

Preliminary observations – USC Ultrafine particle concentration network

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Preliminary

For more information:

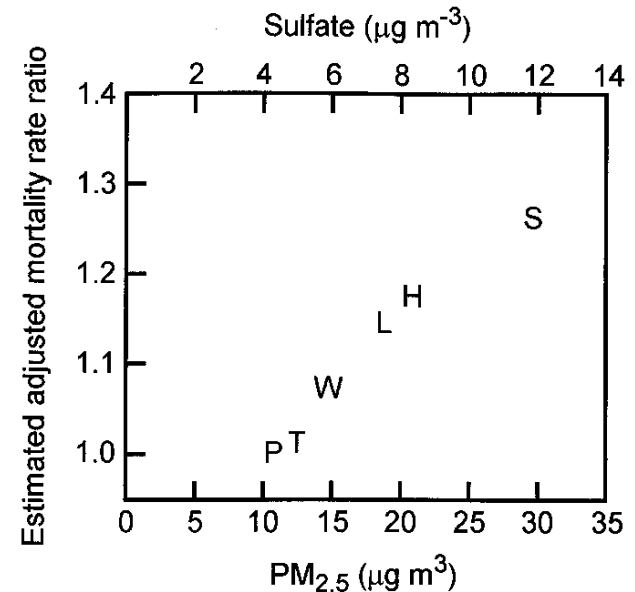
- Harbor Communities Monitoring Study (HCMS)
<http://www.arb.ca.gov/research/mobile/hcm/hcm.htm>
- Sioutas research group
 - <http://www.usc.edu/aerosol>
 - katharim@usc.edu

Outline

- Motivation
 - Ultrafine atmospheric aerosol
- Preliminary results
 - Hourly data
 - Comparison to other observations
 - Port of Long Beach Air Quality data
- Summary/Acknowledgements

Atmospheric aerosol

- Particulate matter
- Research motivated by
 - Climate
 - Atmospheric chemistry
 - **Health effects**
 - National Academy “State of the Science” reports
 - Visibility
- TSP, PM₁₀, PM_{2.5}...
 - Mass-based measurements
- In Los Angeles
 - Mobile sources



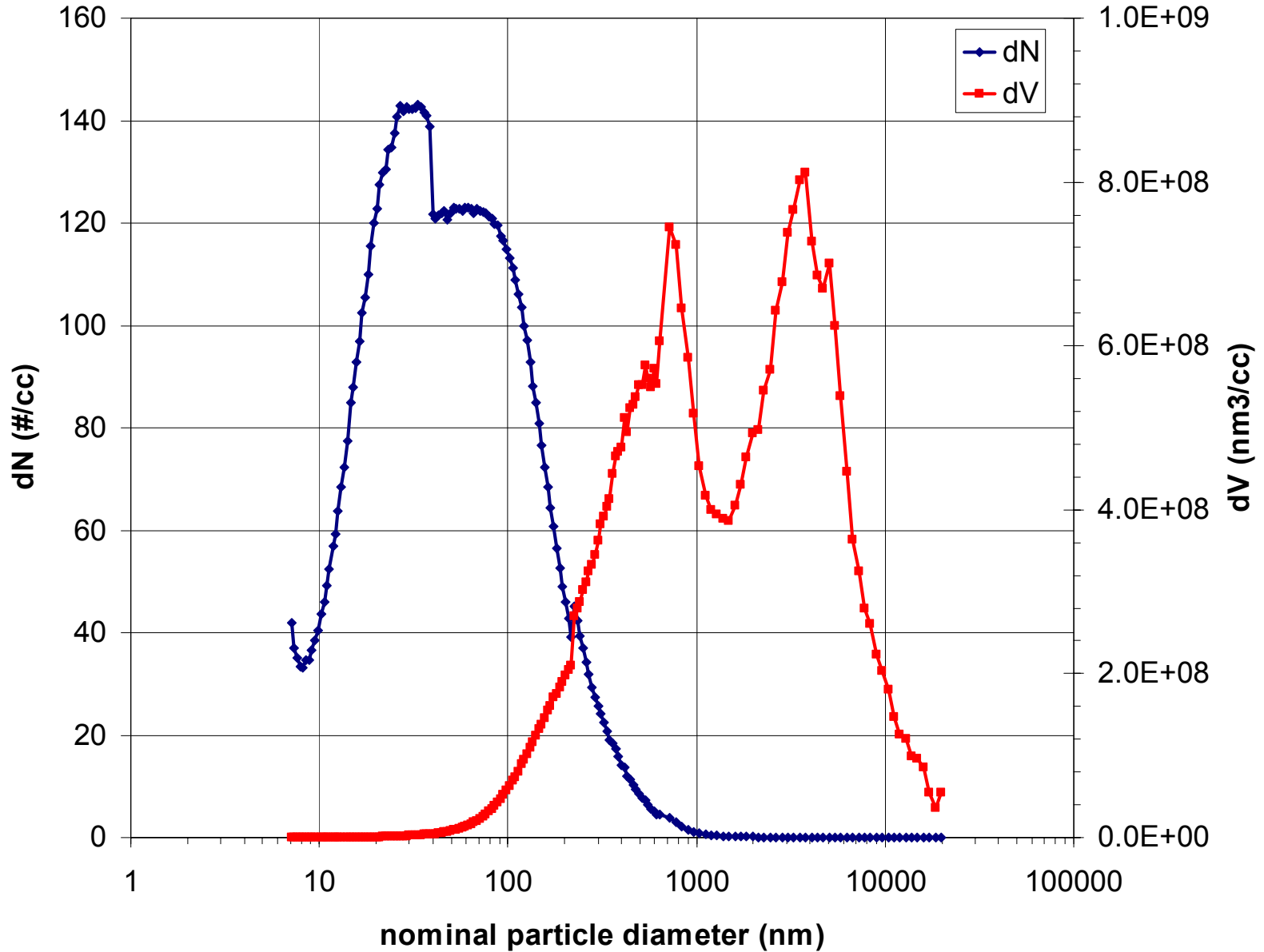
Adjusted mortality rate ratio for several cities

