Das Lebensministerium

Near traffic source apportionment in the City of Dresden, Saxony

PART II: Exceedances of the EU-PM10 limit value

Holger Gerwig[1], Hartmut Bittner[2]
[1] Saxon State Agency for Environment and Geology, Dresden
[2] Department of Umwelt Service, TÜV Industrie Service GmbH TÜV SÜD Group, Dresden, Germany

Freistaat Sachsen

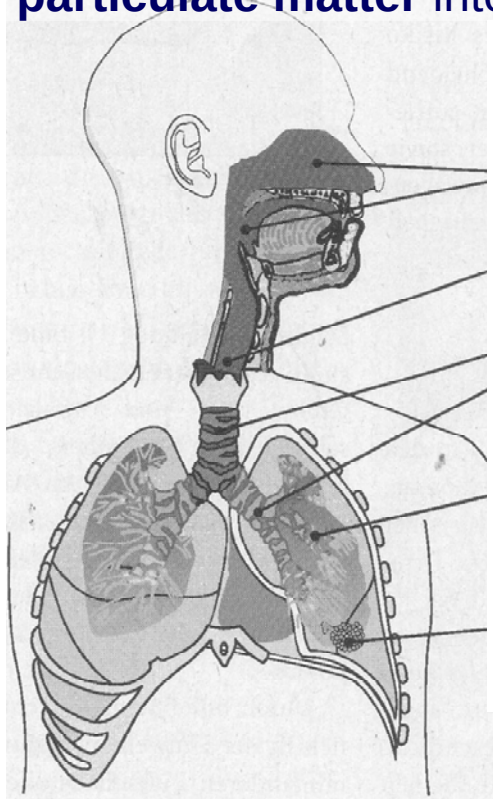
Saxon State Agency for Environment and Geology

Exceedances of the EU-PM10 limit value

1. **Introduction: Why detecting PM10 exceedances ?**
2. Measurements in Dresden
3. Results
   - PM10 source apportionment according to Lenschow
   - Exceedances of limit values by long range transport
   - Saharan dust caused exceedances
4. Conclusions

- **EU-directive** for protection of health
  EU/1999/30 + in Germany: 22. BImSchV (PM10)
- **Limit value: 35 x > 50 µg/m³** PM10 daily av.
- **Dresden traffic**
  2003: 53 x > 50 µg/m³
  2005: 39 x > 50 µg/m³ (until 08-2005)
  -> air quality plan for 2005 necessary
- **Contents** of main components varies in time, place, particle diameter:
  Ammonia, sulphate, nitrate, soot, earth crust, sea salt, organic matter
- **Project:** "Korngrößendifferenzierte Feinstaubbelastung in Straßennähe in Ballungsgebieten Sachsens"

size dependent
depth of penetration of
particulate matter into human



“visible” urban aerosol and Saharan dust in the atmosphere

outskirts Dresden
16-12-2004
52 µg/m³ PM10

Kufstein
21-02-2004

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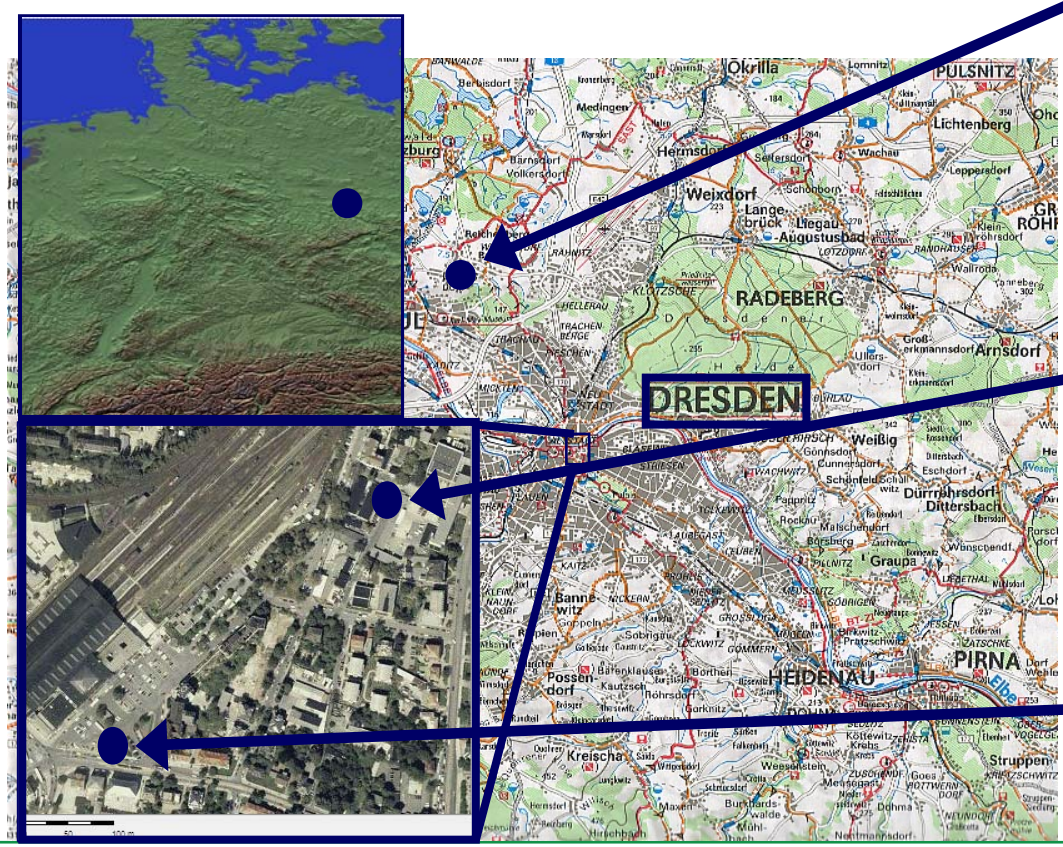
Measurements in Dresden

11-08-2003 - 08-08-2004



HVS Samples

11-08-2003 - 08-08-2004

Sampling	**every second week** for 7 days (24h) **PM10 and PM2.5**
location 1:	**roadside**
period:	**1 year:** 11-08-2003 - 08-08-2004
number:	184
location 2 + 4 :	**urban background and outskirts**
period:	**5 weeks**: 3 summer + 2 winter
number:	35

