Dependency of Urban Traffic on Black Carbon Mass Concentrations: Examples from Leipzig, La Paz and Manila

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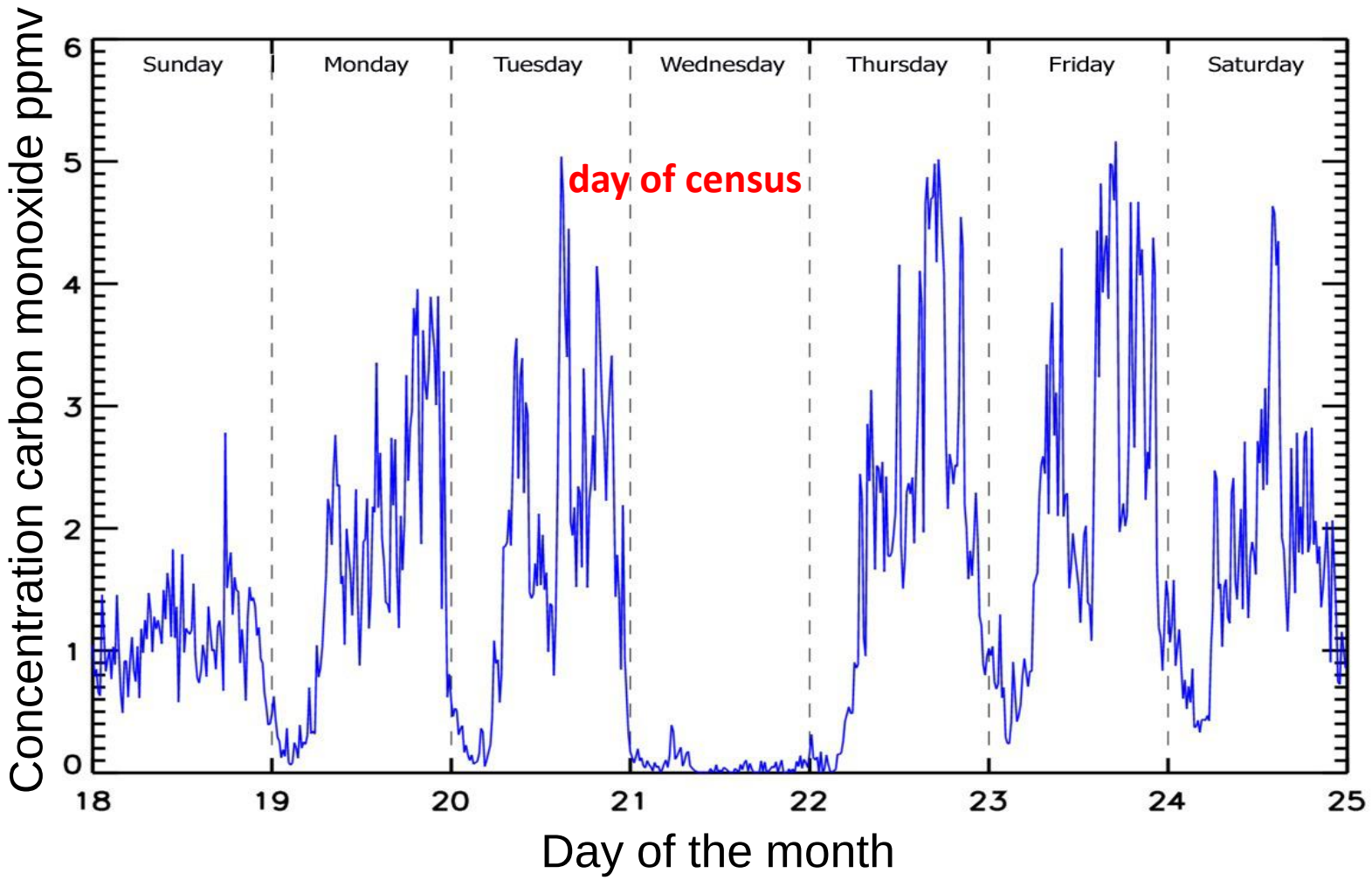
Black Carbon Emissions from Traffic

- In urban areas, traffic is still a major contributor for the emission of black carbon.
- Especially in Asia and Latin America, “old-technology” vehicles can contribute significantly to such emissions.
- To illustrate actual problems, example for La Paz (Bolivia) and Manila (Philippines) are shown.
- A third study (Leipzig, Germany) illustrates how mitigation measure can improve the air quality in terms of black carbon.