(Dockery et al., 1993)

Ultrafine atmospheric aerosol

- Particles < 180 nm in diameter
 - Dust, sea spray > 1000 nm (1 μm) in diameter
- Source
 - Gas-to-particle conversion processes
 - Combustion (polluted)
 - atmospheric oxidation (polluted/pristine)
- Dominate number concentration
 - Difficult to discern in volume/mass concentration
 - Typical characterization (e.g. $\mu\text{g}/\text{m}^3$)
- Responsible for adverse health effects?
 - Controversial
 - On-going research

Number and volume distributions (PIU June/July 2006, 6 - 9 am)



HCMS:

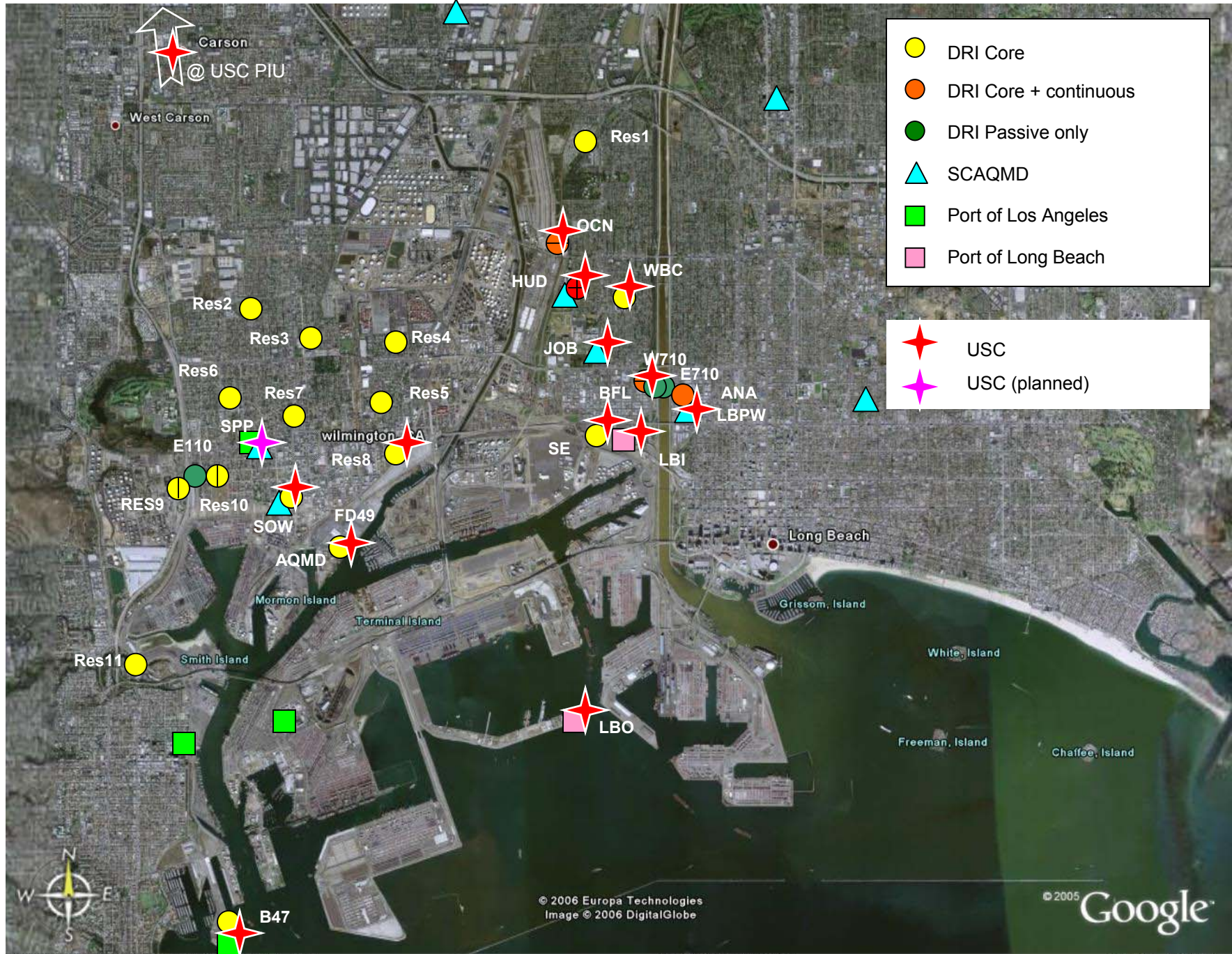
Ultrafine Particle Concentration Network

- **Intra-community variability**
- Particle number concentration
 - Regional + local signal?
- 12 – 13 fixed sites
- Continuous observations
 - Condensation particle counter
 - Number concentration at 1 minute resolution
 - Meteorological data
 - Rolling start (February 2007)
- In coordination/collaboration with
 - other HCMS projects (DRI, UCLA/ARB)
 - SCAQMD
 - Port of Los Angeles and Port of Long Beach Air Quality monitoring

