

# Assessment of the Effectiveness of the Low Emission Zone Leipzig by Measurements of Soot and the Ultrafine Particle Number Concentration

Alfred Wiedensohler, Fabian Rasch, Jia Sun, Wolfram Birmili

Leibniz Institute for Tropospheric Research

World Calibration Center for Aerosol Physics

Gunter Löschau

State Office for Environment, Agriculture, and Geology

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Leibniz Institute for  
Tropospheric Research

# Low Emission Zone (LEZ) Leipzig

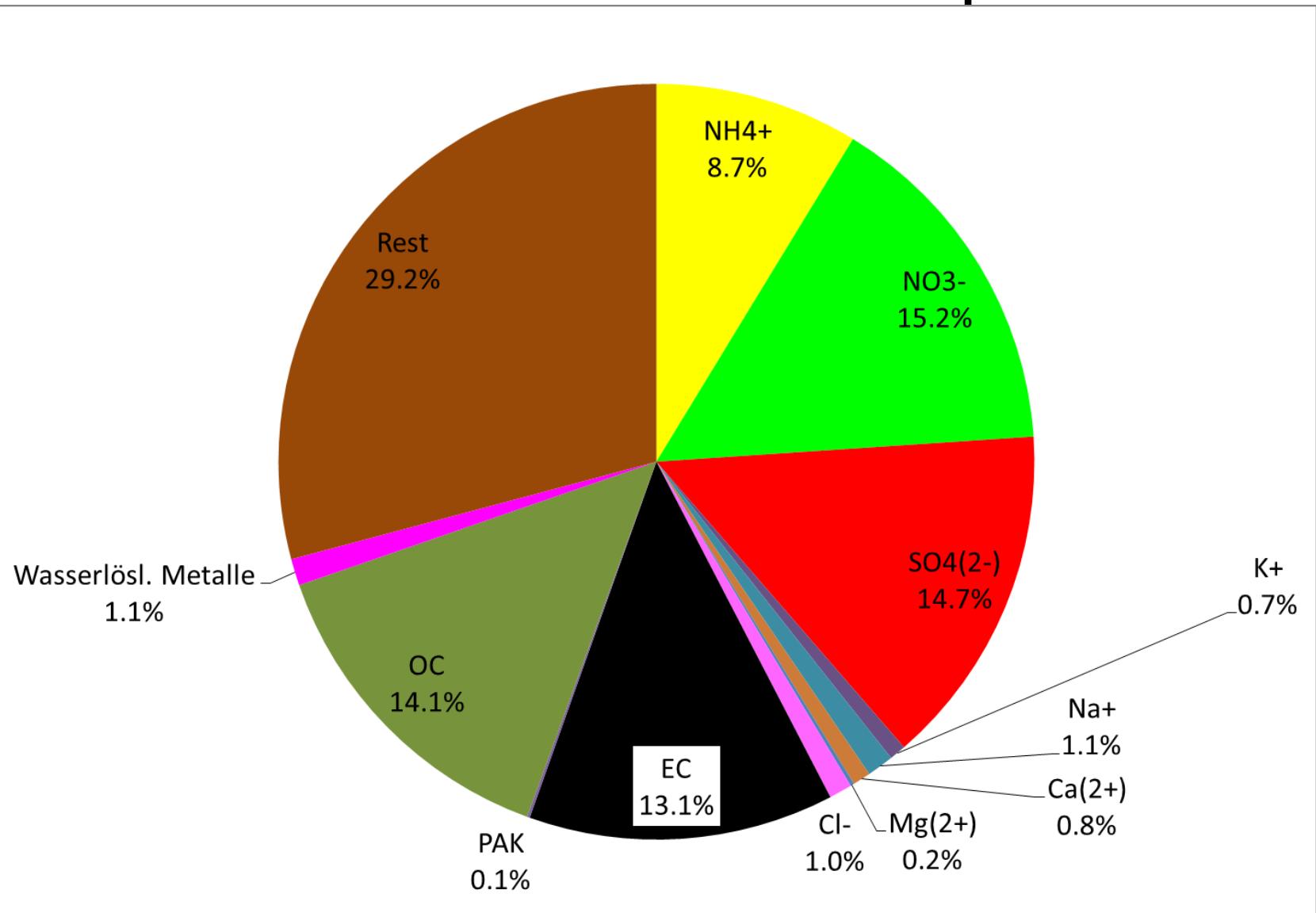
→ EU-Directive 2008/50 / EC  
Limits for air pollutants  
 $\text{PM}_{10}$  and  $\text{NO}_2$

Goal of the environmental zone:

- Ban of vehicles with high exhaust emissions (diesel)
- Reduction of BC and ultrafine particles
- Reduction of  $\text{NO}_x$ ?



# What is the Chemical Composition?



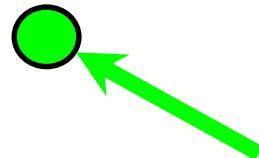
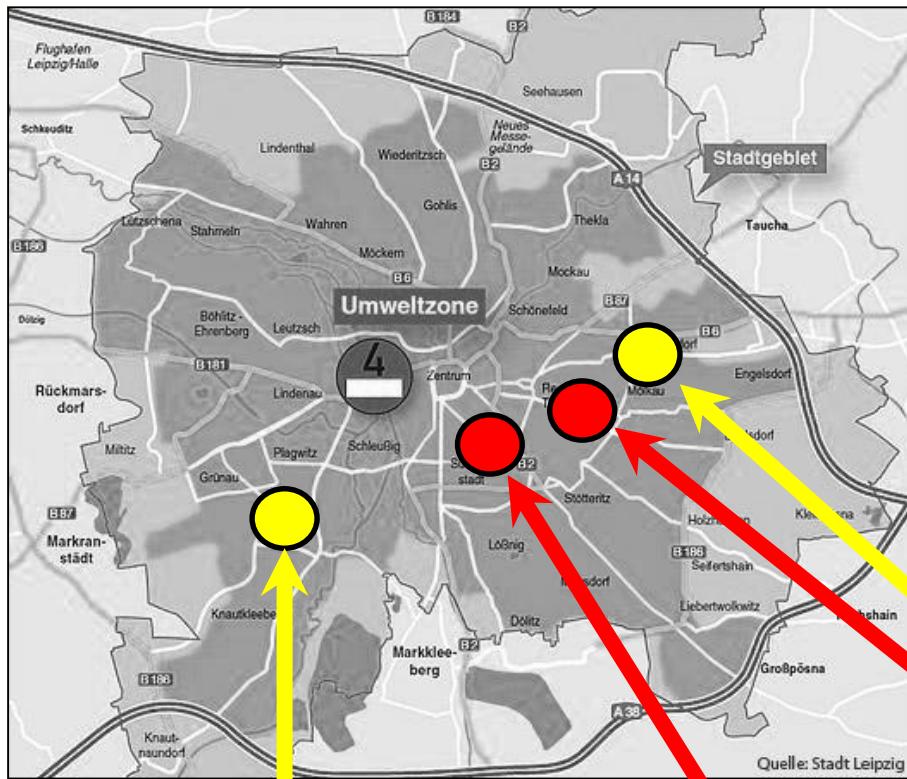
# What Can We Expect from the LEZ?