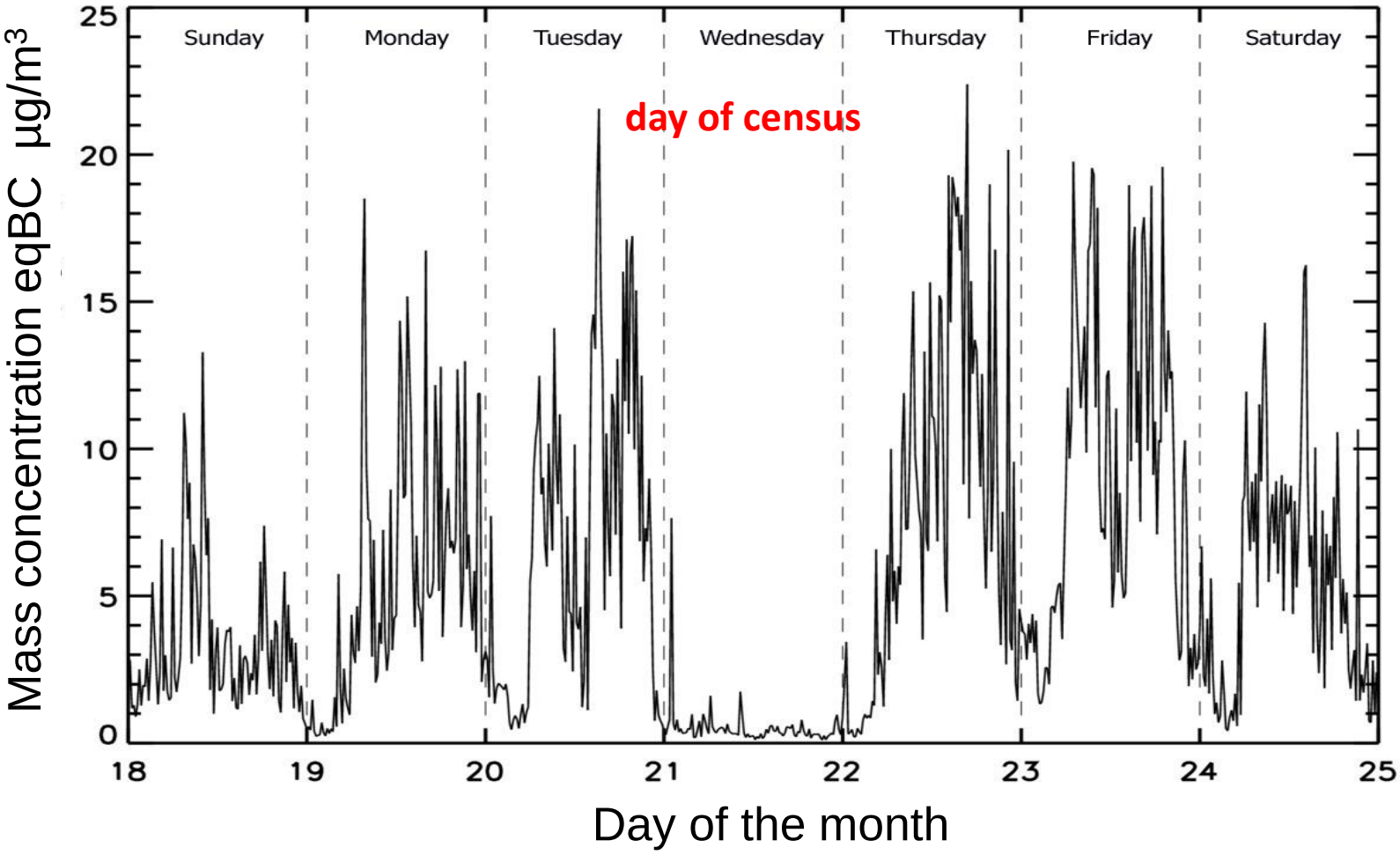
Day of Census in Bolivia

- During an intensive field study, we had the opportunity to study the effect of no cars in the city.
- During the day of census in Bolivia, on Nov. 21, 2012, all people had to stay home.
- Generally, there is no private domestic heating in La Paz and El Alto.