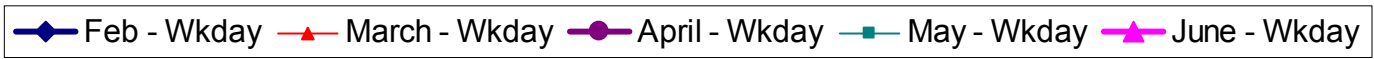
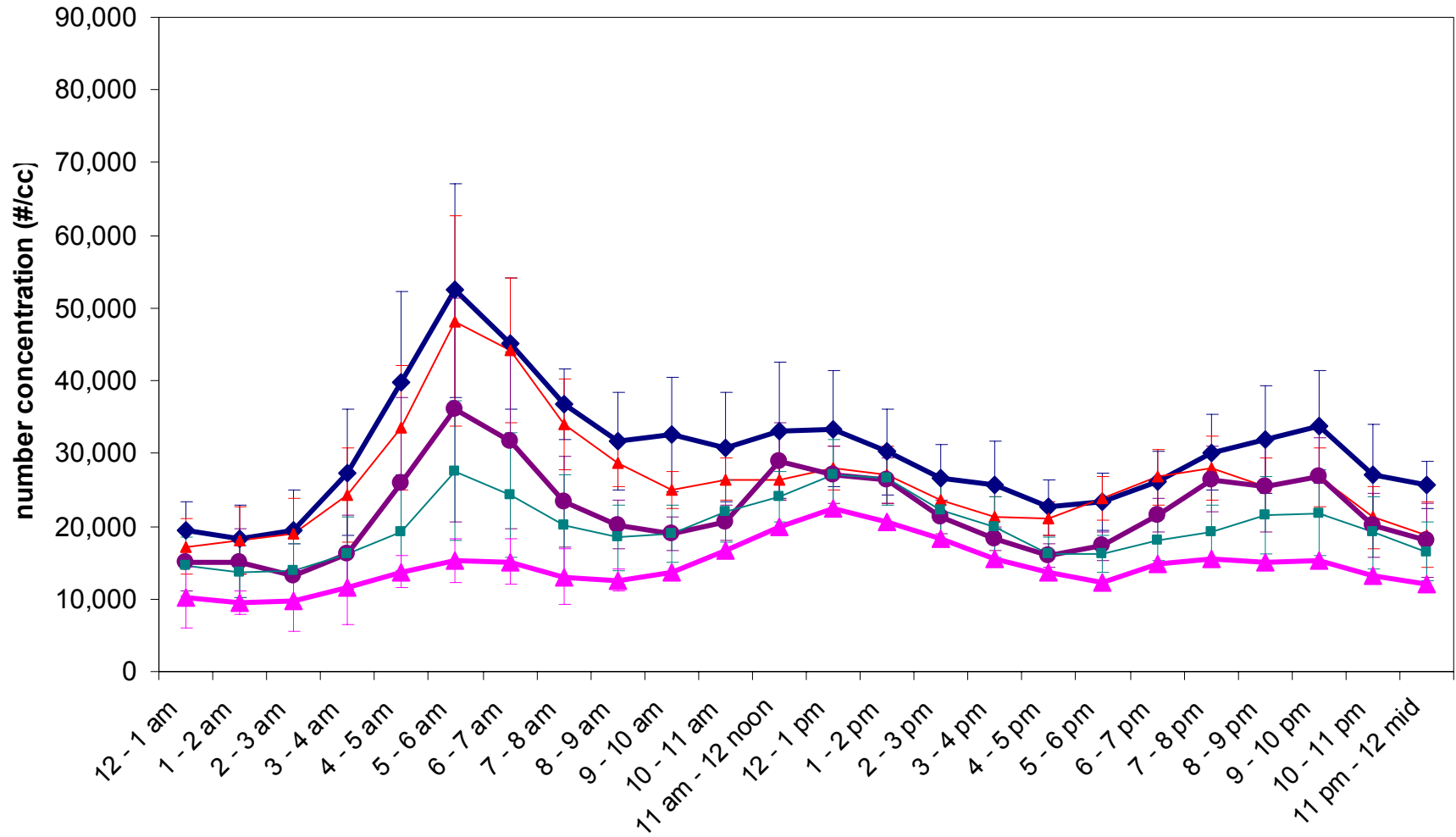
Carson
@ USC PIU

- DRI Core
- DRI Core + continuous
- DRI Passive only
- ▲ SCAQMD
- Port of Los Angeles
- Port of Long Beach

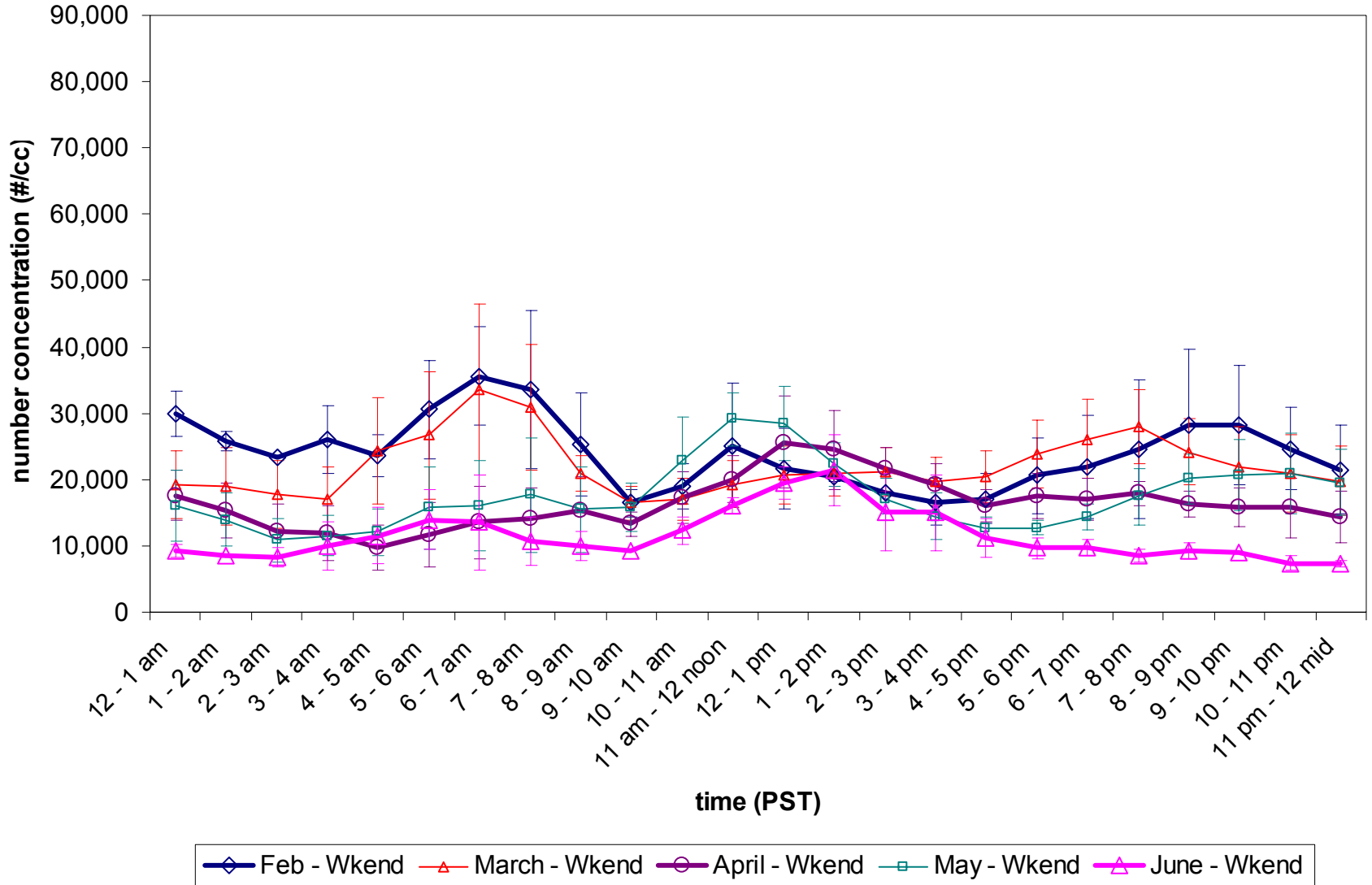
- ★ USC
- ★ USC (planned)



