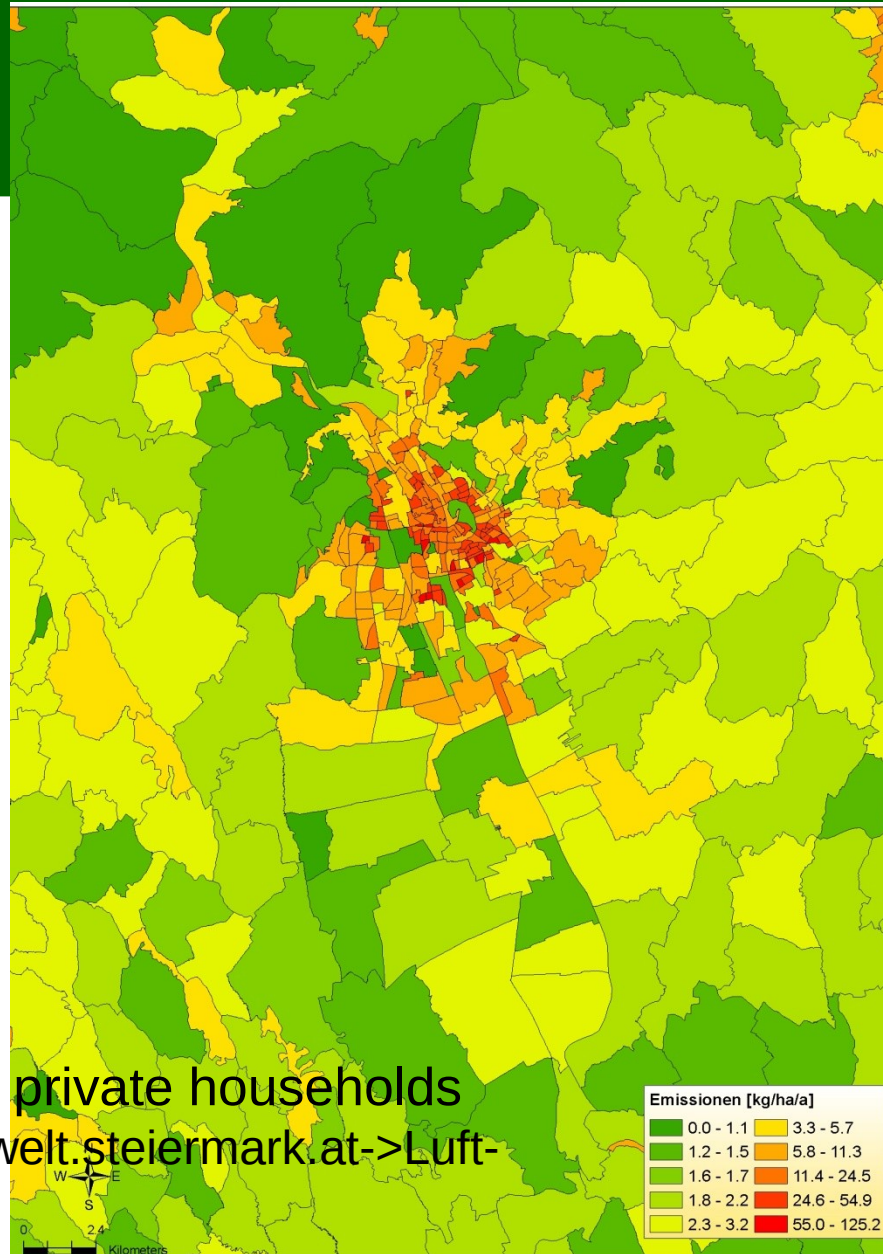
PM₁₀ Traffic
Emissions for Graz,
2006

NEMO:
Network emission
model (Rexeis and
Hausberger, 2005)



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Emissions



Domestic heating of private households
(Oettl, 2008; www.umwelt.steiermark.at->Luft->Publikationen)

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Emissions



Heating of businesses
and industry (Zelle,
2008)