Analysis	**main components** **earth crust** (calculated oxides of Ca, Fe, Ti, Mn + calculated Si, Al from Fe) trace elements PAH

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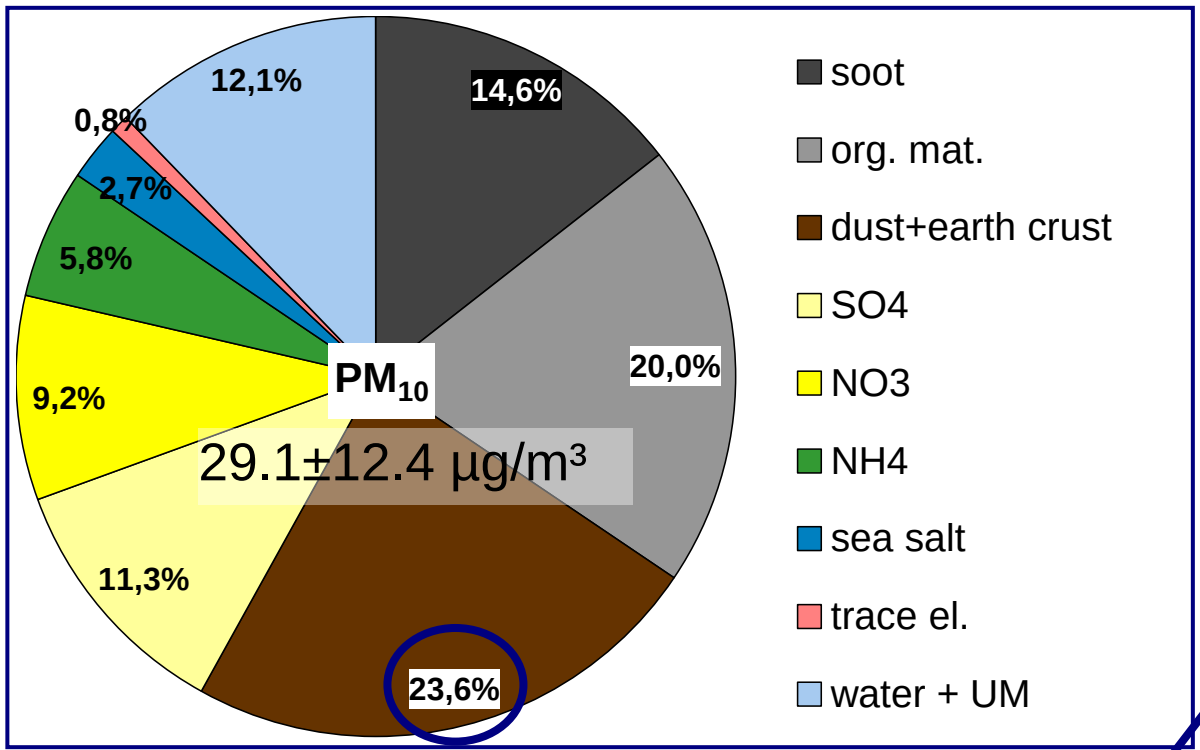
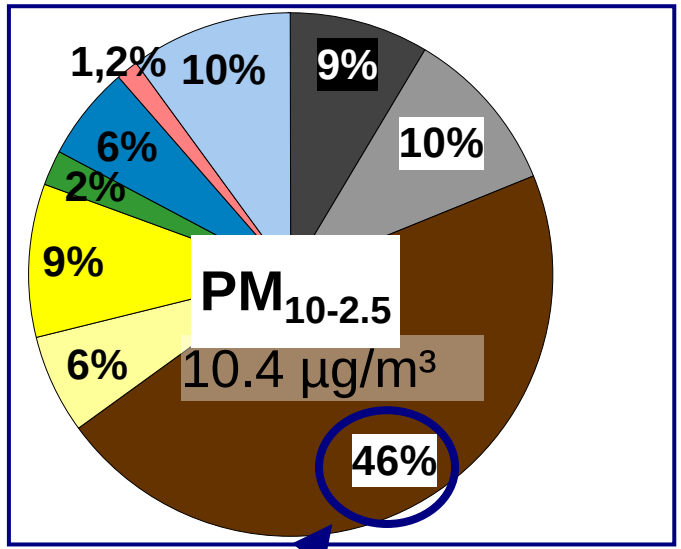
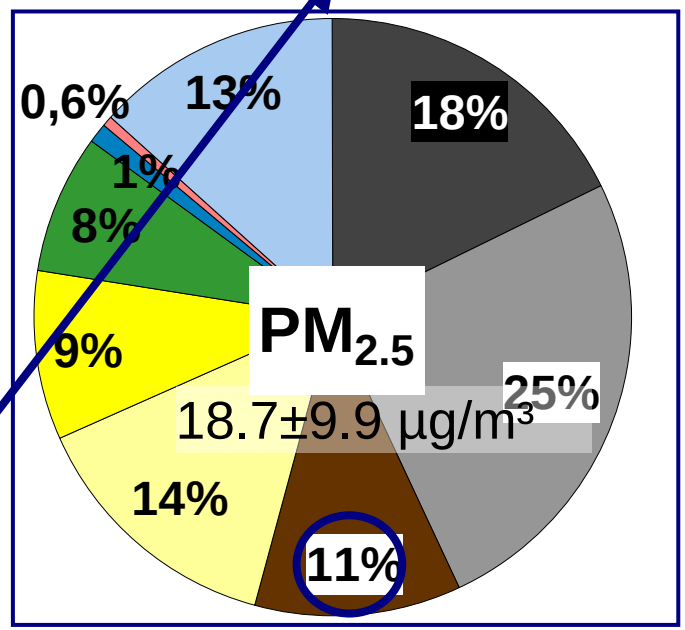
Roadside traffic station

annual average of main components

(8-2003 – 8-2004)