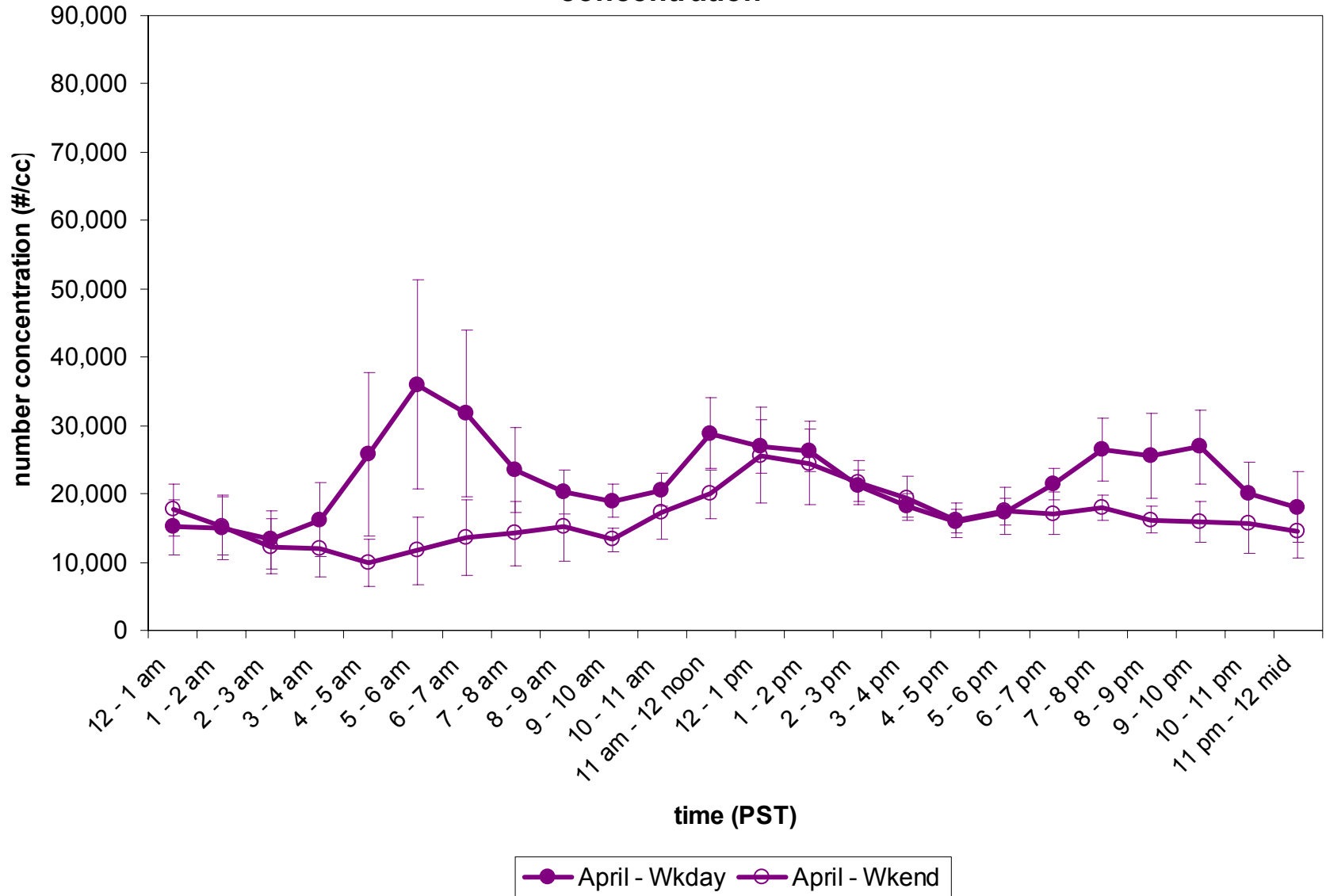
USC PIU - WEEKDAY hourly average number concentration