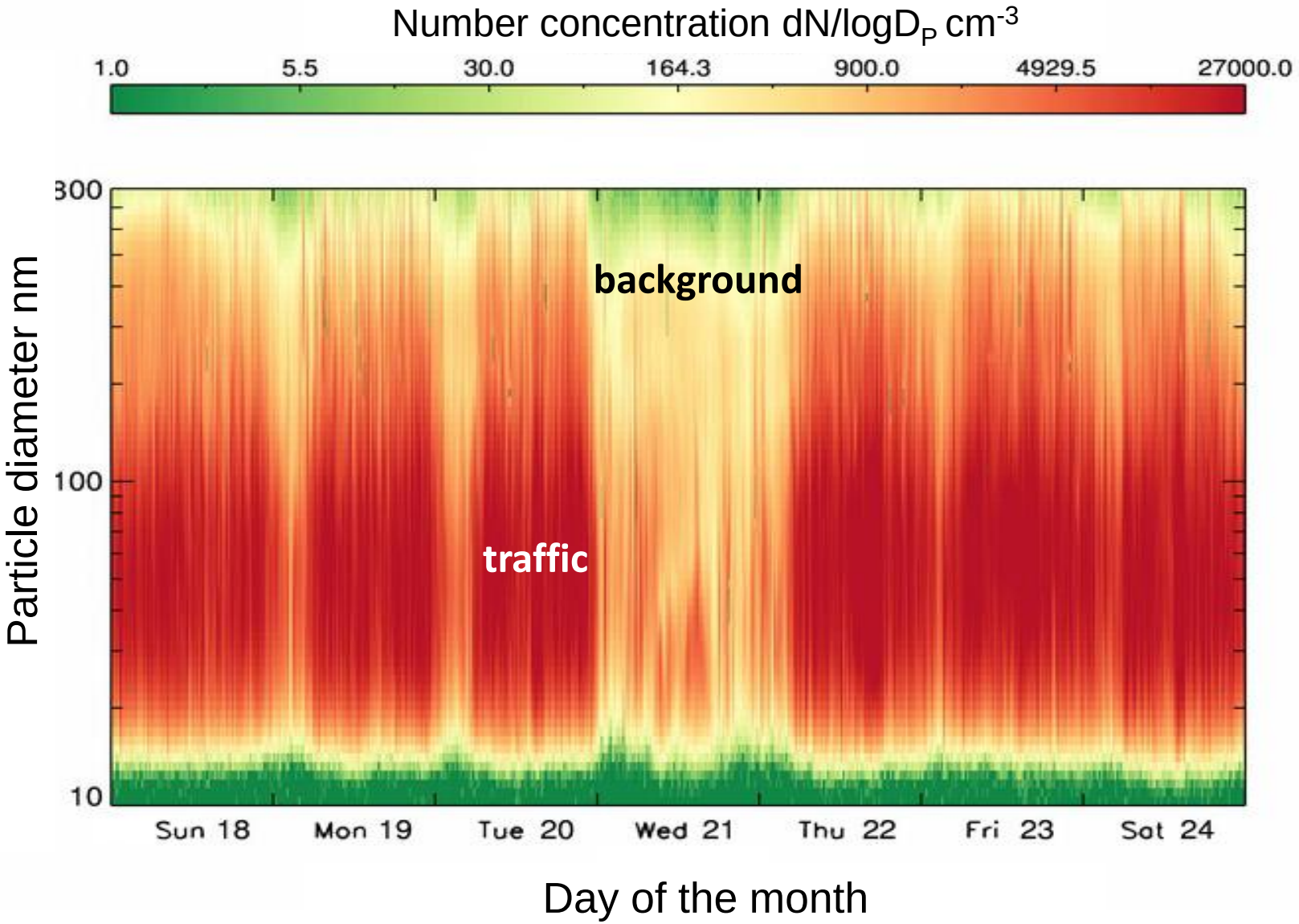
Carbon Monoxide Concentrations



Black Carbon Mass Concentration



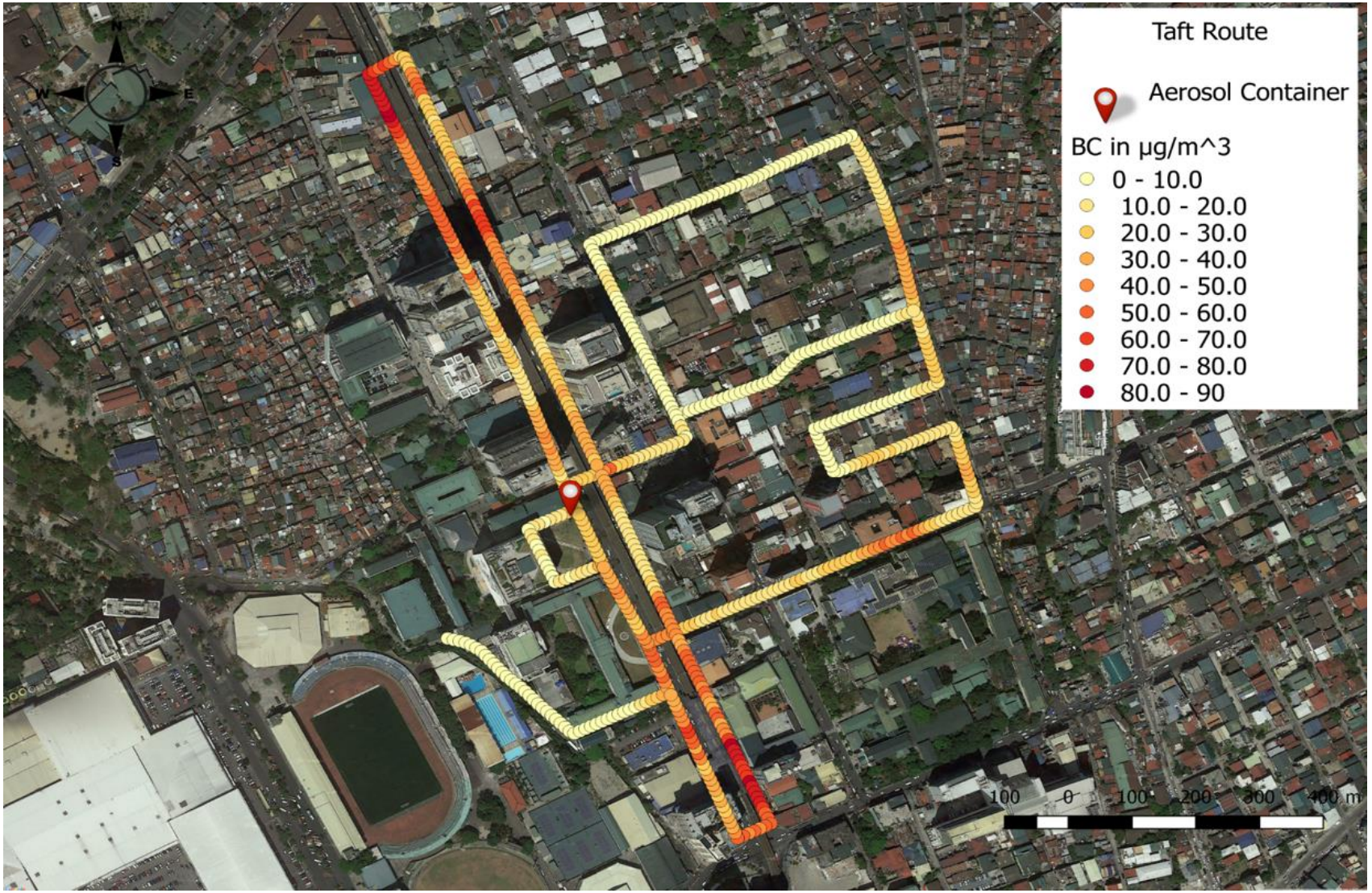
Particle Number Size Distribution



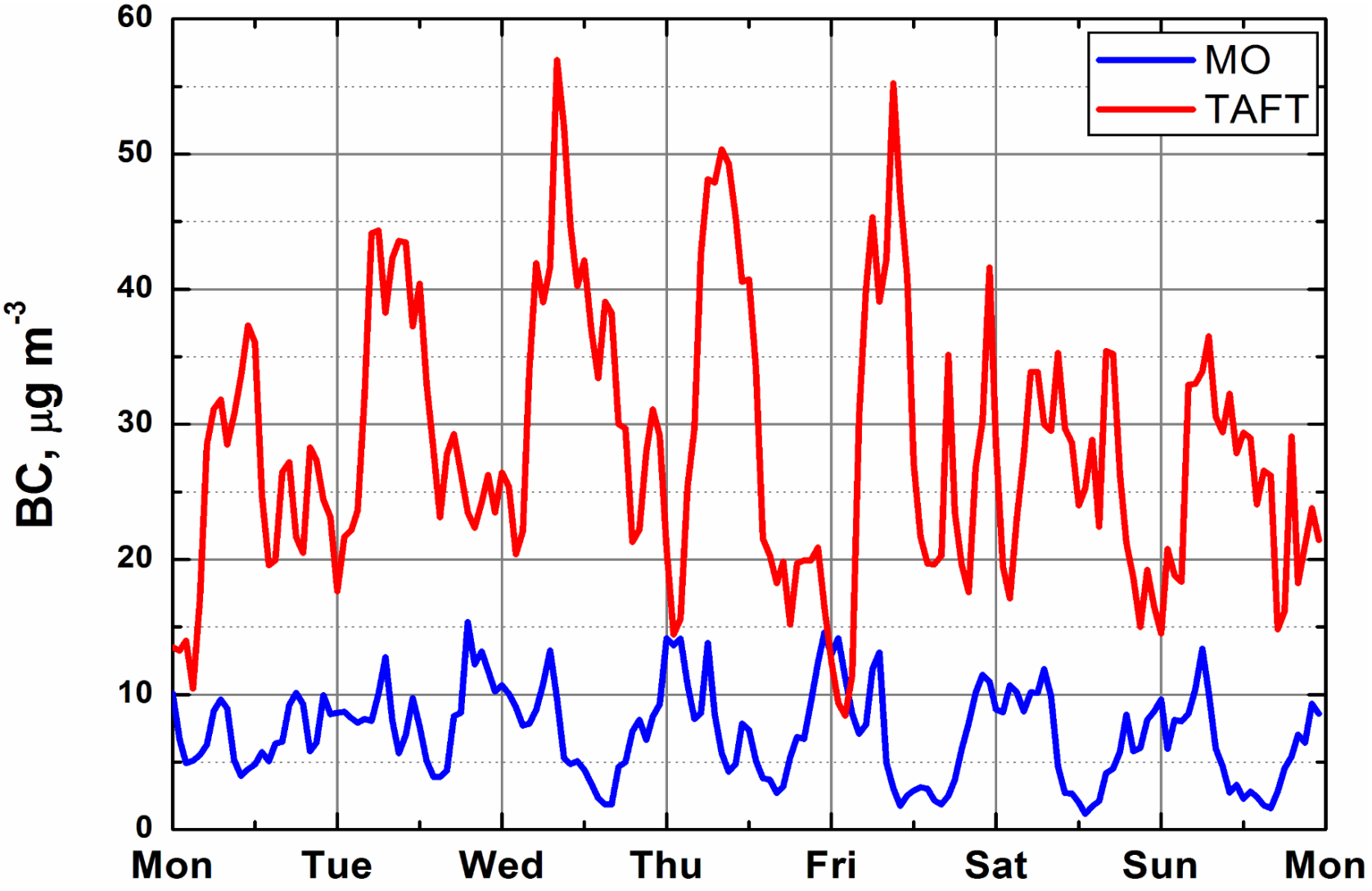
Manila Aerosol Characterization Experiment 2015

- From March to June 2015, intensive measurements in Metro Manila were performed
