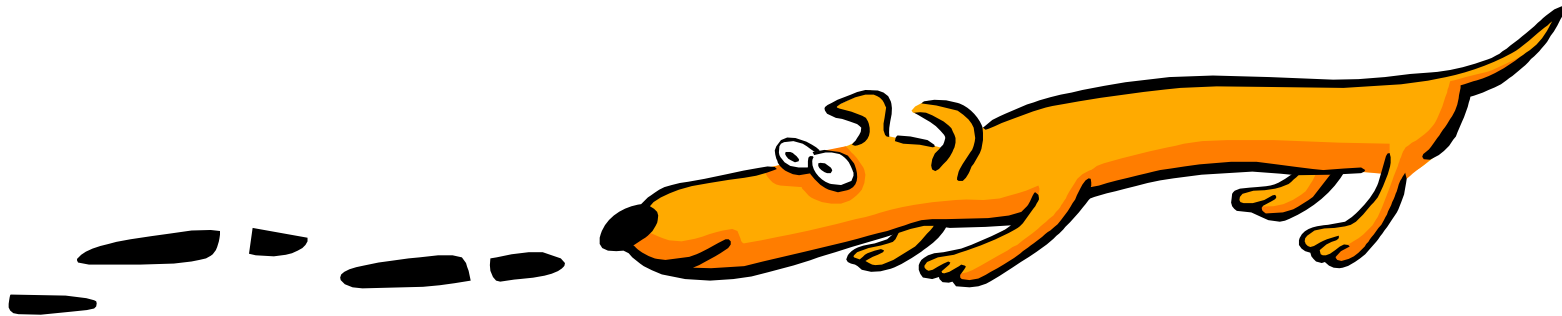


Regional Air Quality Model Applications in Germany

Sabine Wurzler
Heike Hebbinghaus

**North-Rhine Westphalia State Agency for Nature,
Environment, and Consumer Protection, Germany
(LANUV-NRW)**



LANUV-NRW: Who we are and what we do (1/3)

Official State Agency with 8 departments

- Central Administration
- Environmental Protection and Landscape Ecology
- Environmental Vulnerability + Reporting, Toxicology, Epidemiology
- **Air quality, Noise, Vibrations, Radioactivity**
- Water Management and Protection
- Laboratory for Environmental Analysis
- Industrial Techniques, Waste Recycling
- Consumer Protection, Animal Health, Agriculture

Total staff > 1200

including electricians, stockmen, coxswains (mates),....., physicians, veterinarians, engineers, chemists, atmospheric scientists,



LANUV-NRW: Who we are and what we do (2/3)

Air quality:

Responsibilities:

- protection of the health of the citizens of North-Rhine Westphalia
- informing the public on dangerous levels of air pollution
- answer all kind of questions concerning environment
- implementation of EC directives
- reporting to the EC

Requirement:

latest and most accurate information
about air pollution on a day-to-day basis.

Consequences:

Measurement and modelling of air quality



LANUV-NRW: Who we are and what we do (3/3)

LANUV interacts with

- other federal German agencies
- the national Environmental Protection Agency
- the EC and is responsible for the implementation of EC directives.
- other European federal and national environmental protection agencies

LANUV is the head of the European reference laboratories for air pollution measurement methods (AQUILA).



EC air quality directive and it's consequences

EC air quality directive and it's daughters require:

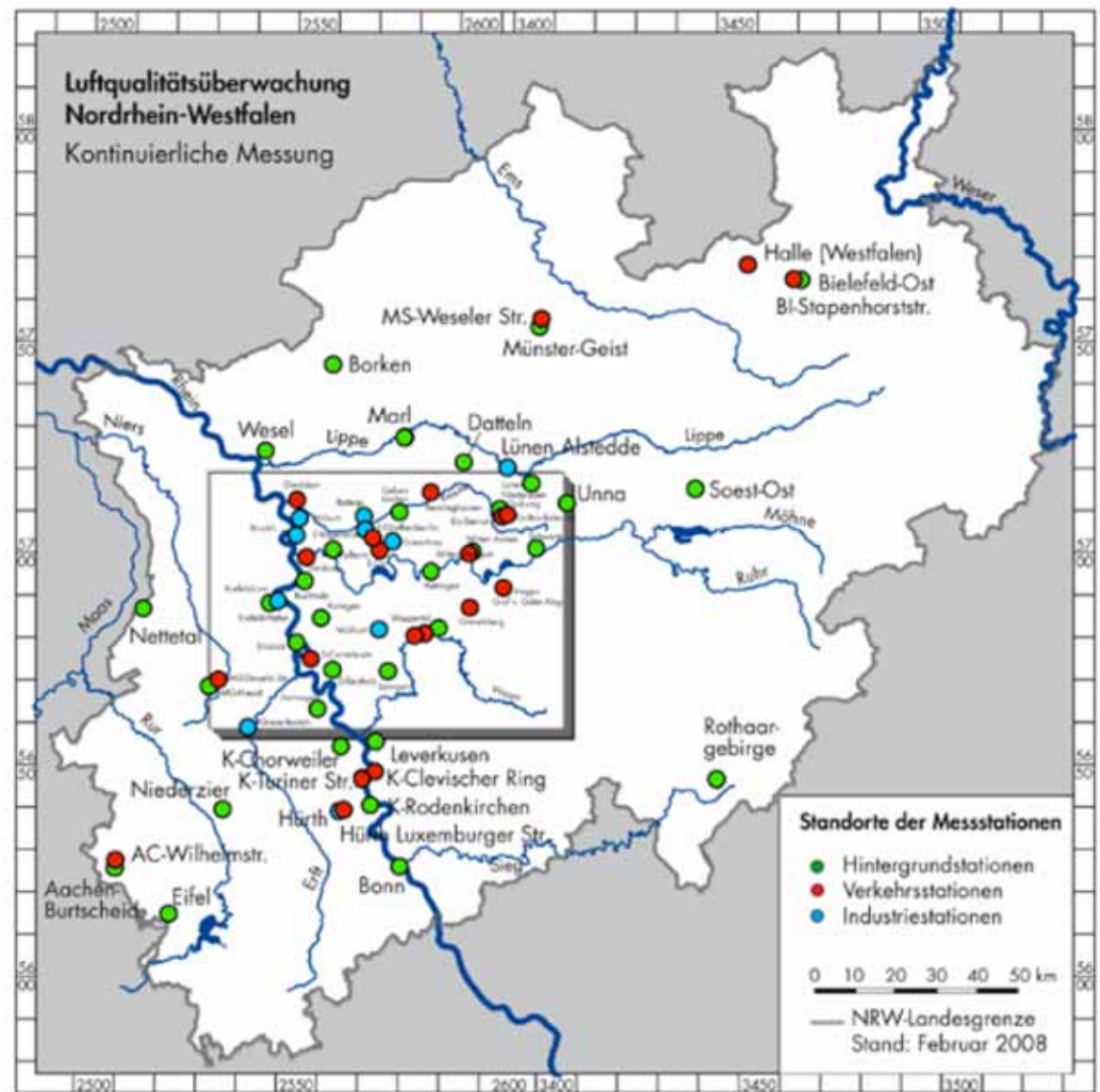
- Assessment of the air quality on the whole territory of each member state
 - Combined efforts of monitoring networks and modeling
- Limit values have to be met for e.g., PM10 in 2005 (2011) and for e.g., NO₂ in 2010 (2015). Amendment?
 - Implementation of plans and programs to achieve these obligations if pollution levels are too high.
 - EC notification procedure



Air Quality Observation Network in NRW

65 stations
(21 traffic stations (red)
+ 10 industrial hotspots
(blue))