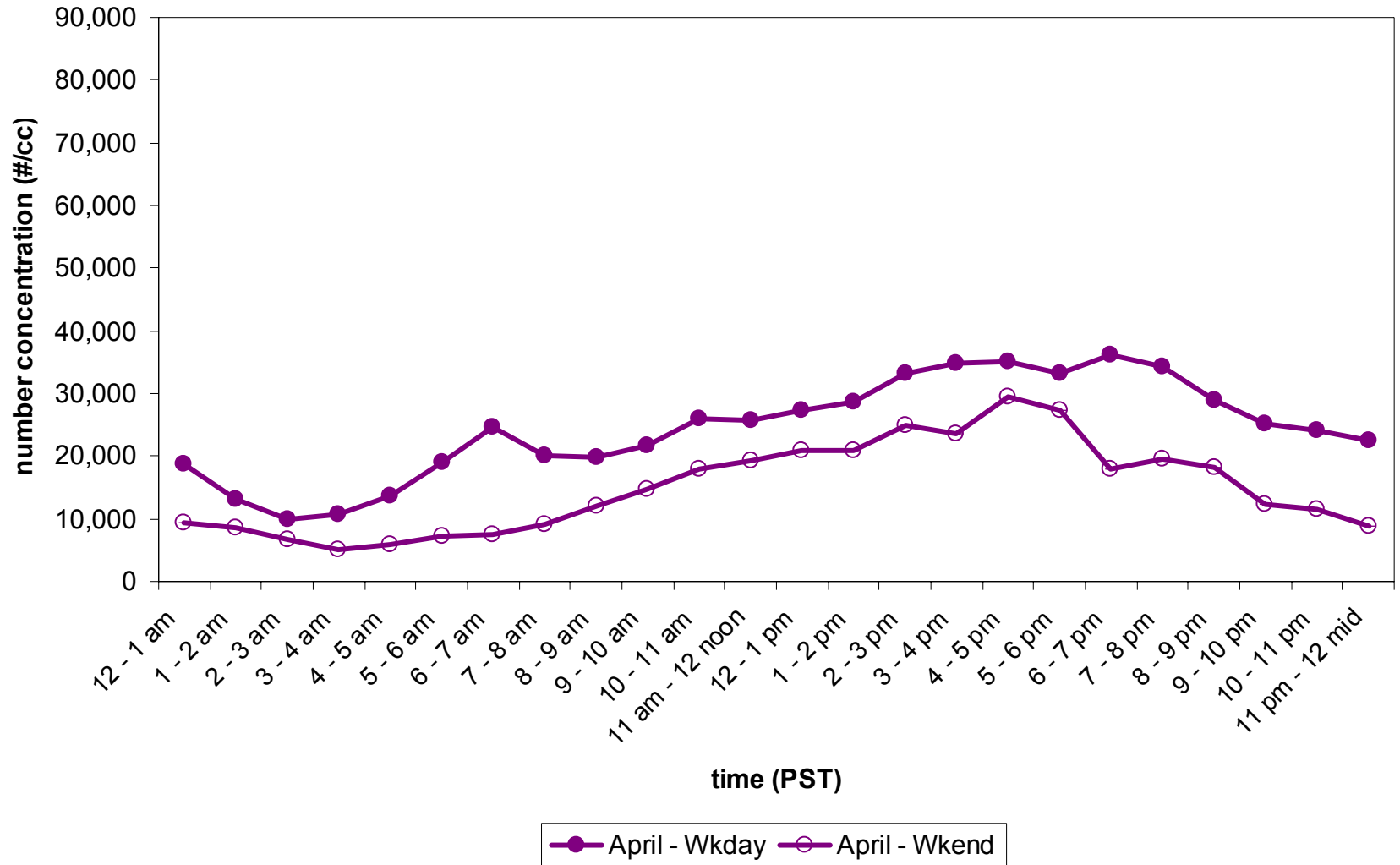
USC PIU - WEEKEND hourly average number concentration



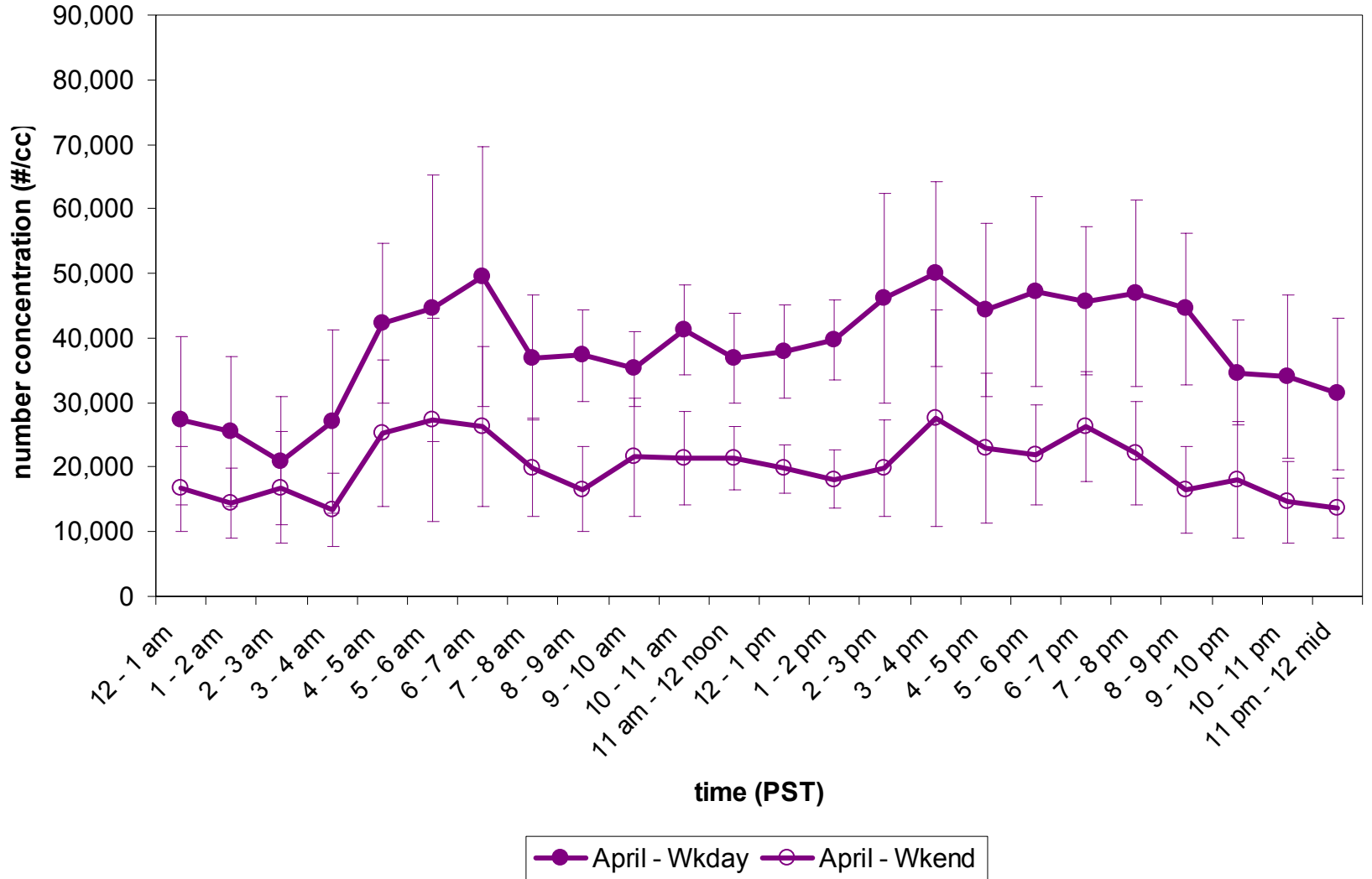
USC PIU - April WEEKDAY/WEEKEND hourly average number concentration