  - One background station, Manila Observatory
  - Two Street sites: Katipunan & Taft Ave.
- Focus was given to Black Carbon and the particle number size distribution

Black Carbon- Manila (Philippinen)



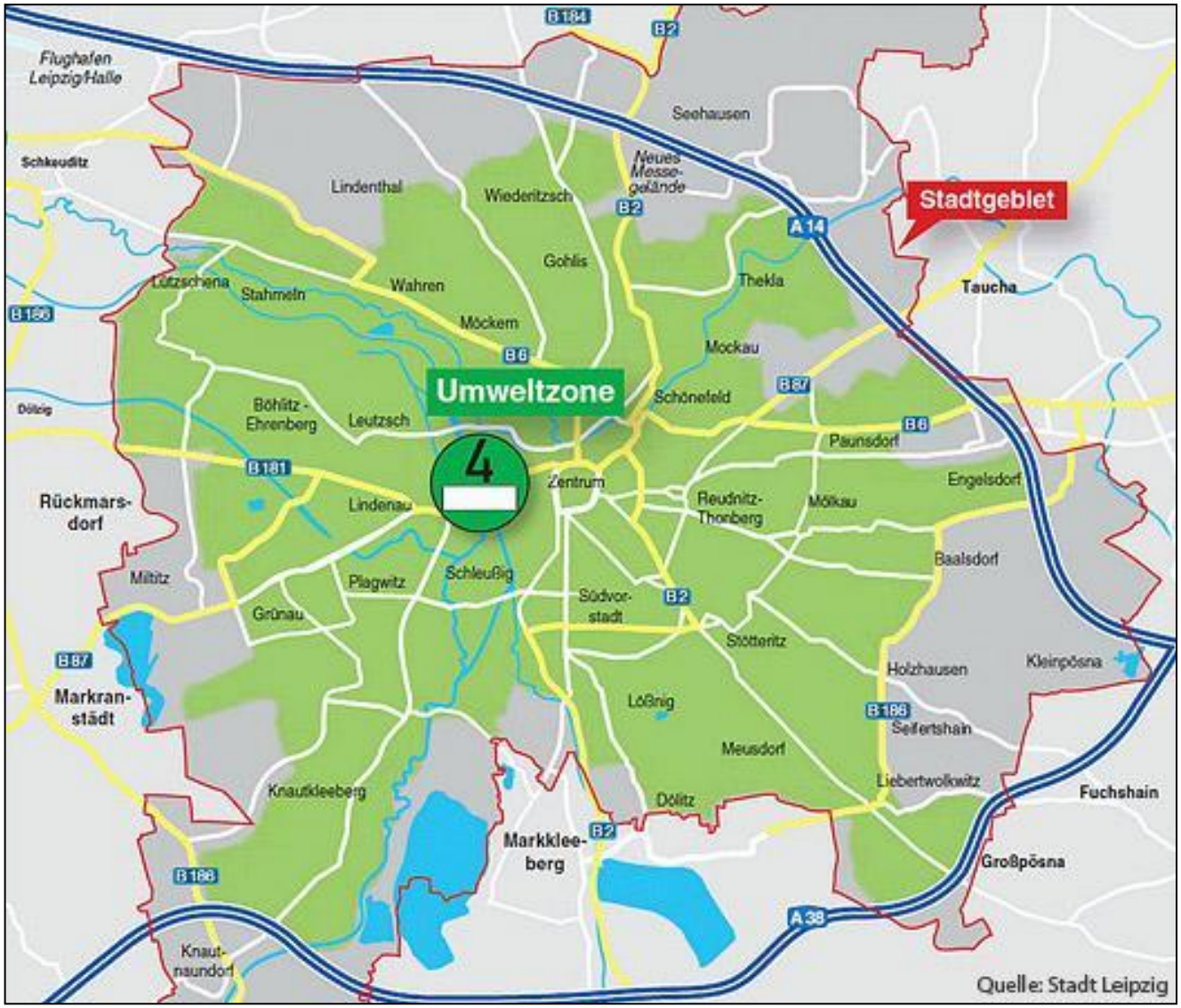
Black Carbon - Manila (Philippinen)