- The **mean PM<sub>10</sub>** mass concentration in Leipzig is approximately **35 µg/m<sup>3</sup>**.
- The year to year **variability** is **6 µg/m<sup>3</sup>** due to **meteorology** (high and low pressure systems, winter inversion etc.).
- **Tail pipe emissions at the street site** are responsible for about **5-10%** of the PM<sub>10</sub> mass concentration.
- A **LEZ** can reduce the yearly mean value maximum by **3 µg/m<sup>3</sup>** at a street site.
- A **reduction of traffic soot** would significantly **minimize the exposure** of people to **toxic aerosol particles**.

# LEZ Leipzig



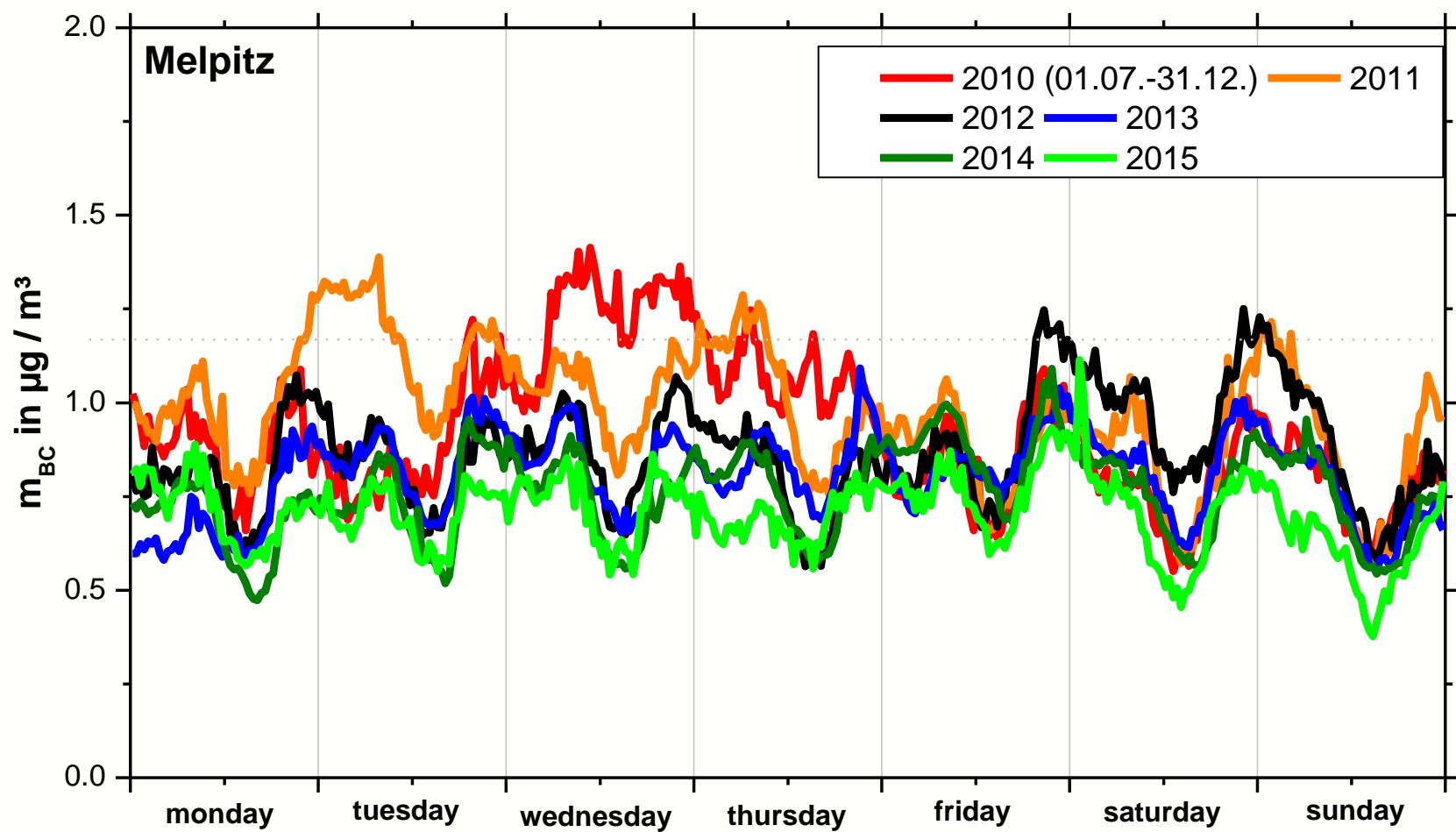
# LEZ Sampling Sites



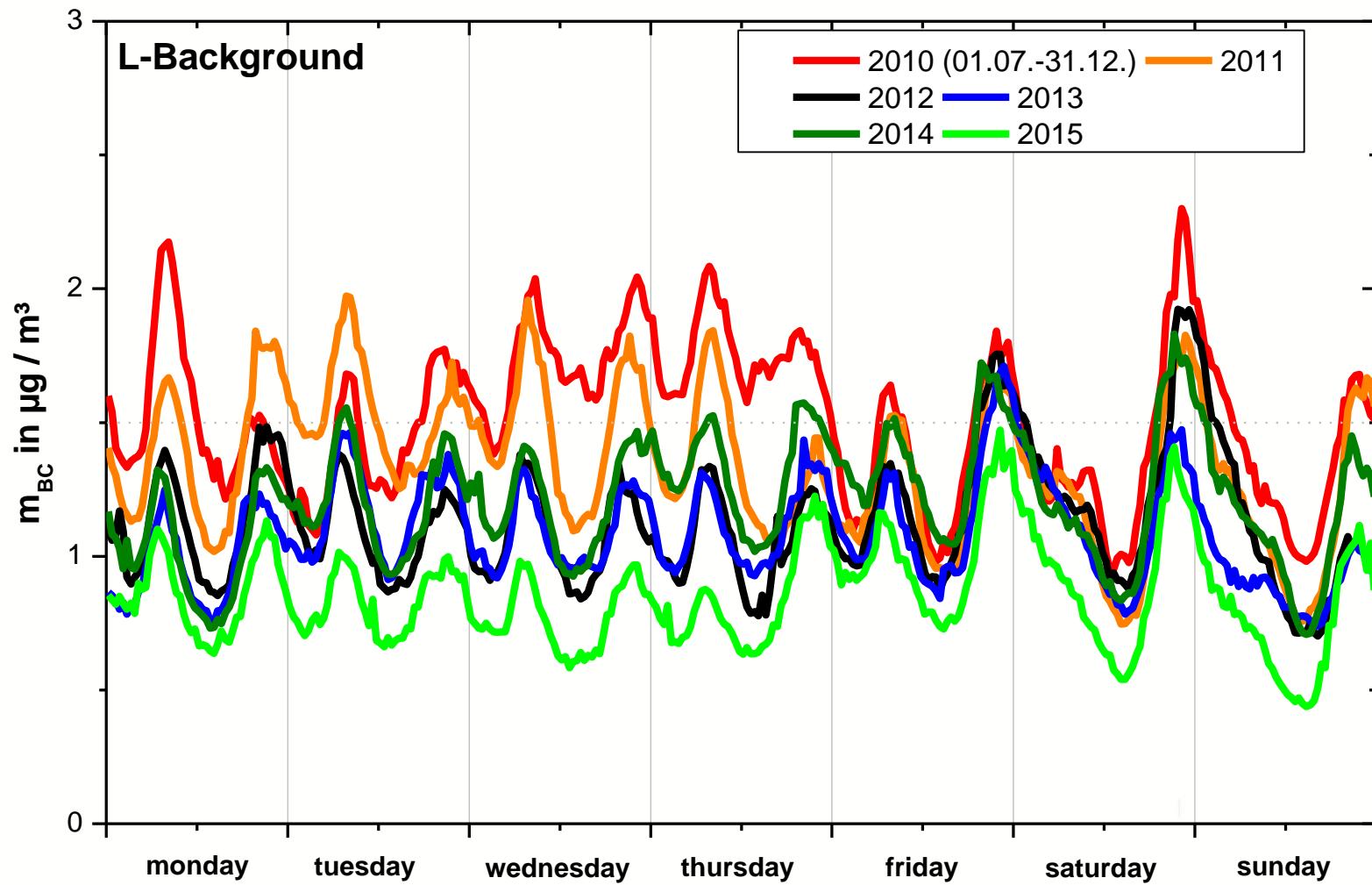
# What was Additionally Measured at the LEZ?

- Particle number size distribution
  - Mobility particle size spectrometer 3-800 nm
- Mass concentration of equivalent black carbon
  - Multi-Angle Absorption Photometer
- NO<sub>x</sub> mass concentration