Dust + earth crust: more in coarse mode

Horizontal profile of PM10 in Dresden

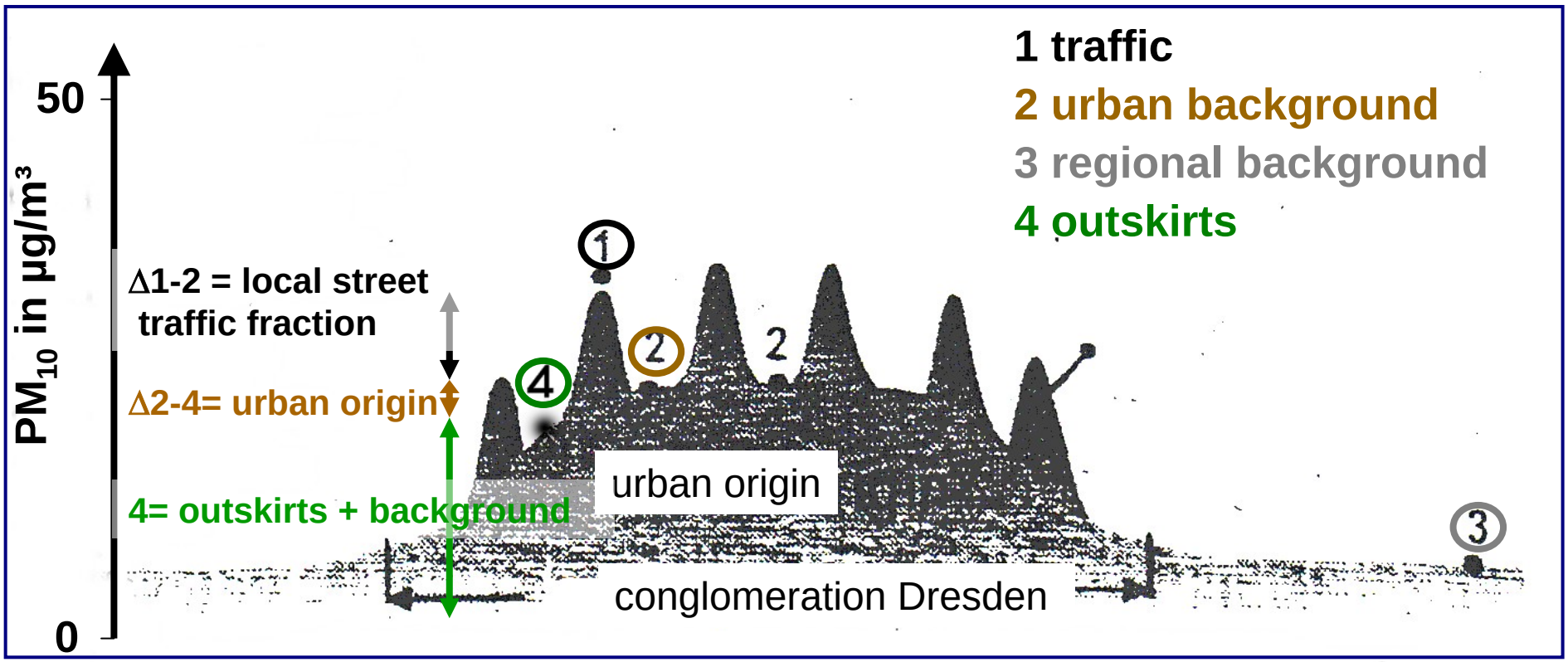
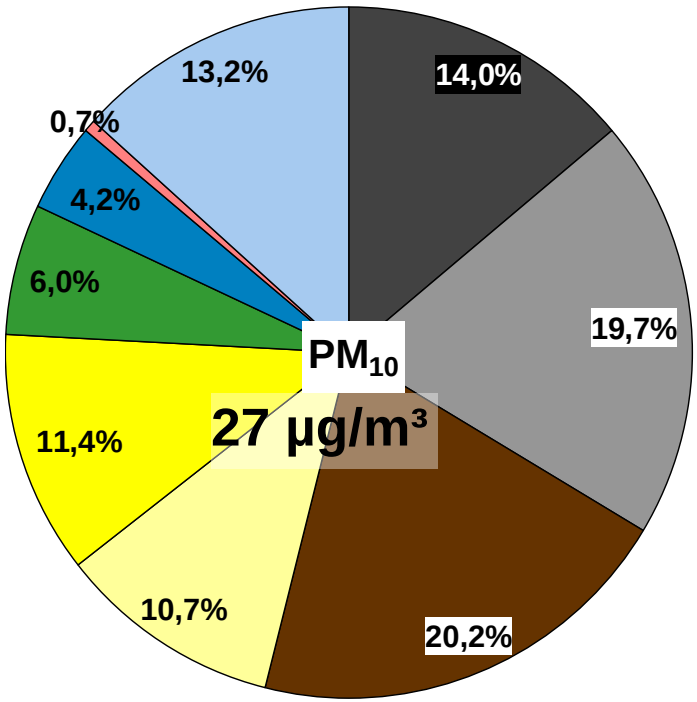
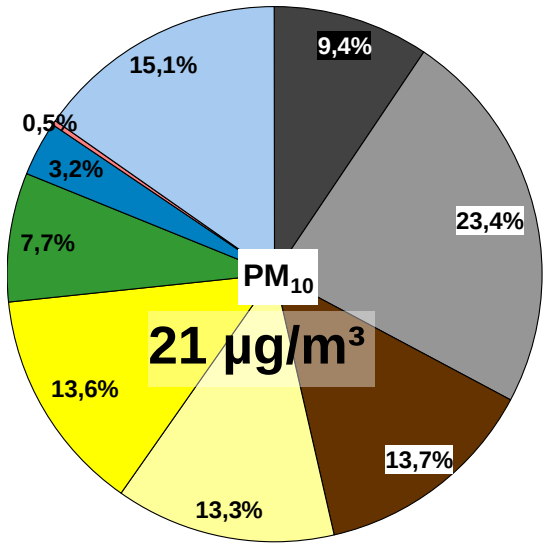