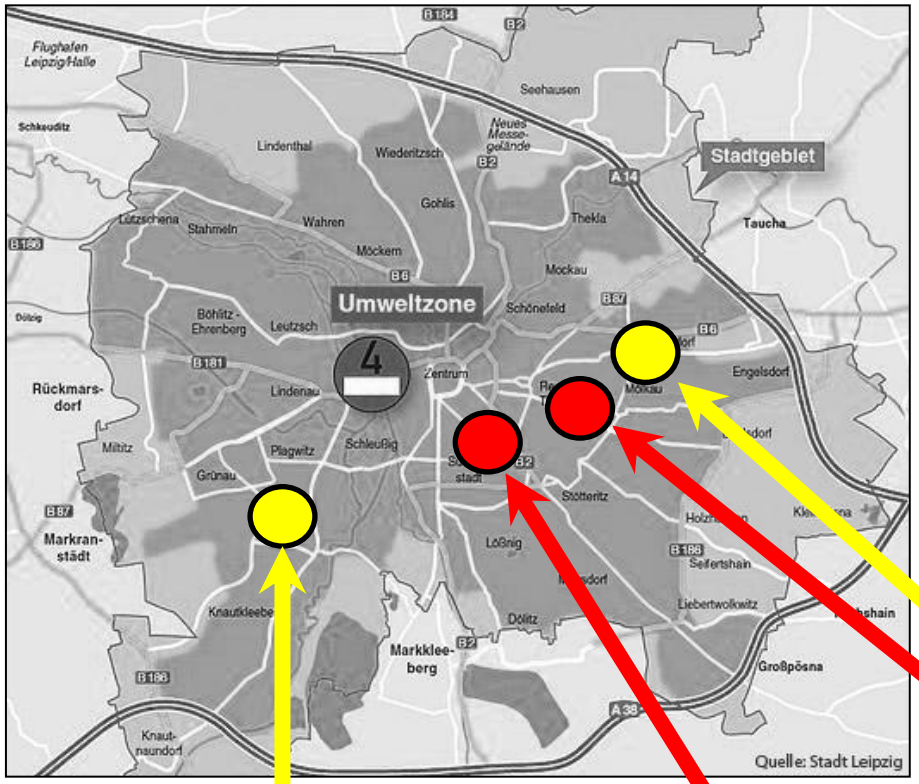
Low Emission Zone Leipzig - LEZ

- As a mitigation strategy to reduce PM10 and PM2.5 mass concentrations, a LEZ was established in Leipzig 2011.
- Only Diesel vehicles with EURO4 (or equivalent) were allowed to enter the LEZ.
- Exceptions, mainly for small and mid-sized enterprises for their light duty vehicles were given until end 2014
- In cooperation with the State office for Environment, Agriculture & Geology, we studied the change in black carbon and ultrafine particle number concentration.