green = background
stations

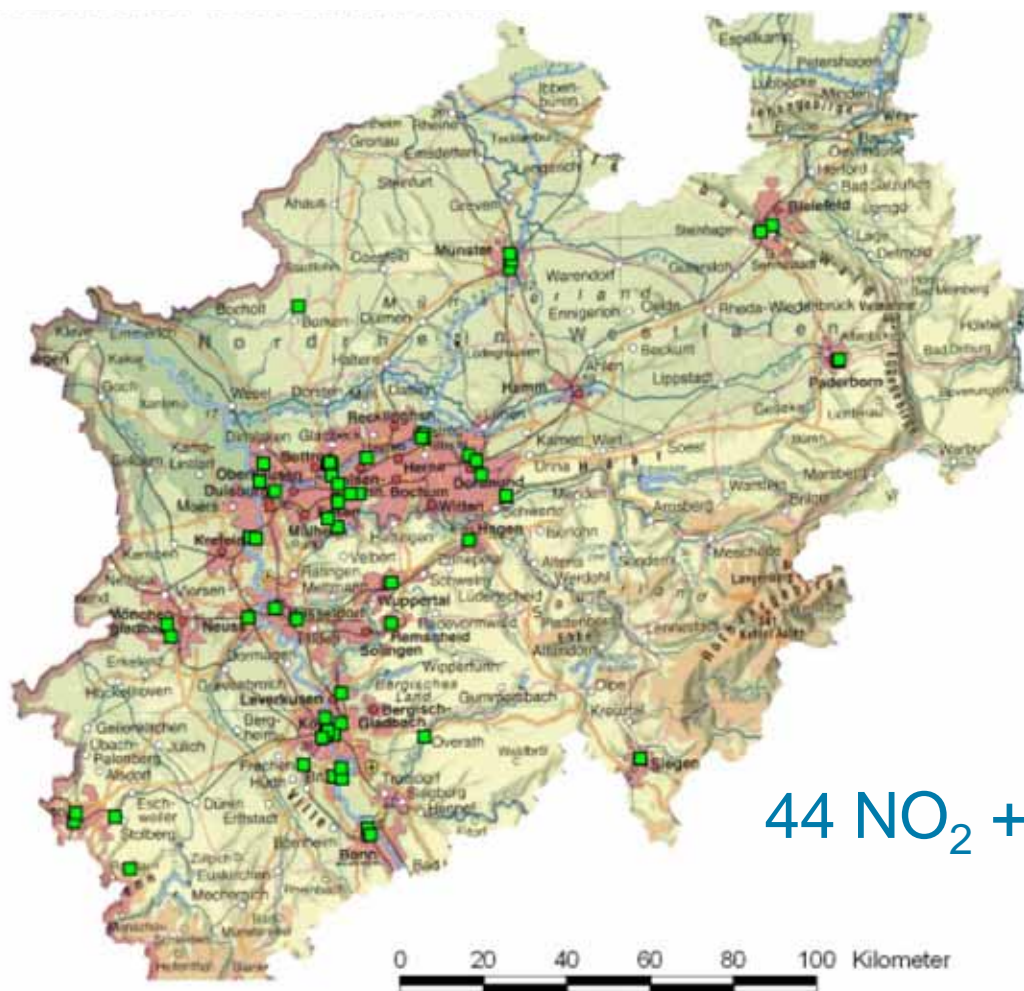


Kartographie: Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen

February 2008

lanuvNRW.







Passive samplers in NRW



44 NO₂ + 55 benzene (benzol)



Air quality in NRW with the EC limit values as yard stick

compound	av. time	att. date	situation	comments
NO ₂	1 h year	2010		frequent exceedances at traffic hotspots
PM10	1 d year	2005		frequent (some) exceedances at traffic hotspots and near some industrial installations
SO ₂	1 d year	2005		no problem anymore
benzene	year	2010		2 exceedances near industrial installations
lead	year	2005/10		2 exceedances near industrial installations
CO	8 h	2005		