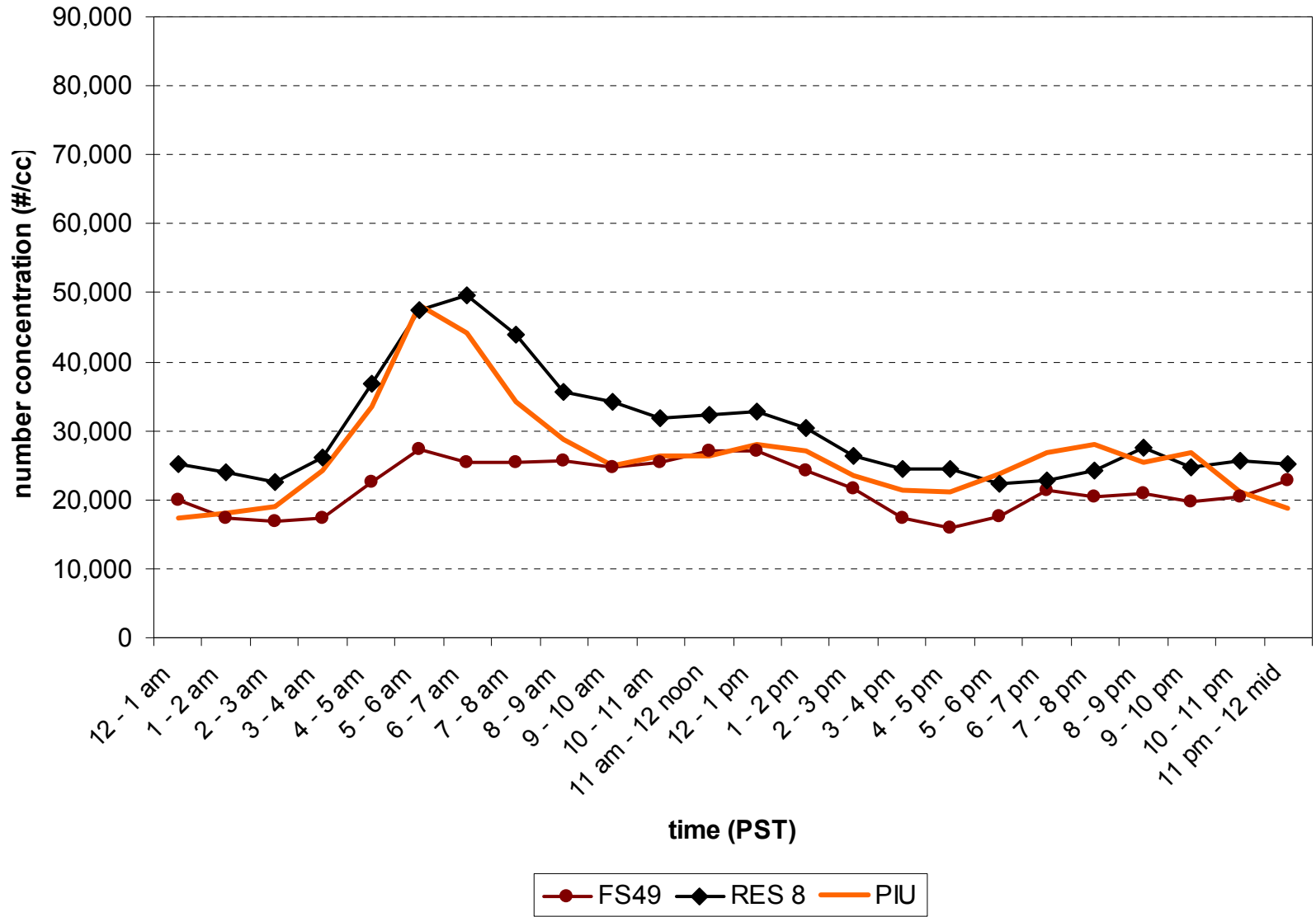
HUD (Hudson School) - April WEEKDAY/WEEKEND hourly average number concentration