Fig. modified from. LENSCHOW et. al. (2001) Atmospheric Env. 35, S23-33

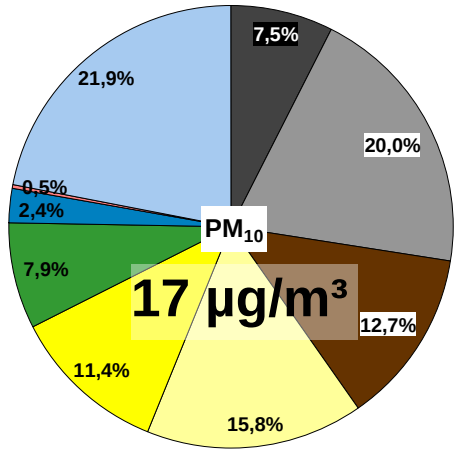
Roadside traffic loc. 1



urban background loc. 2



suburban loc. 4



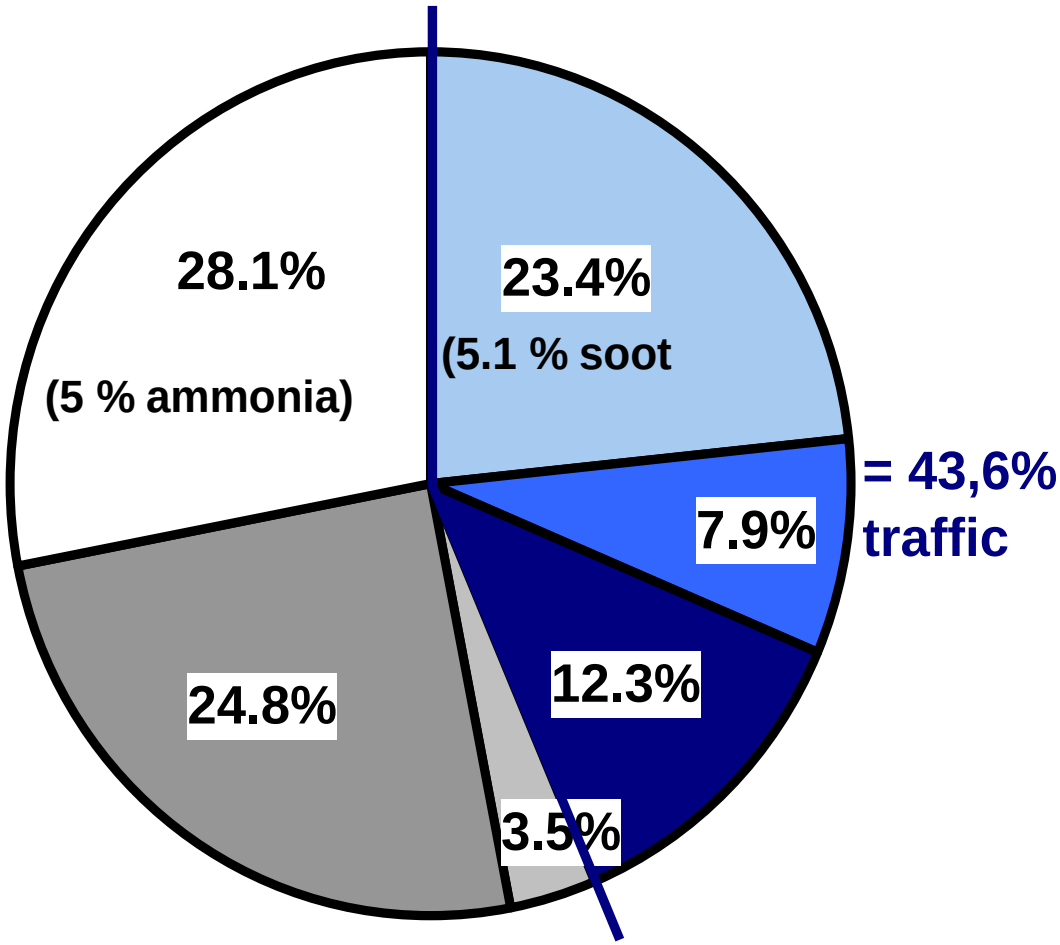
Feb-2004 + Jul-Aug-2004

Sources of PM10 at roadside station in Dresden

Emission inventories + PM10 compound concentrations at 3 stations (Lenschow)

PM_{10} sources

- local street
- traffic in city
- traffic in suburbs and long range transport
- households
- industry
- agriculture and nature



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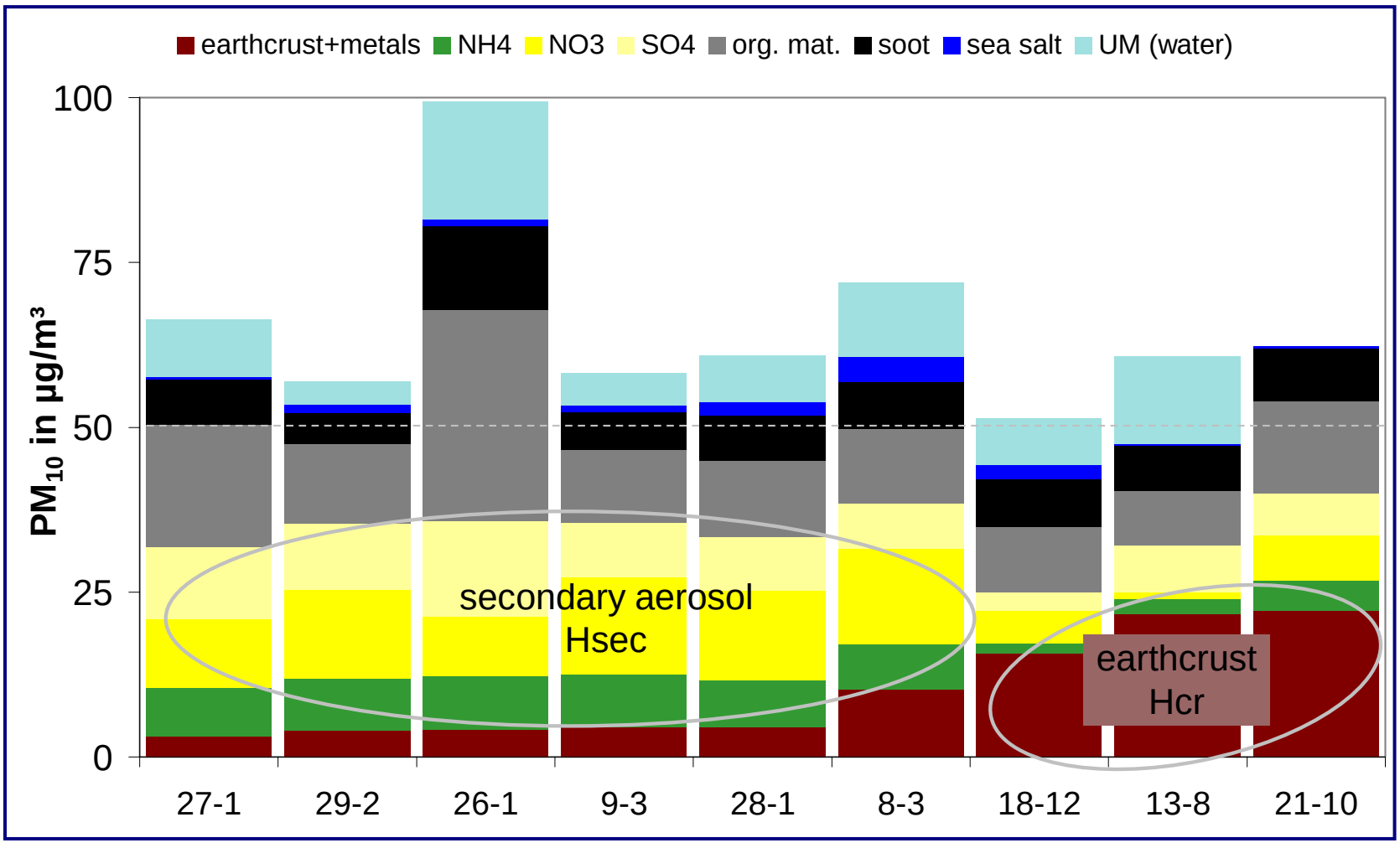
Days PM_{10} > 50 µg/m³