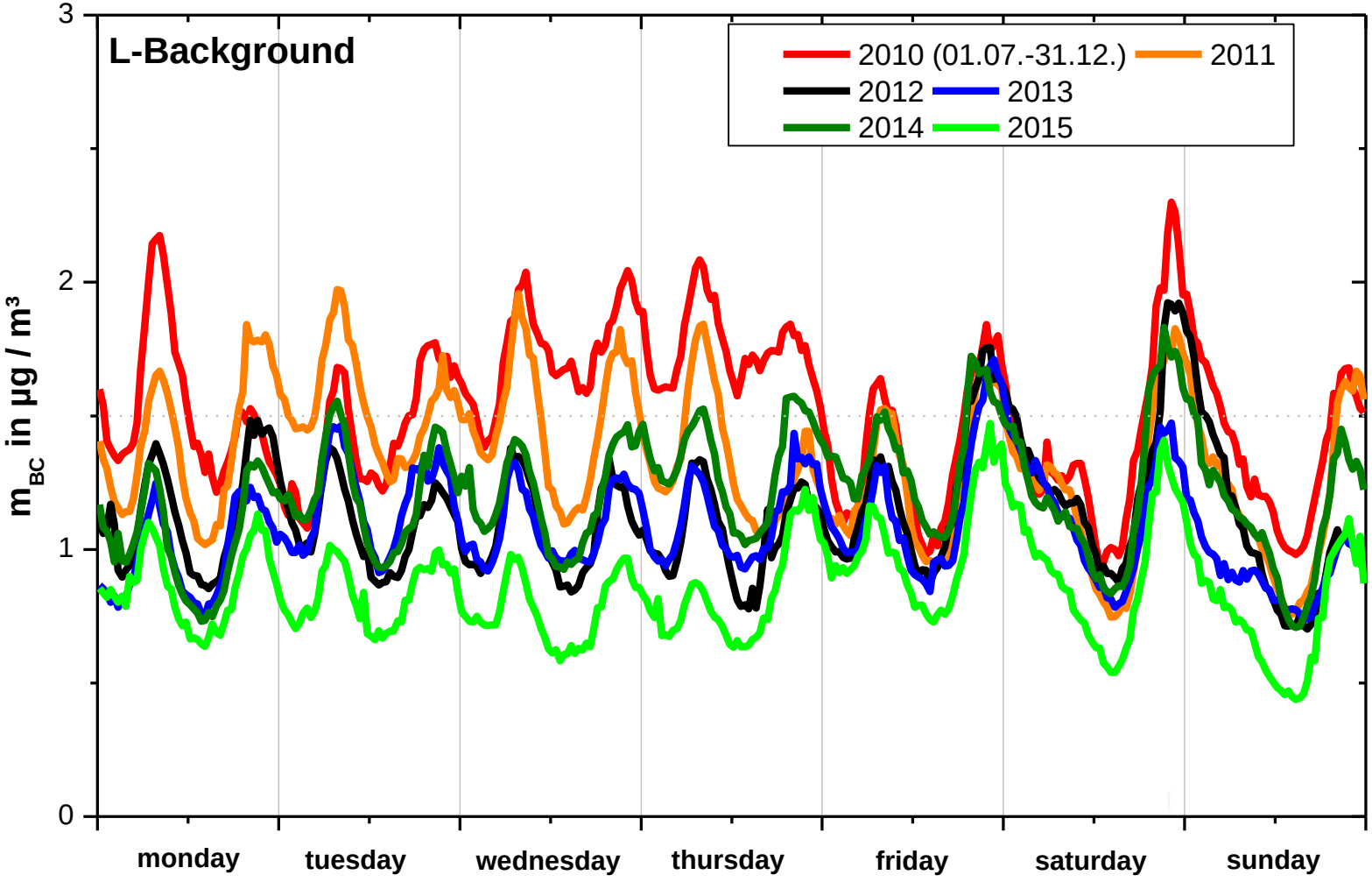
LEZ Leipzig


Flughafen Leipzig-Halle
Schkeuditz
Lindenthal
Wiederitzsch
Seehausen
Neues Messegelände
Stadtgebiet
Gohlis
Wahren
Lützschena
Stahmeln
Möckern
Thekla
Taucha
Mockau
Umweltzone
Schönefeld
Böhlitz-Ehrenberg
Leutzsch
Paunsdorf
Engelsdorf
Zentrum
Lindenau
Reudnitz-Thonberg
Mölkau
Rückmarsdorf
Miltitz
Plagwitz
Schleußig
Baalsdorf
Südvorstadt
Grünau
Stötteritz
Markranstädt
Holzhausen
Kleinpösna
Lößnig
Seifertshain
Meusdorf
Liebertwolkwitz
Fuchshain
Knautkleeberg
Dölitz
Markkleeberg
Großpösna
Knautnaundorf
Quelle: Stadt Leipzig