Article 5 §4 of 1st daughter directive 1999/30/EC

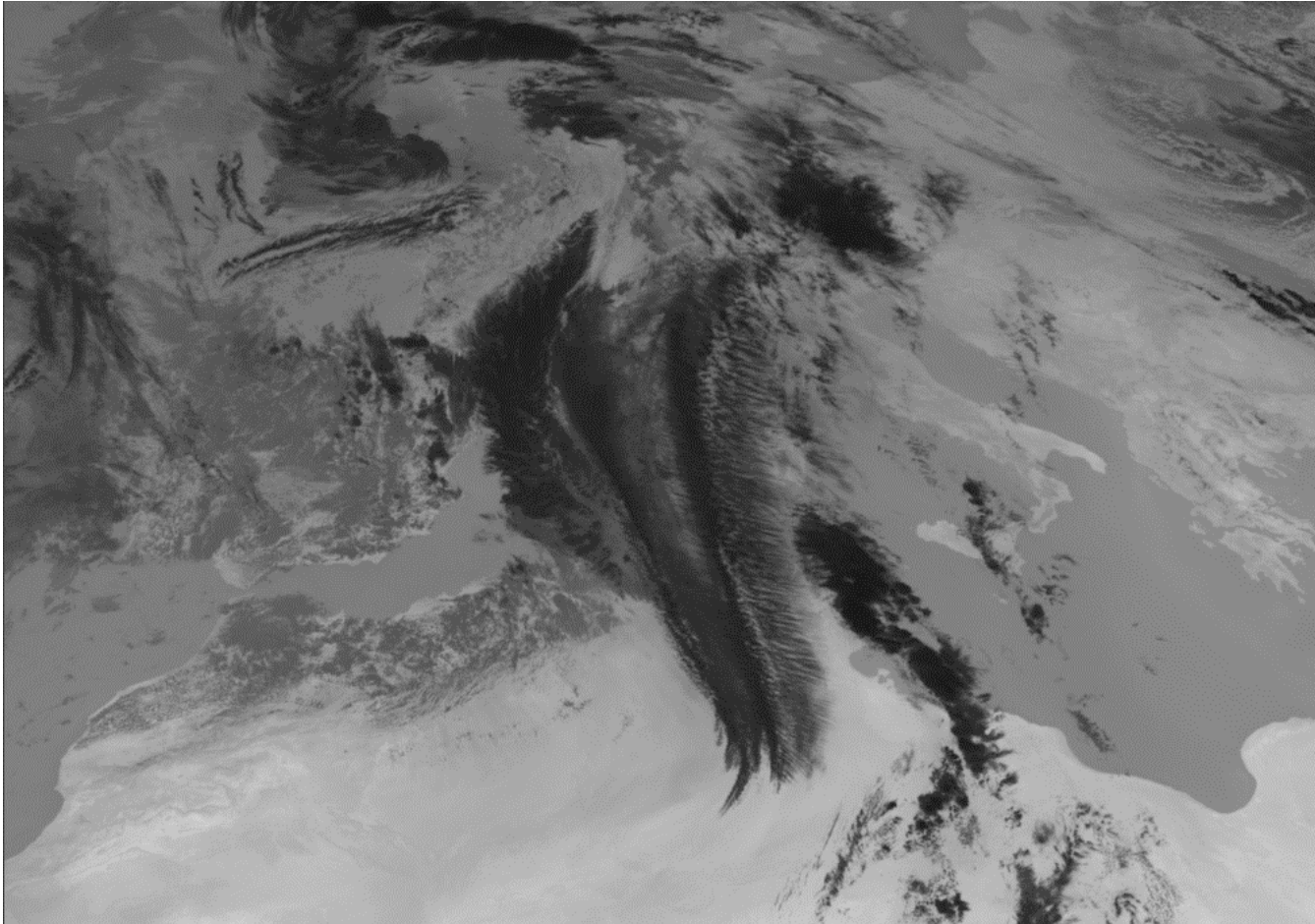
We didn't cause this

4. Where the limit values for PM_{10} laid down in Section I of Annex III are exceeded owing to concentrations of PM_{10} in ambient air due to natural events which result in concentrations significantly in excess of normal background levels from natural sources, Member States shall inform the Commission in accordance with Article 11(1) of Directive 96/62/EC, providing the necessary justification to demonstrate that such exceedances are due to natural events. In such cases, Member States shall be obliged to implement action plans in accordance with Article 8(3) of Directive 96/62/EC only where the limit values laid down in Section I of Annex III are exceeded owing to causes other than natural events.



Example Sahara-dust event in May 2008

Article 5 §4 from 1st daughter applicable



EUMETSAT IR (10.8 μm) Meteosat 9
May 28, 2008, 12 UTC



General strategy of LANUV on objectives offered by PROMOTE

LANUV is User of two services:

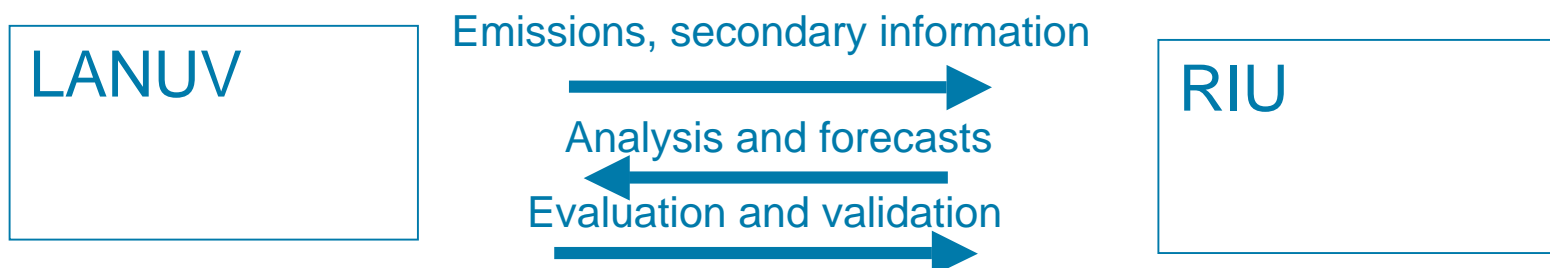
Air Quality Records Service
→AQ multi year
reanalyses

Regional Air Quality Service
→AQ forecasts
3-day forecast
Twice a day

3dimensional-variational data assimilation of all available observations

LANUV uses EURAD-data,

Provider is Rhenish Institute for Environmental Research



Air Quality Records - Near surface analyses - WHAT and HOW

Daily (max, avg, max-1h, max-8h, max-24h) / monthly (avg, var) / annual
(avg, var) surface maps for:

SO₂, NO₂, O₃, CO, PM₁₀

Data availability:

hourly values for key constituents

full CTM-fields every 3 hrs

PROMOTE II Phase 2: Jan 2002 - Dec 2005

PROMOTE II Phase 3: Jan 2002 - Dec 2008

Observations: combination of satellites, flight and ground based

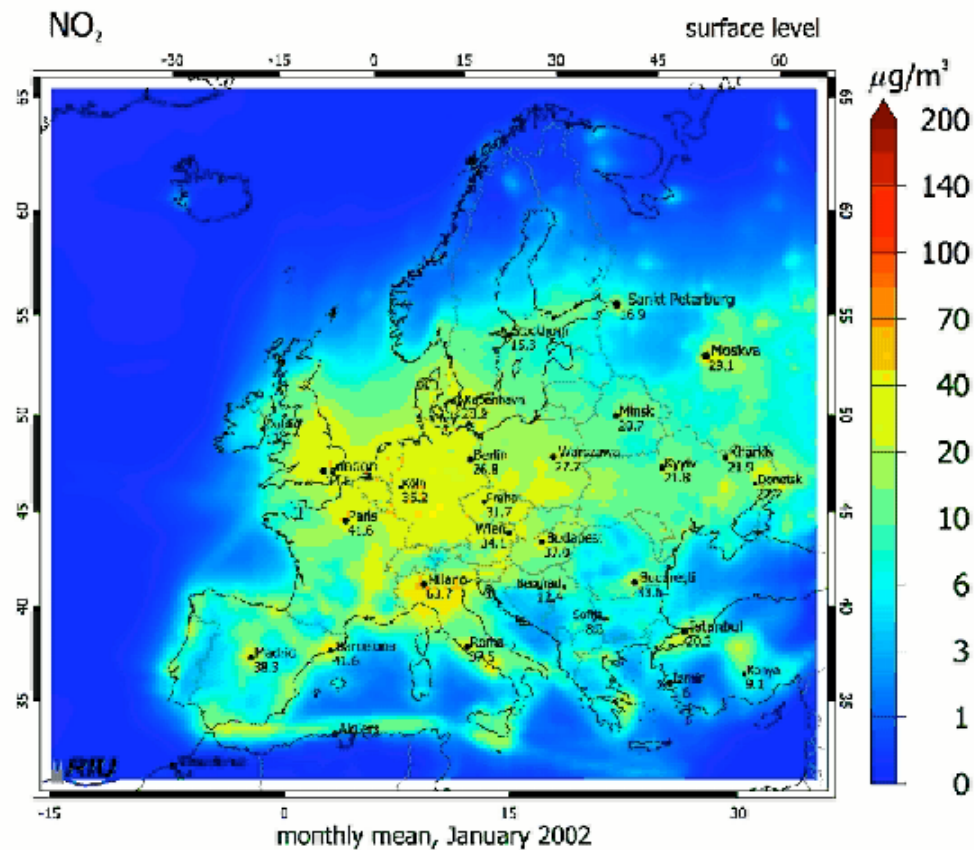
GOME, SCIAMACHY, OMI, GOME-2, MOPITT

EEA (in-situ, ground-based)