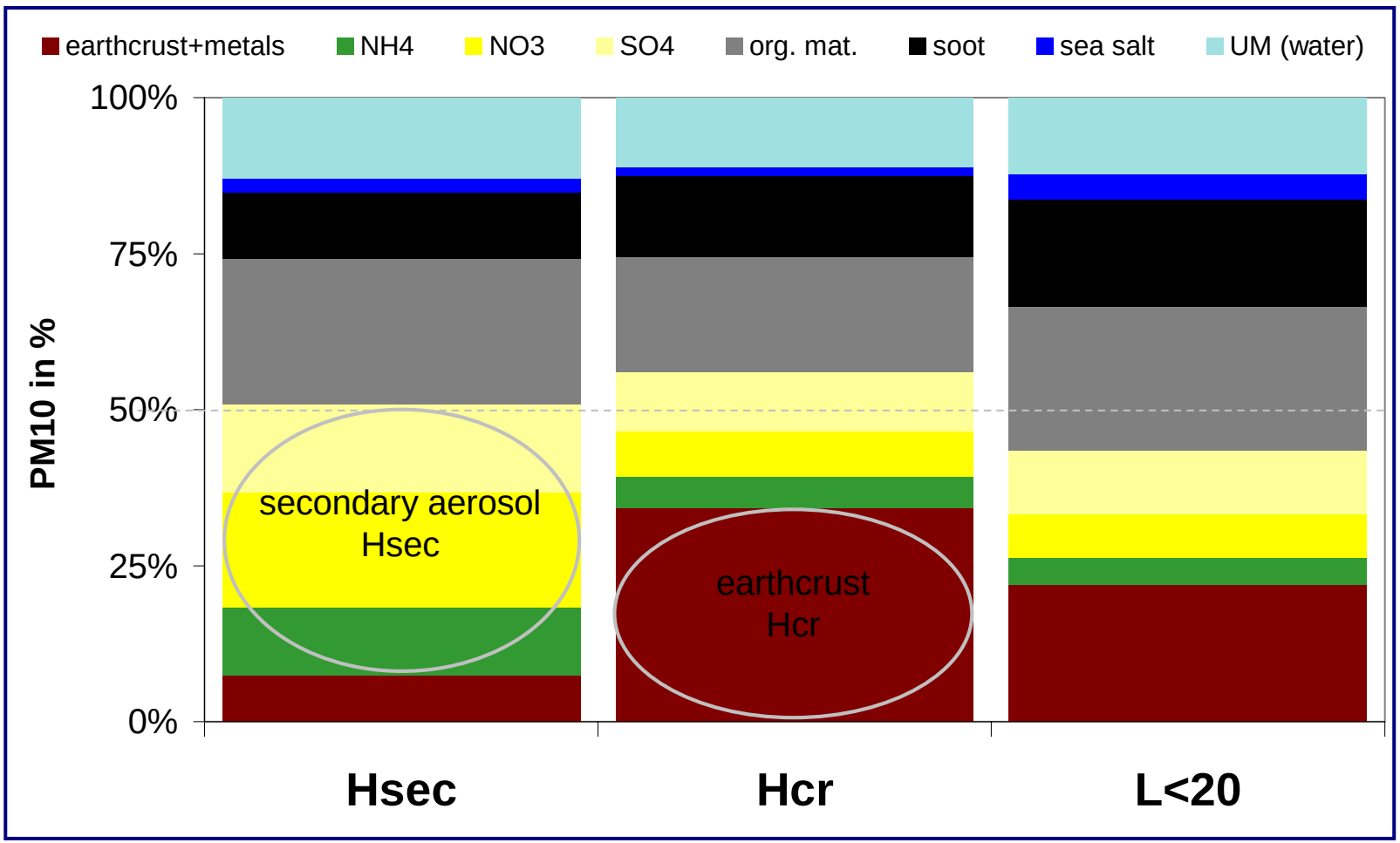
9 of 27 days >50 µg/m³ during sampling period were analyzed