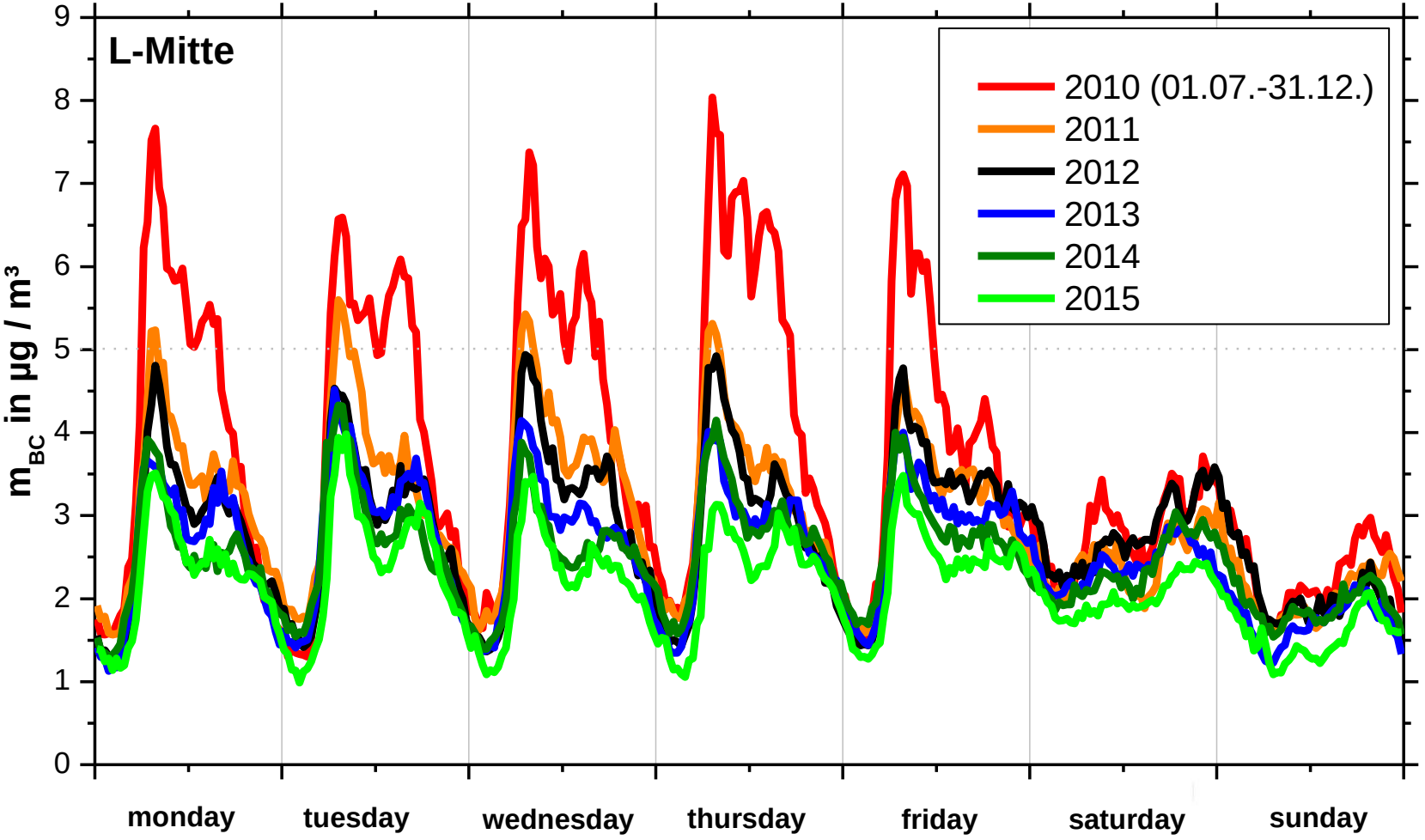
LEZ Sampling Sites



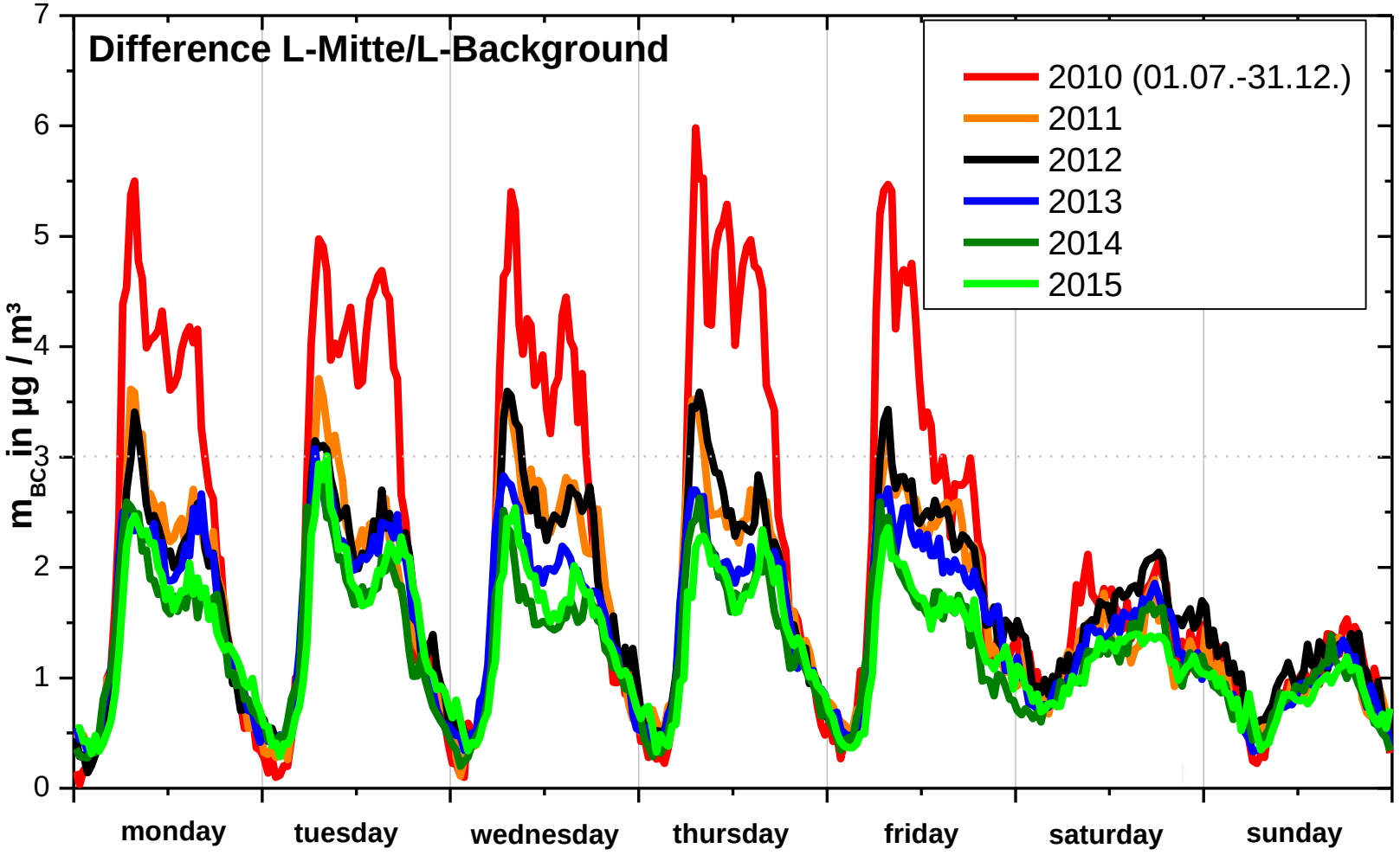
Leipzig Background - BC Mass Concentration