MOZAIC (in-situ, air-borne)



Example: Monthly Mean of NO₂ 2002-2005

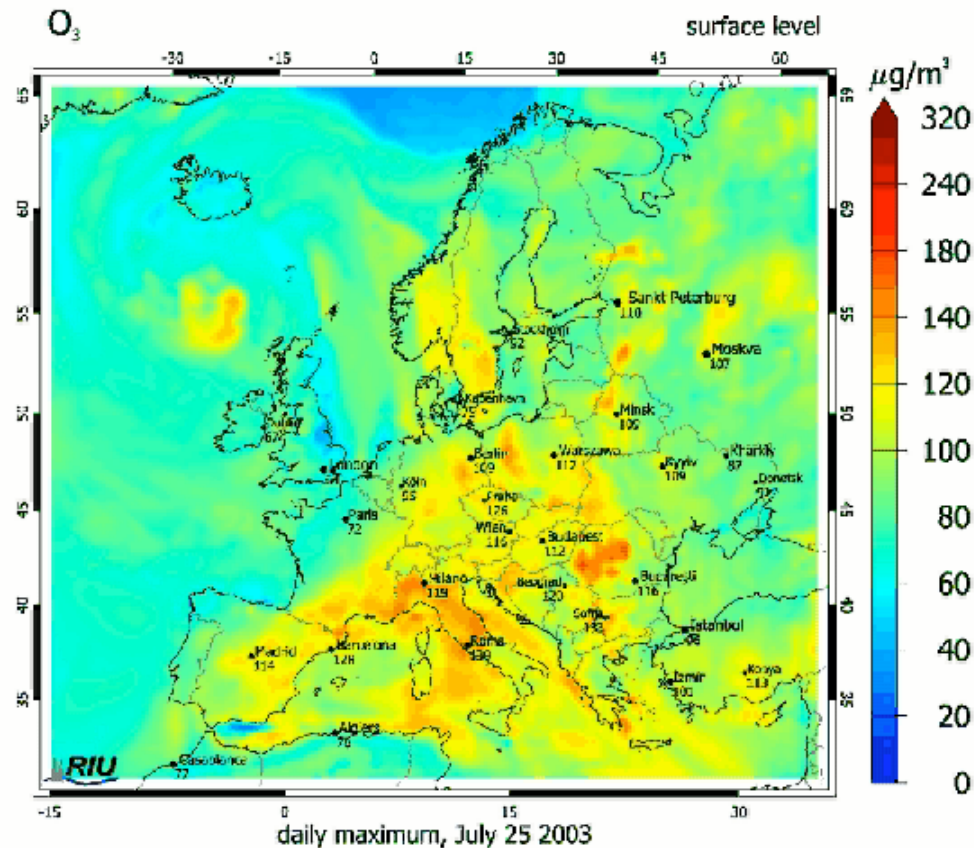


Example: Monthly Mean of NO₂ 2002-2005



Example: A pronounced ozone episode

Daily Max of O_3 , July 25 – Aug 20 2003

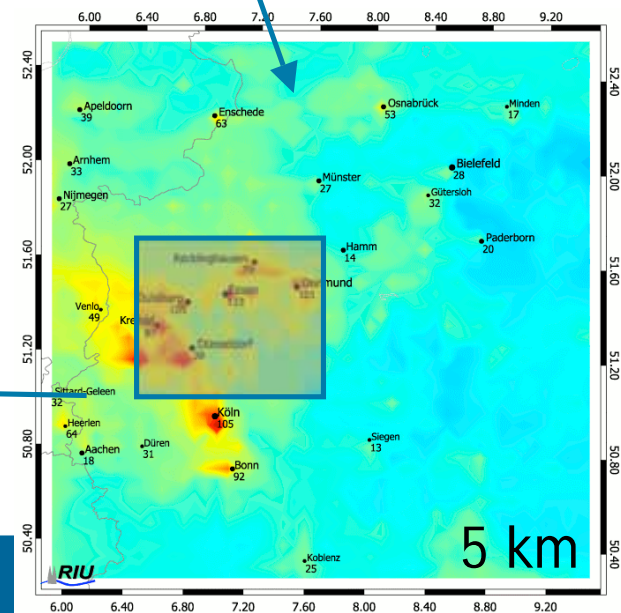