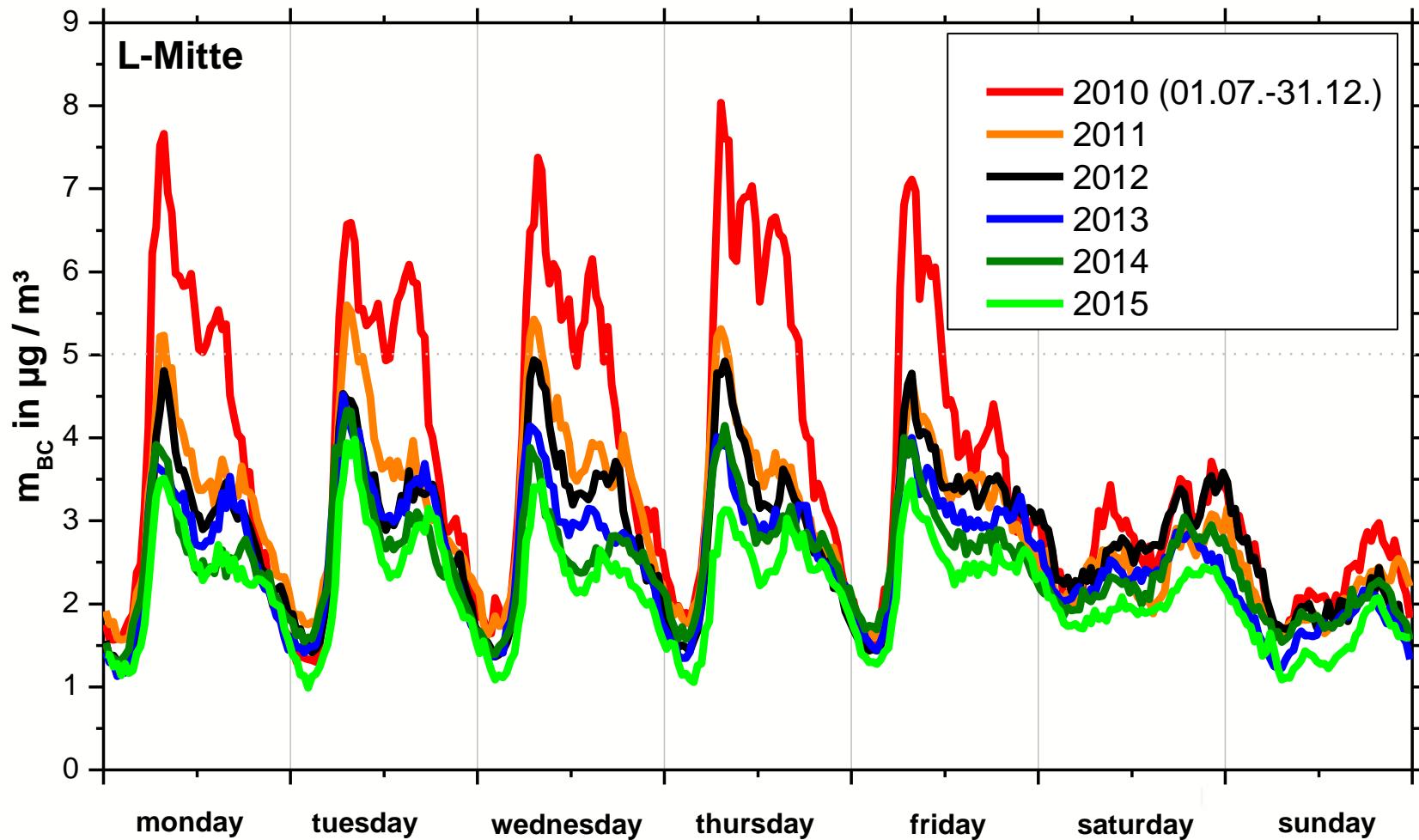
# Melpitz - eBC Mass Concentration



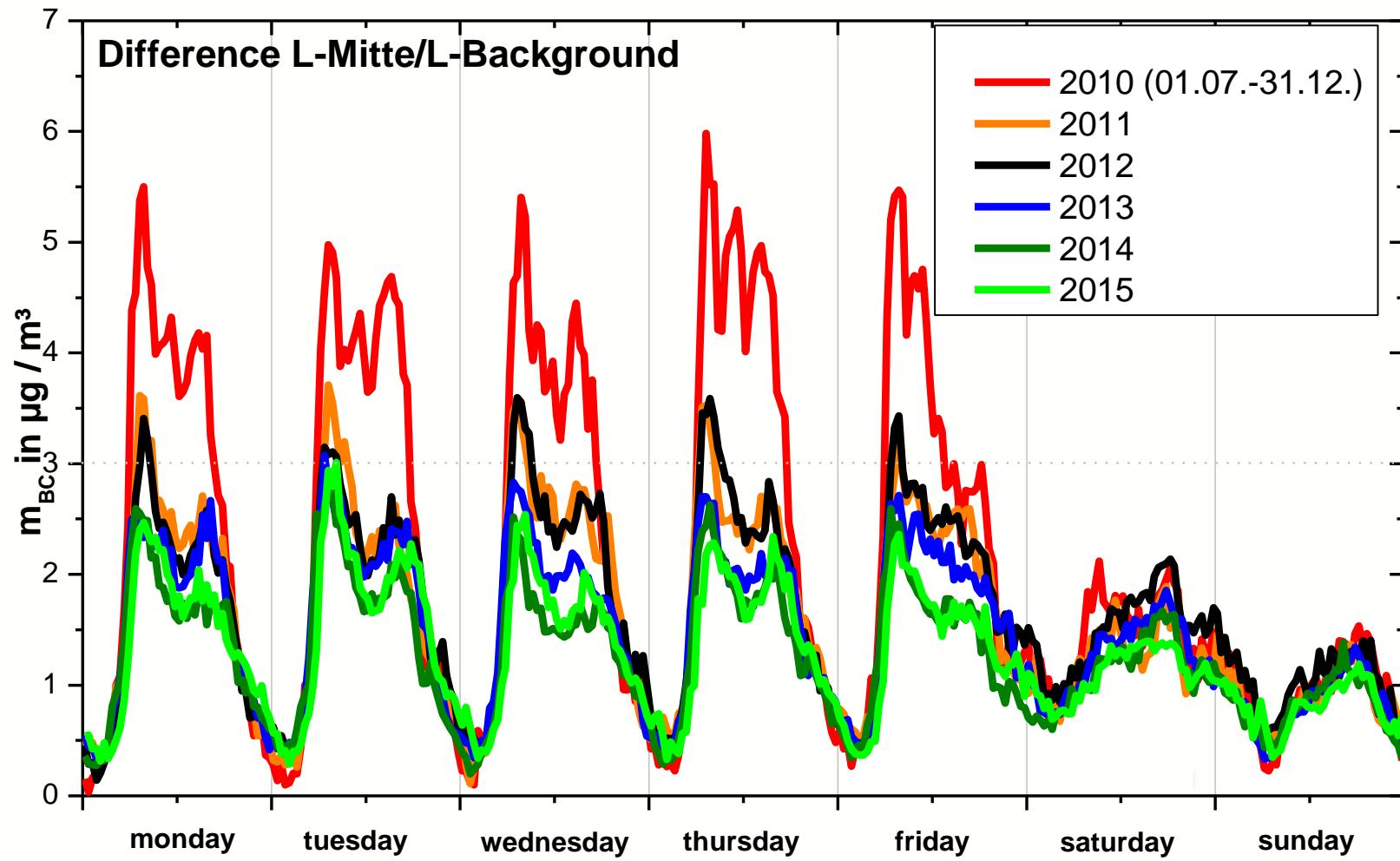
# Leipzig Background - eBC Mass Concentration