Hsec 32-55% **secondary aerosols ; < 0°C**

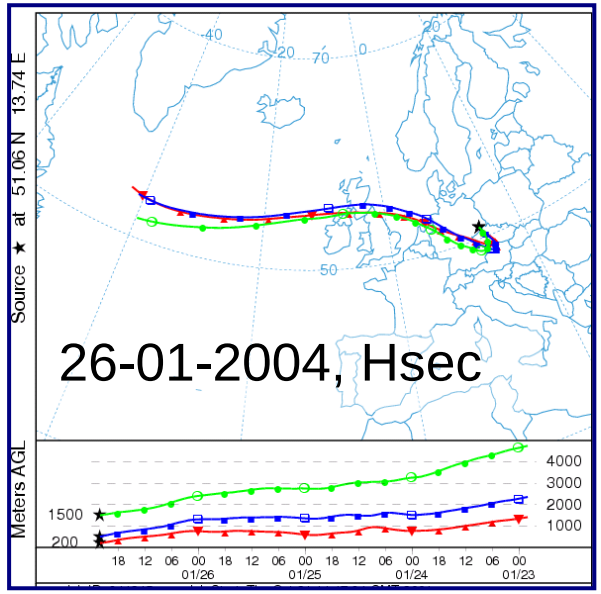
Hcr 30-38% **earth crust**

L **< 20 µg/m³** PM10



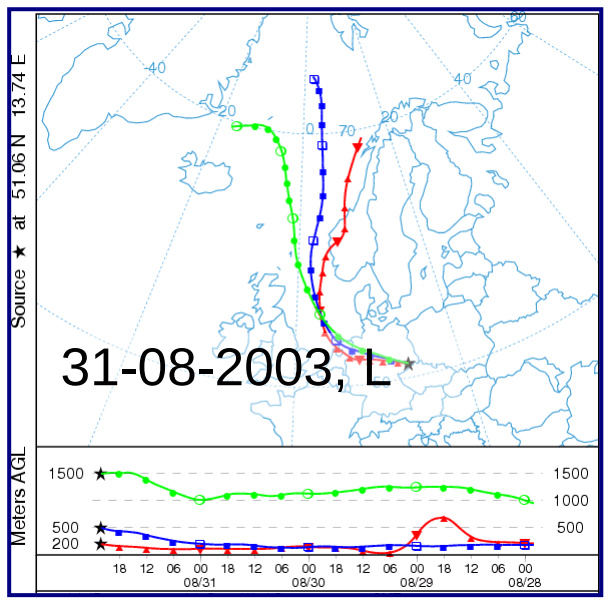
Class Hsec + Hcr (> 50µg/m³),n = 9

- **no rainfall** 1-6 days before
- wind velocity half of group L (**1.1 m/s**)
- more **inorganic secondary aerosol** or **earth crust**
- 96h backward trajectories: at least one source regions: **Czech basins, the Ruhr area or southwest Poland**



Class L (< 20µg/m³), n = 39

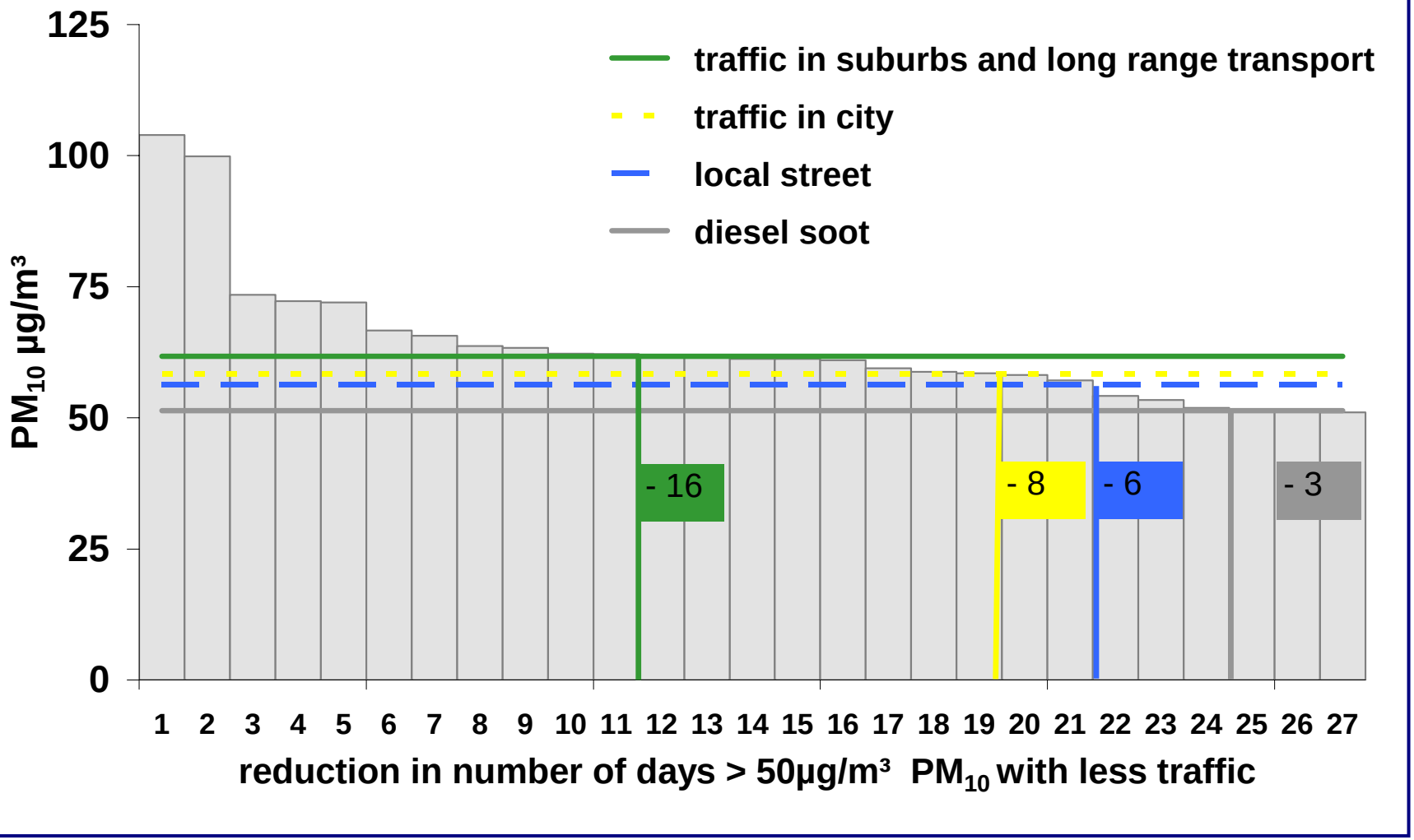
- Almost **every day rain**
- **Wind velocity: 2.2 m/sec**
- 96h backward trajectories: **14 x North Atlantic**, **Scandinavia**; 12 x from West; 13 x different origins