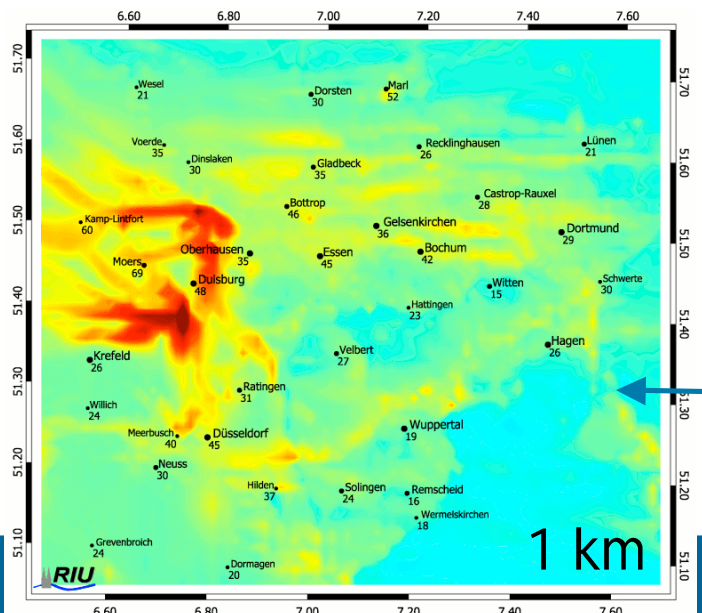
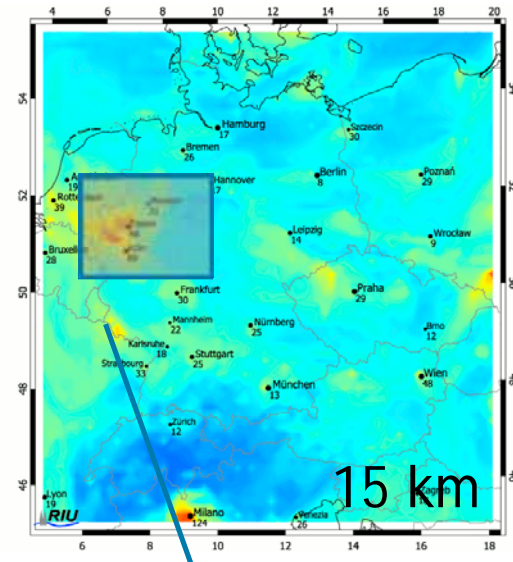
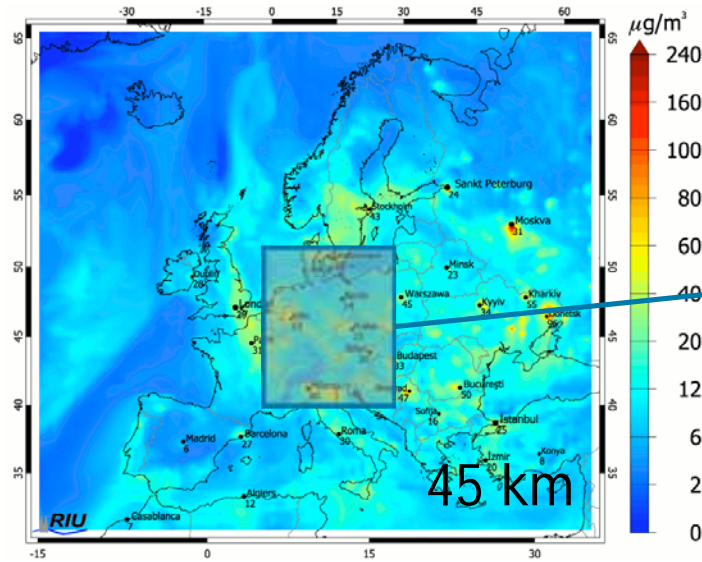


Example: A pronounced ozone episode

Daily Max of O₃, July 25 – Aug 20 2003



Regional Air Quality Service - HOW



Regional Air Quality Service

How useful is it?