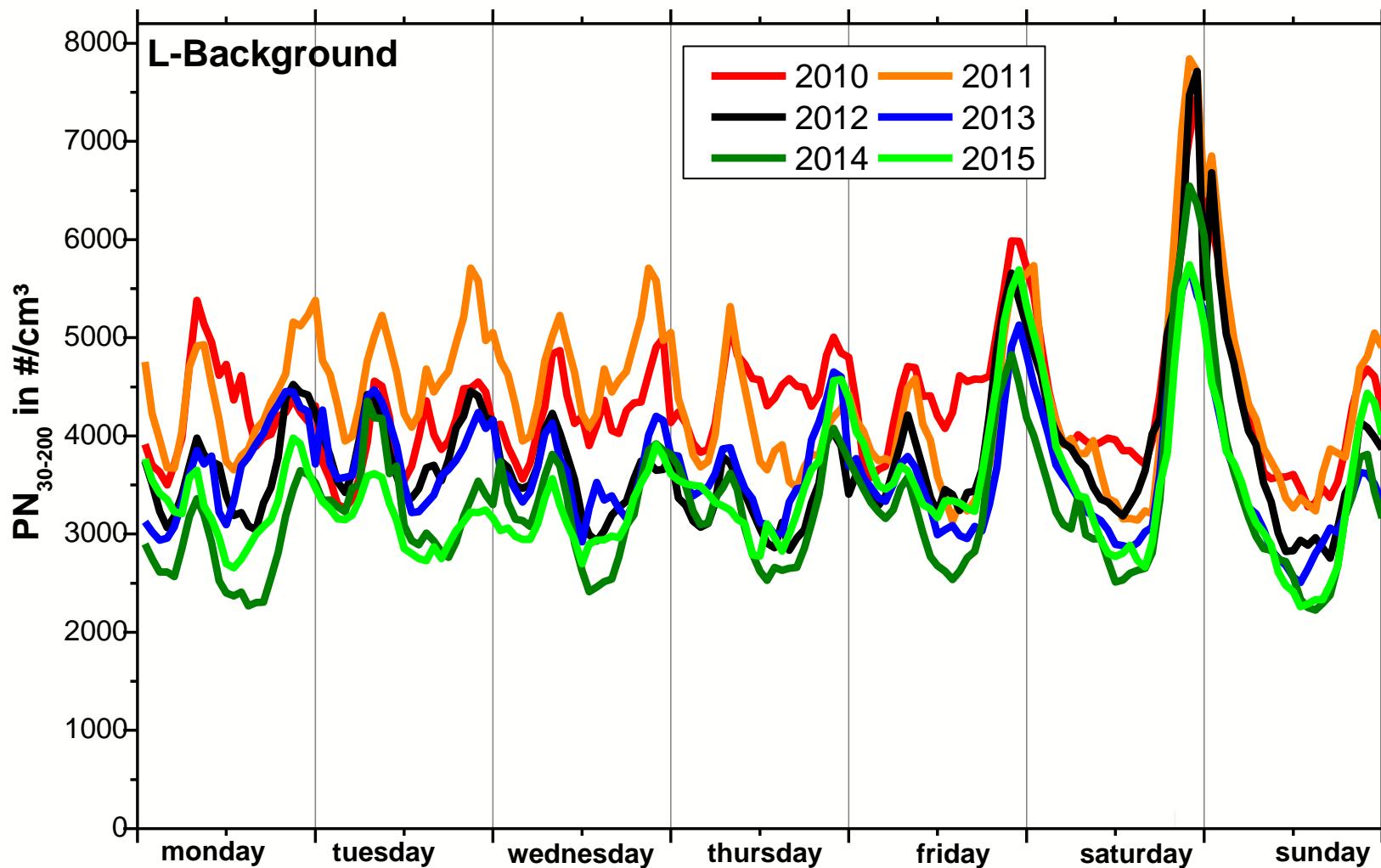
# Leipzig Mitte - eBC Mass Concentration



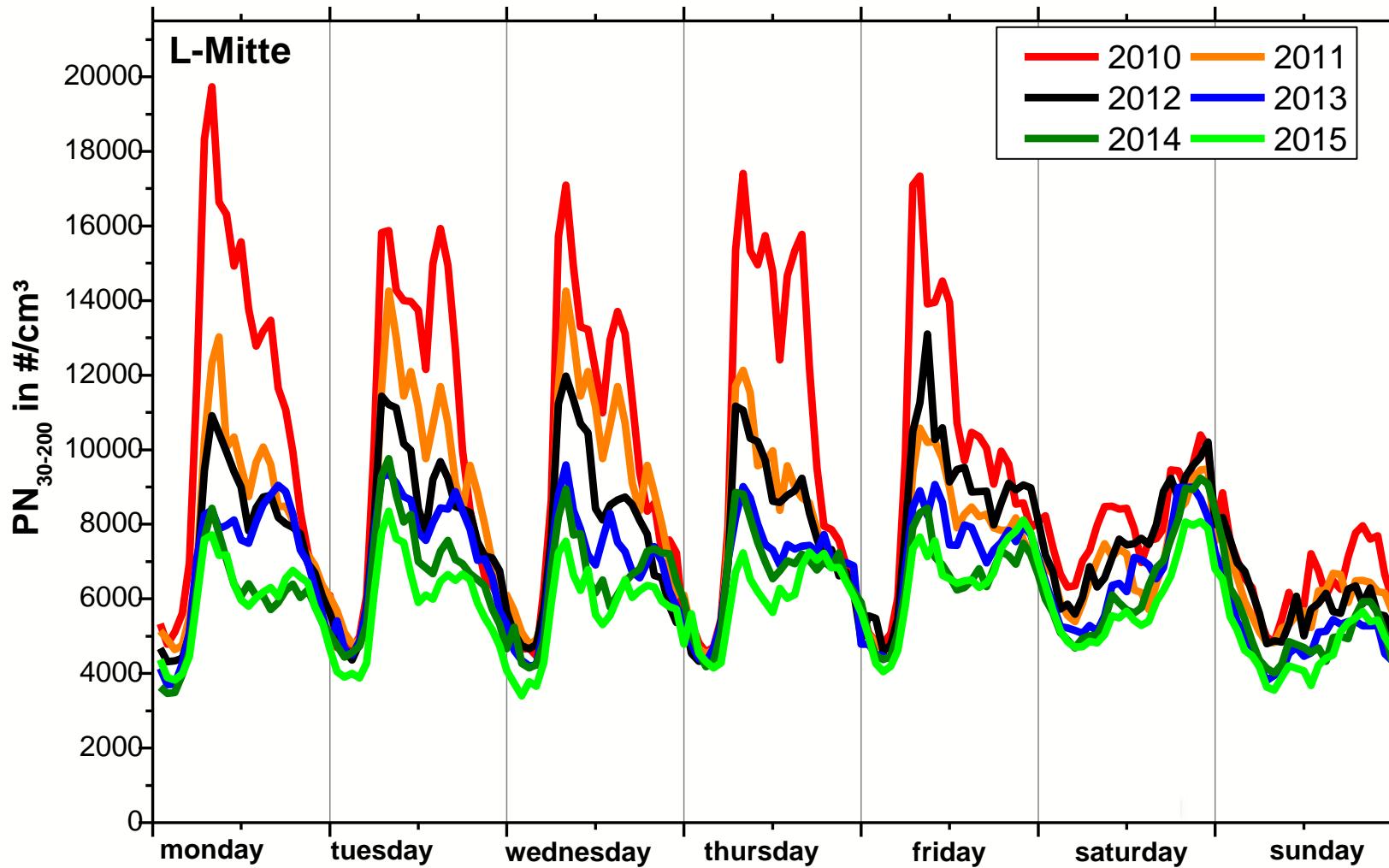
# Difference Leipzig Mitte – Background eBC Mass Concentration