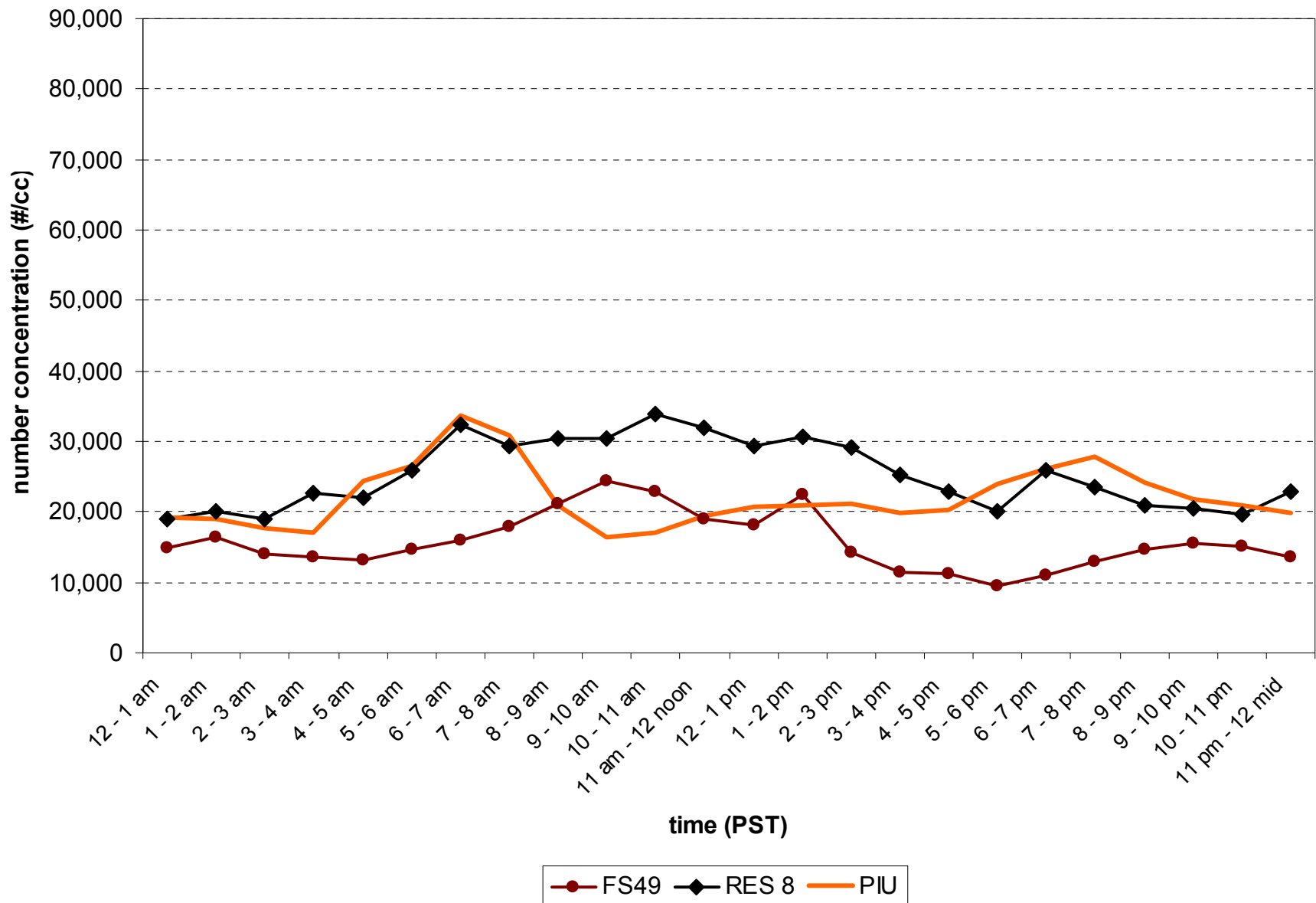
SE (Santa Fe & Anaheim) - April WEEKDAY/WEEKEND hourly average number concentration



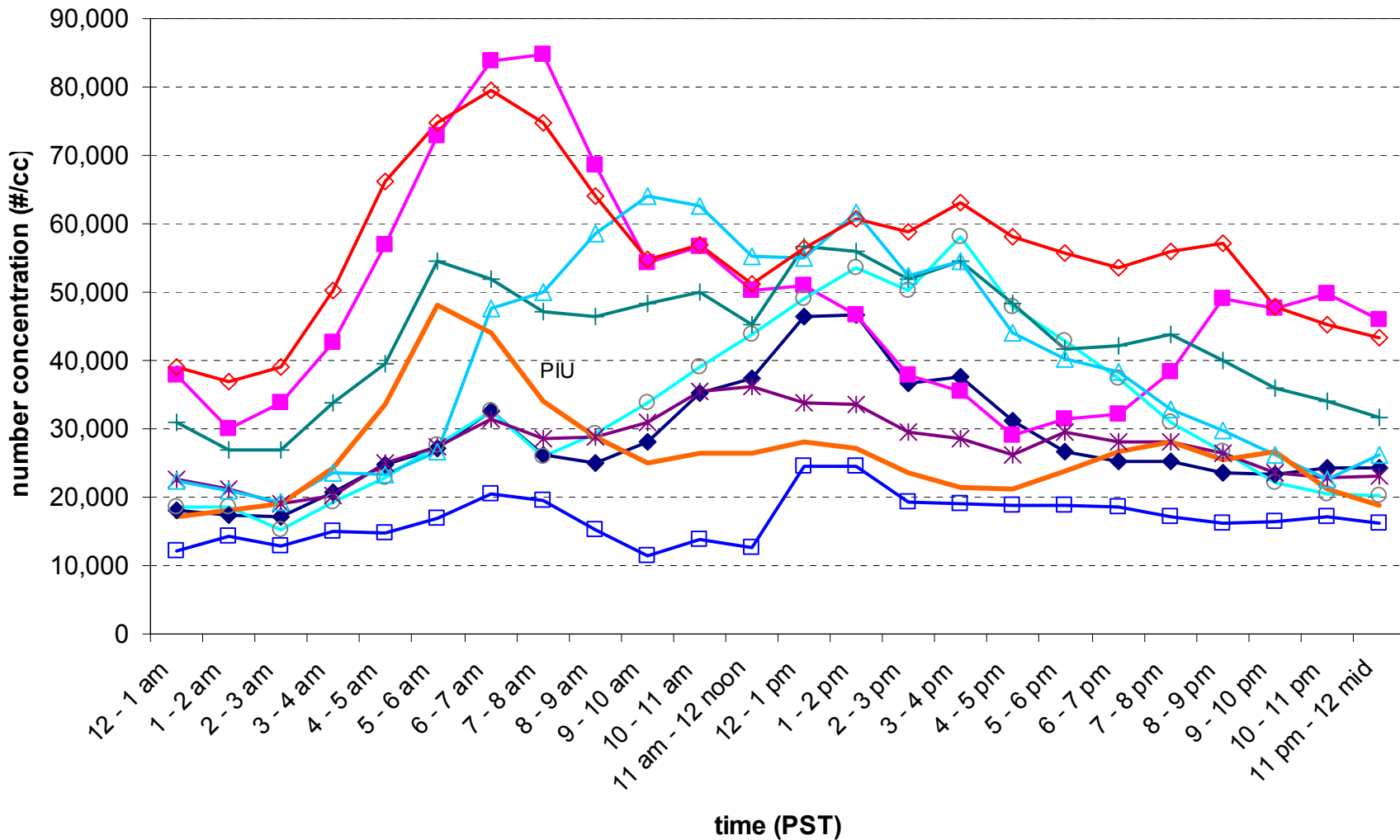
March - WEEKDAY - Wilmington - hourly avg number concentrations