Conc. all compounds:

L < H exception **magnesium**

27 days of exceedance (During sampling period) could probably reduced with traffic reduction by x days:



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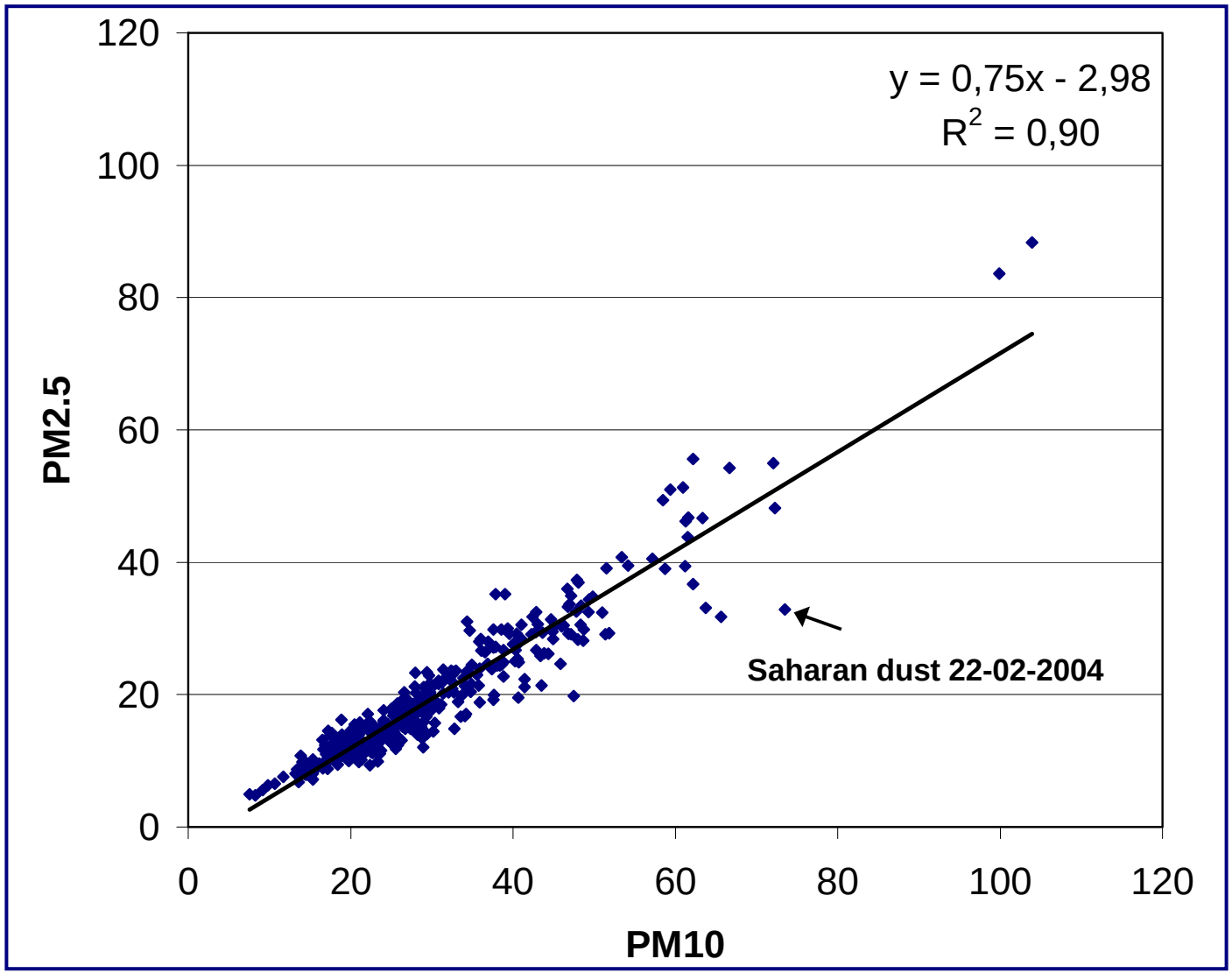
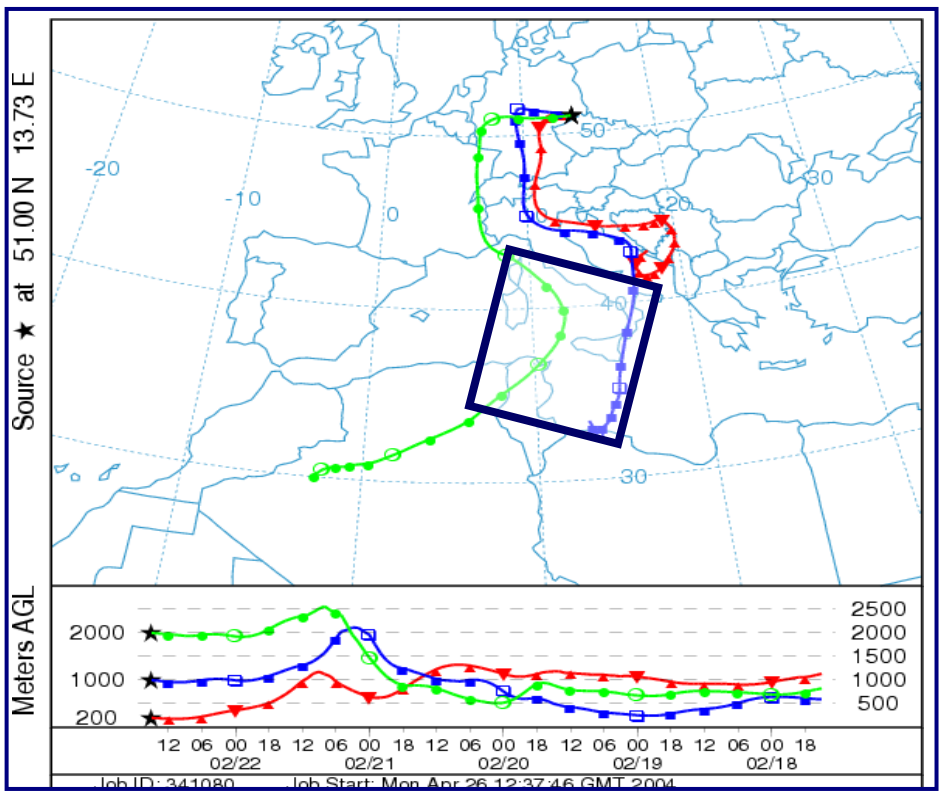
PM2,5 / PM10 minimum, (< 0,75) on 22-02-2004