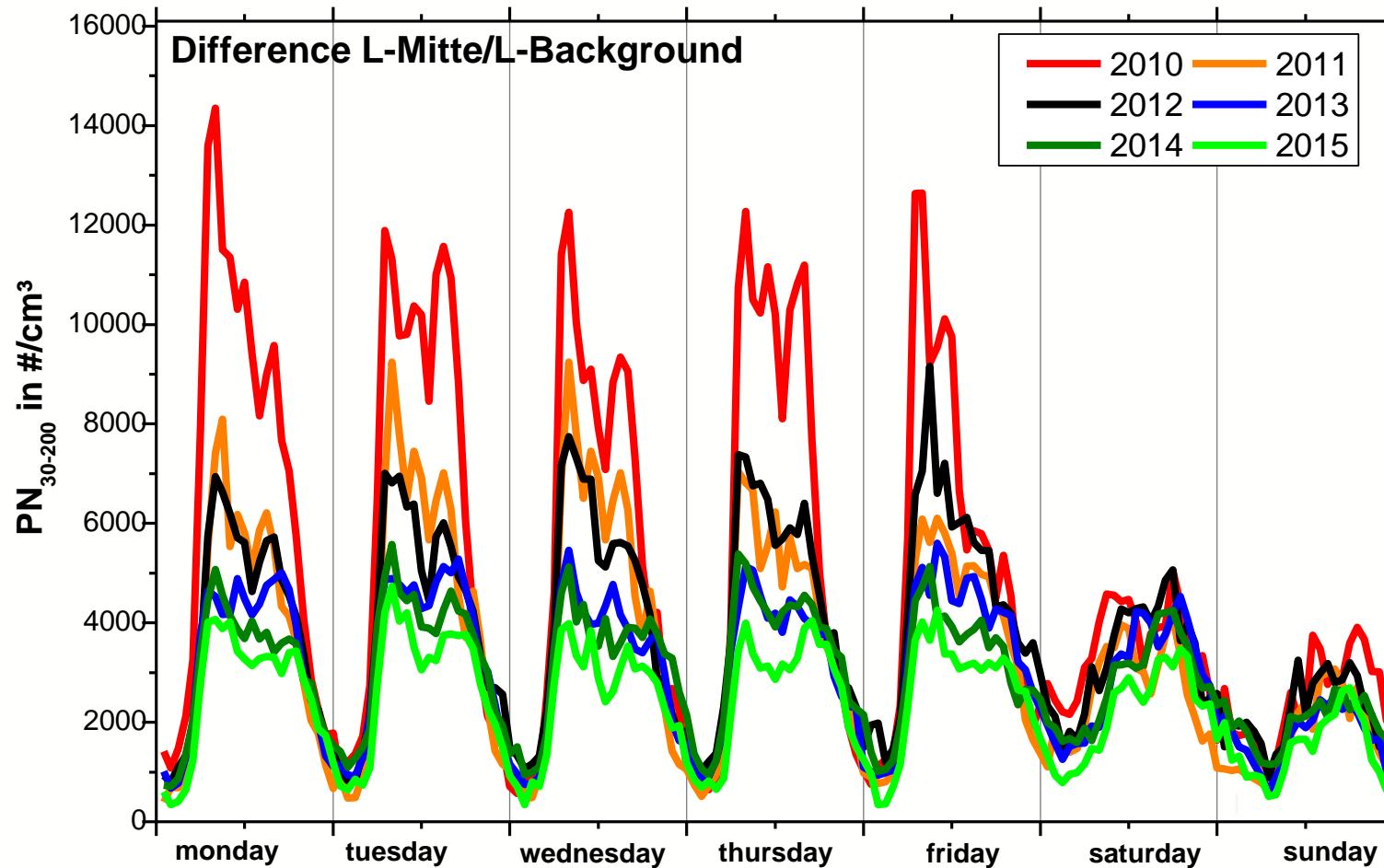
# Leipzig Background - N<sub>30-200</sub> Concentration