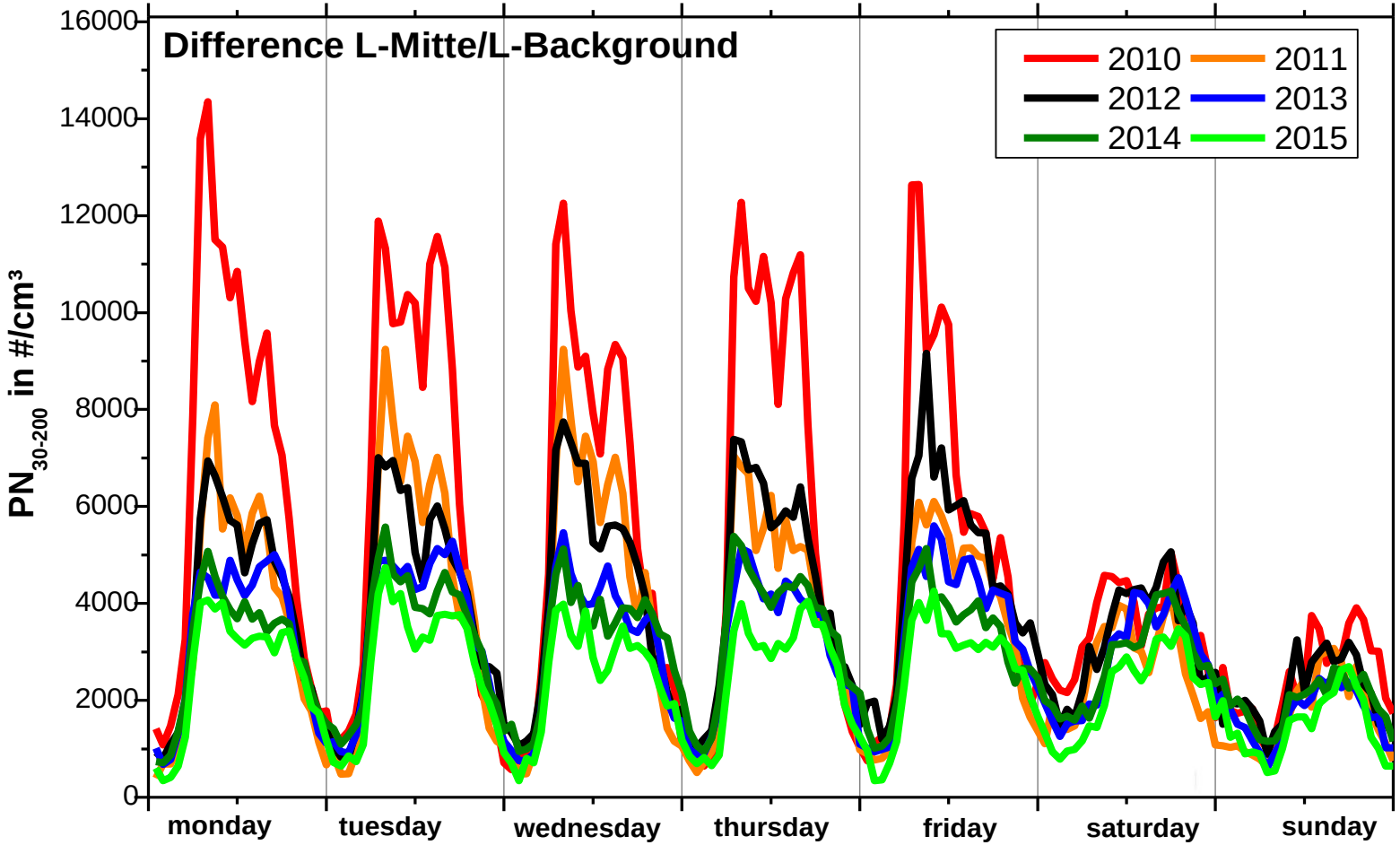
Leipzig Mitte - BC Mass Concentration



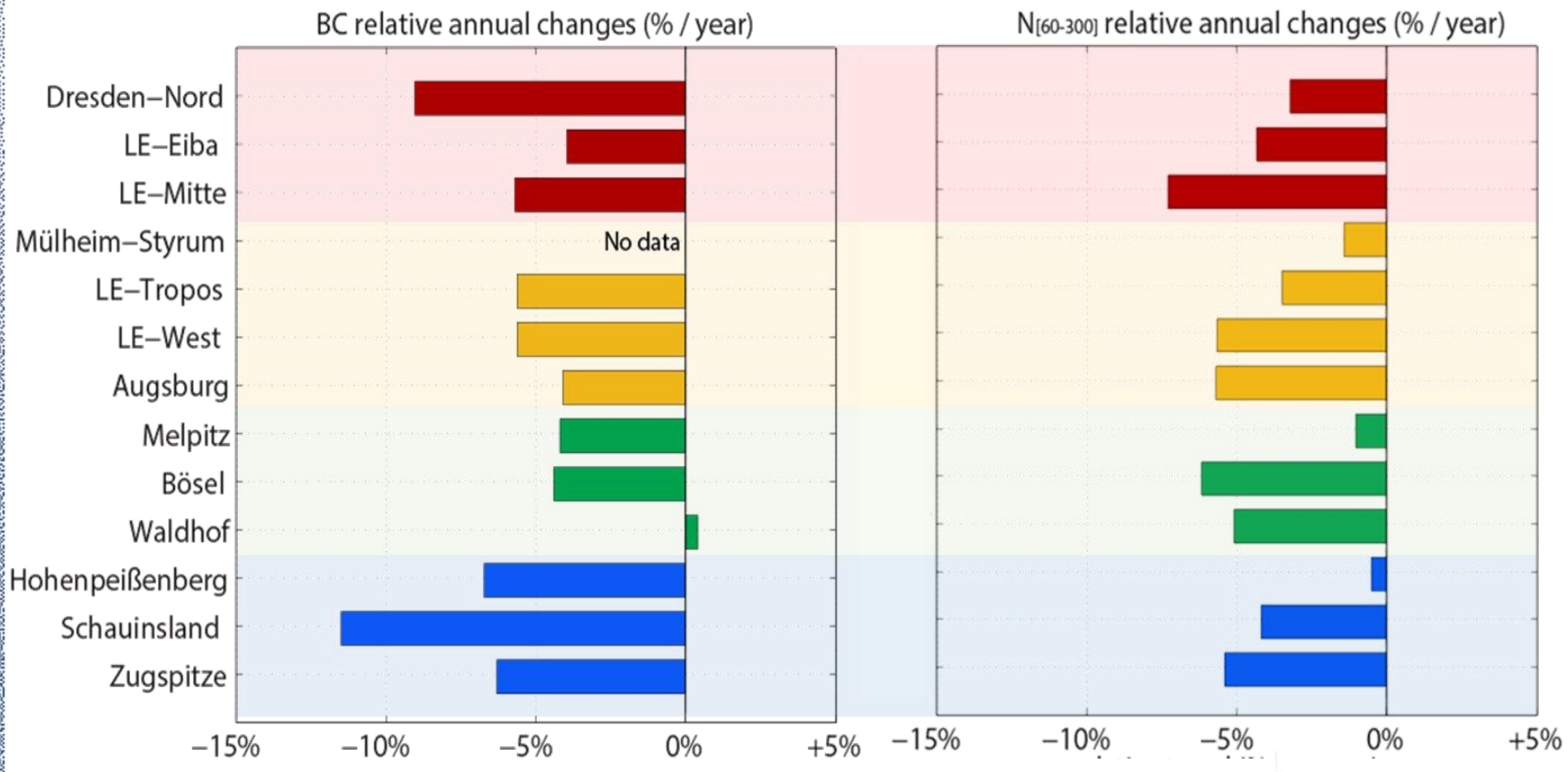
Difference Leipzig Mitte – Background
BC Mass Concentration



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



Trends GUAN (2009-2014)
BC Mass & $N_{60\text{-}300}$ Concentrations



Summary

- In many cities in Asia and Latin America, black carbon dominates the particulate air pollution.
- Mitigation strategies have to be implemented.
- Social and economic impacts have to be considered.
- Changing atmospheric composition (here black carbon) has to be monitored by scientific institutions.
- Decreasing health risk has to be proven.