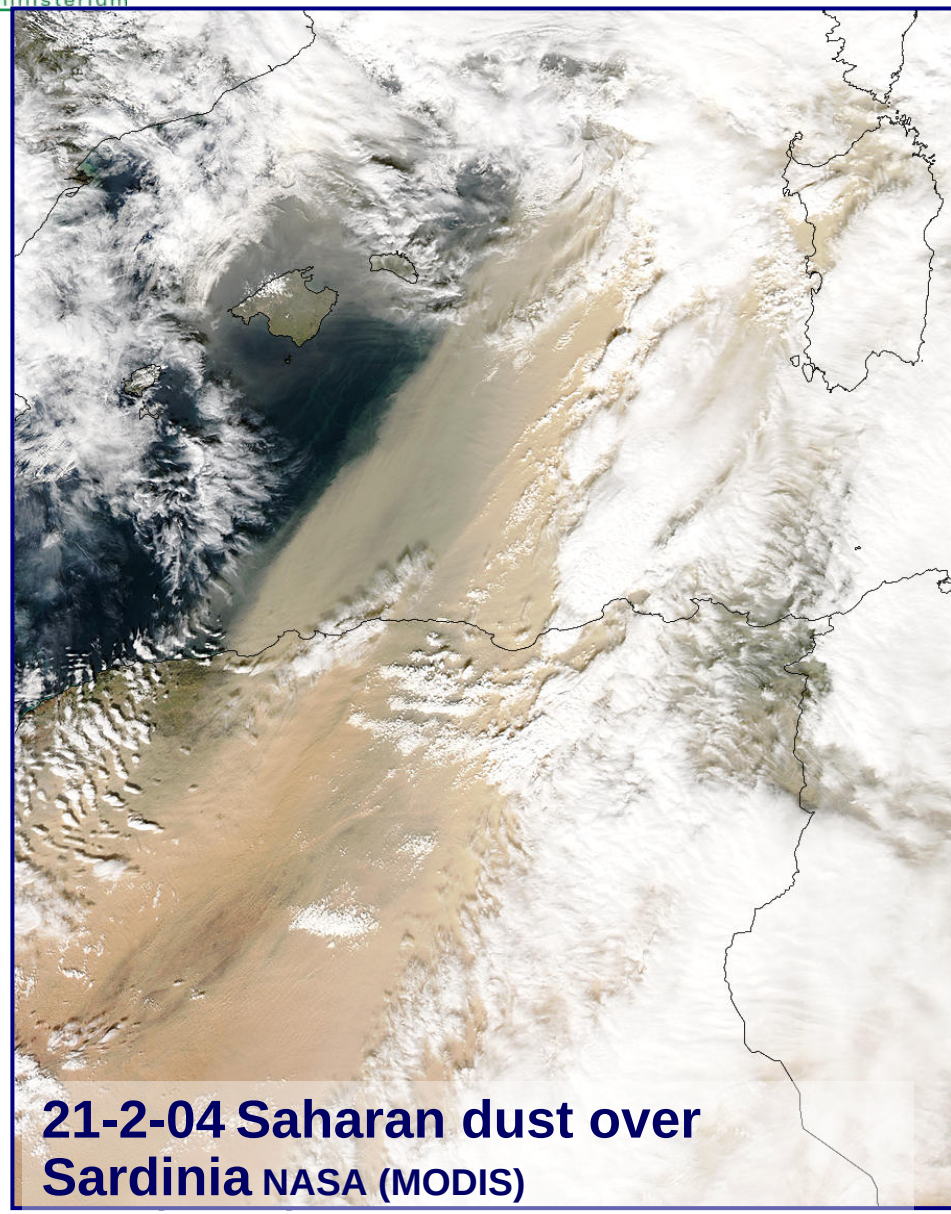


Saharan dust events

- **10 days per year in Leipzig on av.**
  (ANSMANN, 2004)
- **more of coarse fraction** (PM2,5/PM10<0,75)

22-2-2004 96h Backwards trajectories
(Draxler, NOAA HYSPLIT)





21-2-04 Saharan dust over Sardinia NASA (MODIS)

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Conclusions

- **Traffic** is the **source** of **44%** of **PM10** at a **roadside station** in Dresden, **5%** from **diesel soot** from **local street** emissions

- **Exceedances** of limit value > 50 µg/m³ PM10 daily average:
  no rain, low wind speed, air masses from **polluted areas**
  2 classes
  Hsec: high conc. **secondary aerosols** + days < 0°C
  Hcr: high conc. **earth crust + street dust**

- **Saharan dust caused exceedances on 22-02-2004**
  with about **40 µg/m³** and **PM2,5/PM10 < 0,75**

Interpretations regarding Size Segregated Characterization of Main Components with MOUDI + Berner Impactors:
EAC-presentation: Tuesday 11:30 Aerosol Chemistry (J. v. Eyck room)
report: **www.umwelt.sachsen.de/lfug/luft-laerm-klima_5356.html**

Acknowledgements

- Department **Umwelt Service**, **TÜV** Bau und Betrieb GmbH, Dresden, Dr. Bittner
  - Analytics of PM_{10} und $PM_{2.5}$ filter
- **Staatliche Umweltbetriebsgesellschaft** Mr. Lohberger, Dr. Müller et al.
  - Sampling PM_{10} and $PM_{2.5}$
- **Saxon State Agency for Environment and Geology, Dresden**
  - Financing the project