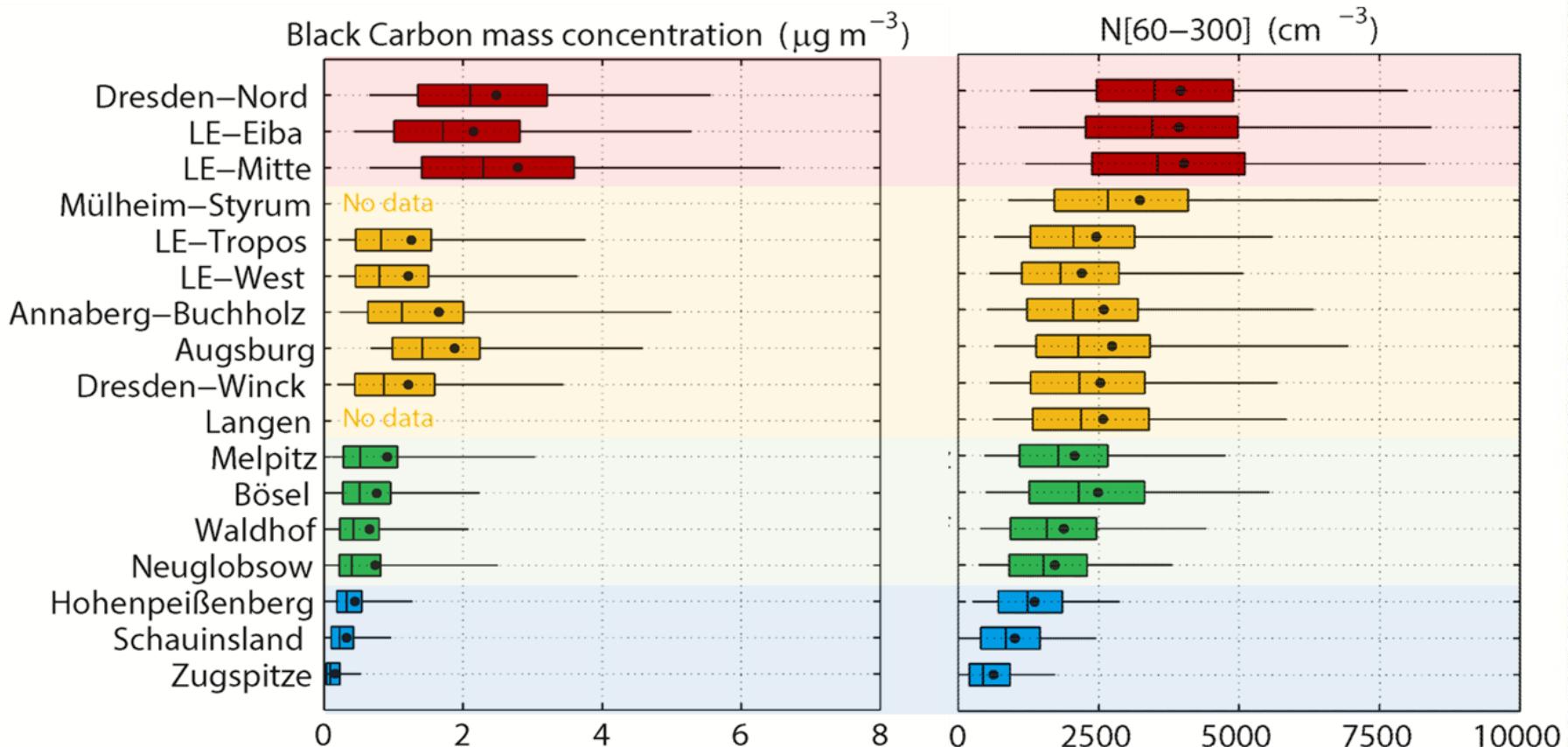
# Leipzig Mitte - N<sub>30-200</sub> Concentration



# Difference Leipzig Mitte – Background $N_{30-200}$ Concentration



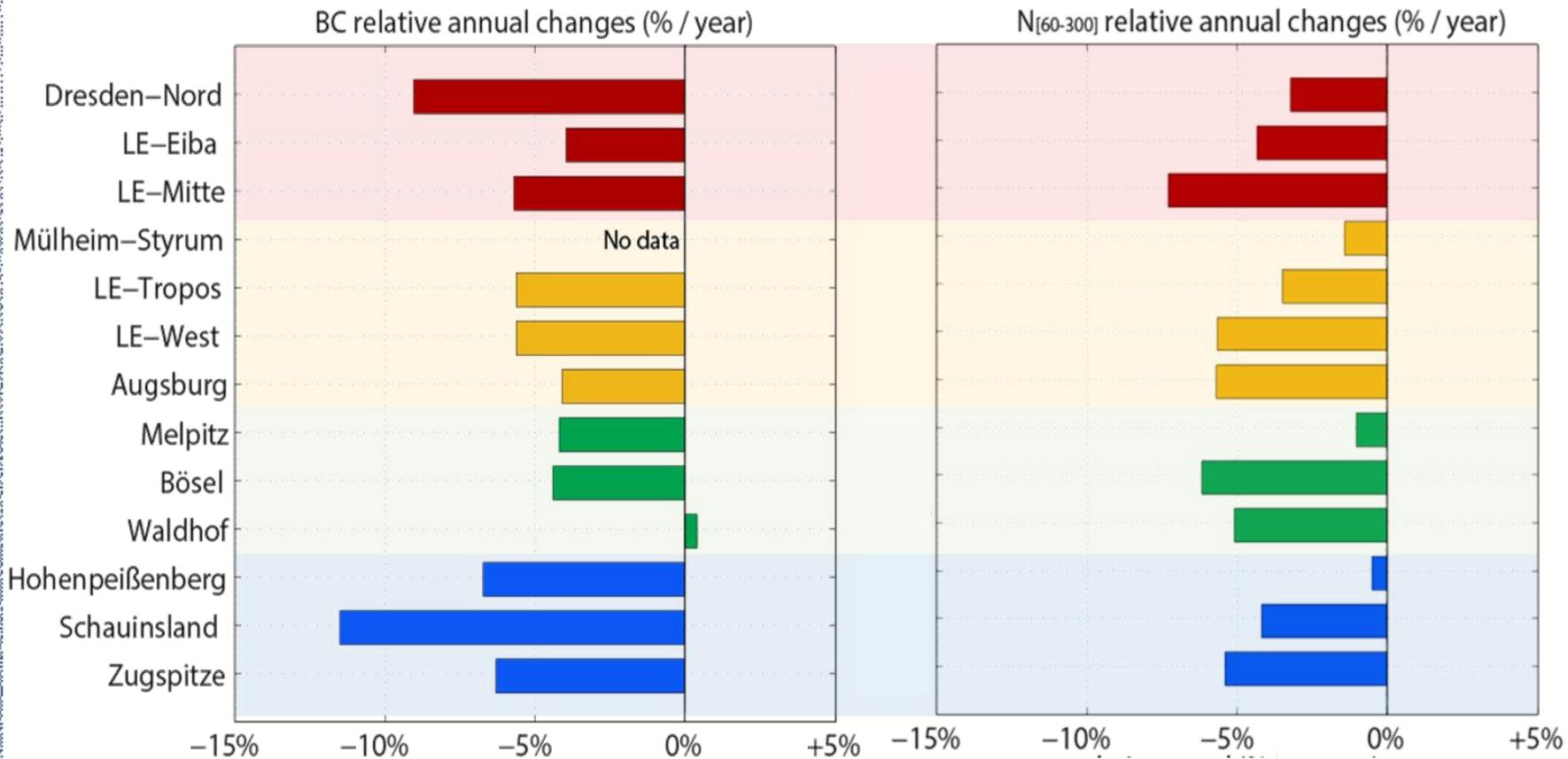
# GUAN\* (2009-2014) eBC Mass & N<sub>60-300</sub> Concentrations