Very useful to fulfill our responsibilities with regard to

- protection of the health of the citizens of North-Rhine Westphalia
- informing the public on dangerous levels of air pollution
- implementation of EC directives

What needs still to be done

- Focus on clouds, wet phase chemistry, and aerosol speciation
- Even higher resolution.
e.g., GLOBMODEL: Europe with 15 km
- 4d-var data assimilation (+emission rate optimisation, +consistent temporal evolution)

Talking about EC directives



The new daughter directive 2008/50/EC (1/4)

Came into effect June 11, 2008

Transferred into national law of the member states about 2 years later

Two main tasks:

1. Air quality standards (limit values) for PM_{2.5}
2. EC-notification procedure

PM_{2.5} air quality standards for the annual average concentration:

- Limit value of 25 µg/m³ to be met in 2015
- Limit value of 20 µg/m³ to be met in 2020 (under revision in 2013)

Area wide observation of PM_{2.5} necessary -> measurements and modelling



The new daughter directive 2008/50/EC (2/4)

EC-notification procedure

What to do, when the limit values for PM₁₀, NO₂ or benzene are not met in 2005/2010

- Under special circumstances: Extension of time (PM₁₀ 2011, 2015 NO₂) , amendment, EC-notification procedure
- Otherwise: infringement procedure at the European Court of Justice, consequence: the member state has to pay a considerable amount of money

What are those special circumstances:

- Adverse site specific dispersion conditions (street canyon)
- Adverse climatic conditions
- High contribution of transboundary pollution

You need to prove that in the EC-notification procedure.

→ Transboundary transport of pollution → EURAD model



The new daughter directive 2008/50/EC (2/4)

EC-notification procedure

If the limit values for PM₁₀, NO₂ or benzene are not met in 2005/2010:

- Under special circumstances: Extension of time (PM₁₀: 2011, NO₂: 2015), amendment, EC-notification procedure
- Otherwise: infringement procedure at the European Court of Justice, consequence: the member state has to pay a considerable amount of money

What are those special circumstances:

- Adverse site specific dispersion conditions (street canyon)
- Adverse climatic conditions
- High contribution of transboundary pollution

You need to prove that in the EC-notification procedure.

→ Transboundary transport of pollution → EURAD model



The new daughter directive 2008/50/EC: (3/4)

EC notification procedure or The marvels of EC bureaucracy

Form 10: Reasons for non-compliance for PM₁₀	
a.	Code of exceedance situation
b.	Information related to site-specific dispersion conditions
	Street length (m) ¹
	Average width of street (m) ¹
	Average height of buildings (m) ¹
	Evidence that the exceedance is restricted to the street geometry ¹
	Comments for clarification if needed
c.	Reference to document which explains in detail why the exceedance is due to site-specific dispersion characteristics
d.	Adverse climatic conditions
	Average wind speed (m/s) ¹ or other indicator of adverse climate conditions
	Location and averaging period used for the average wind speed ¹ or other indicator
	List of measured PM₁₀ concentrations and average wind speeds for all days with PM₁₀ concentrations > 50 µg/m³, starting in 2005 ², or corresponding correlation with other indicator¹
	Comments for clarification if needed (necessary if other indicator than average wind is used)

The new daughter directive 2008/50/EC: (4/4)

EC notification procedure or The marvels of EC bureaucracy

Form 10: Reasons for non-compliance for PM₁₀	
e.	Reference to document which explains in detail why the exceedance is due to adverse climatic conditions.
f.	Transboundary pollution
NRW had 12 of these notifications for PM10 so far. Coming up: > 50 for NO₂	
	States and/or other countries ¹
	For exceedances of the daily limit value: Number of exceedance days which remain after subtracting days with exceedances due to
Thank you very much for your attention !	
	Topic of consultation
	Reference to relevant documents
	Outcome of the consultation (expected reduction of emissions of relevant sources and expected improvement of air quality)
	Justification if no consultations were undertaken
g.	Reference to document which explains in detail why the exceedance is due to transboundary pollution
h.	Comments for clarification if needed