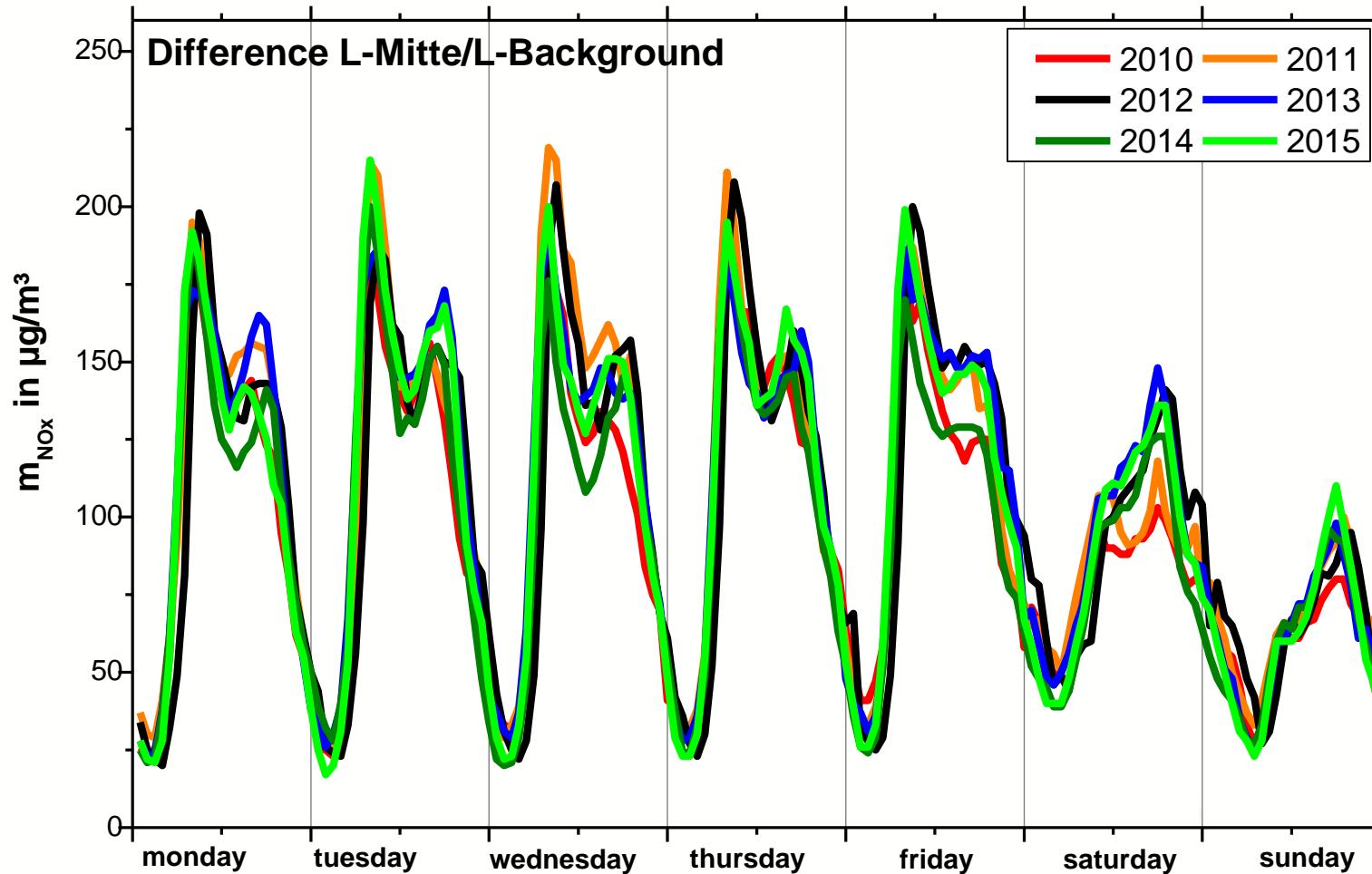
\*GUAN (German Ultrafine Aerosol Network)

# Trends GUAN (2009-2014)

## eBC Mass & N<sub>60-300</sub> Concentrations



# Difference Leipzig Mitte – Background NO<sub>x</sub> Mass Concentration



# Summary

- The low emission zone Leipzig (at the street site) was successful in terms of:
  - Black carbon mass concentration – reduction ~ 50%
  - Ultrafine particles ( $N_{30-200}$ ) – reduction > 50%
- The low emission zone Leipzig (at the street site) was not successful in terms of:
  - $\text{NO}_x$  - no reduction
- The decrease of the  $\text{PM}_{10}$  mass concentration is difficult to estimate:
  - The number exceedance days might have decreased by few days
- There are no exceptional permissions for passenger cars and light/heavy duty vehicles since end of 2014:
  - Why did the BC emissions only drop 50% at the street site?