March - WEEKEND - Wilmington - hourly avg number concentrations



March - WEEKDAY - West Long Beach - hourly avg number concentration



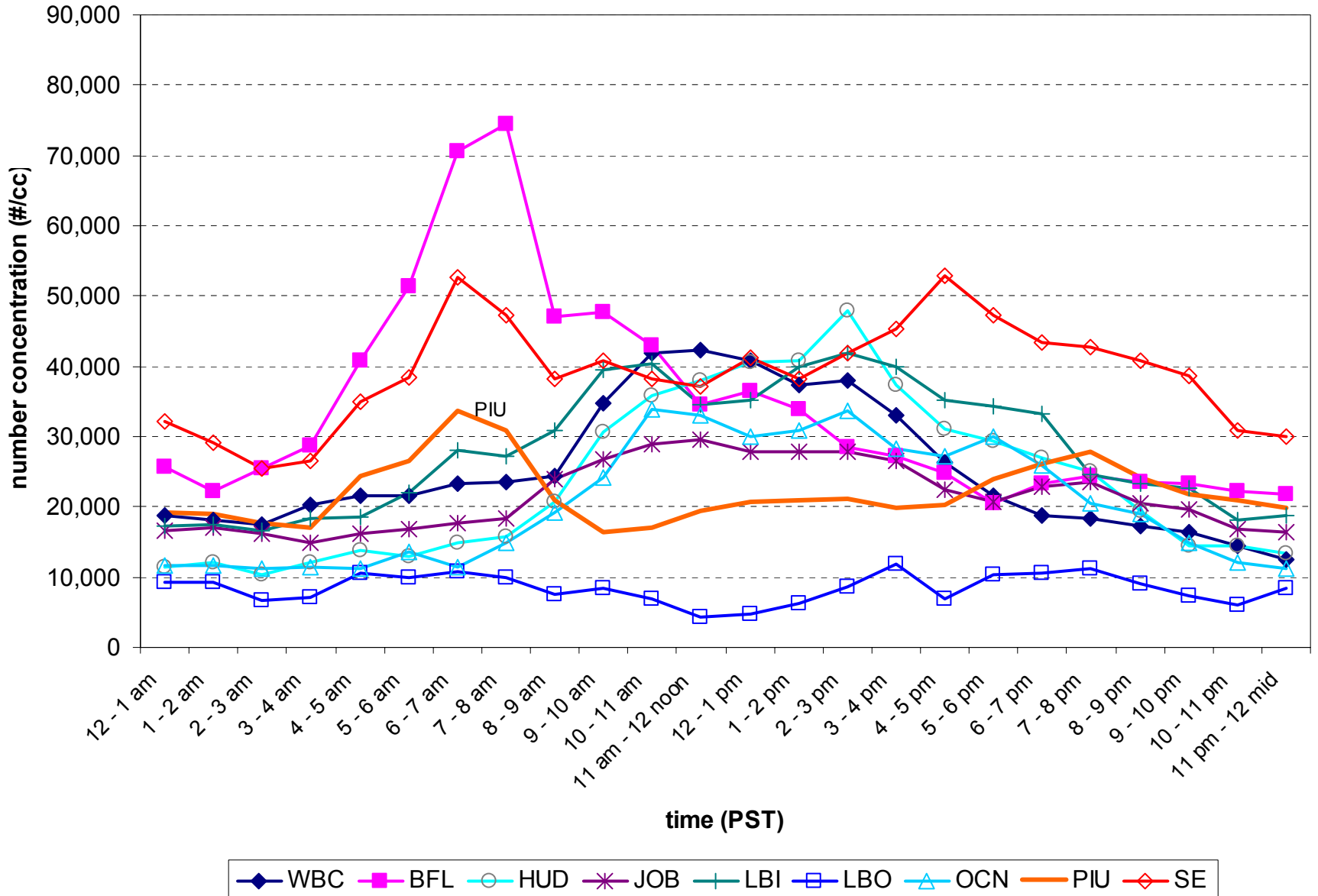
◆ WBC
 ■ BFL
 ○ HUD
 ✱ JOB
 + LBI
 □ LBO
 △ OCN
 — PIU
 ◇ SE



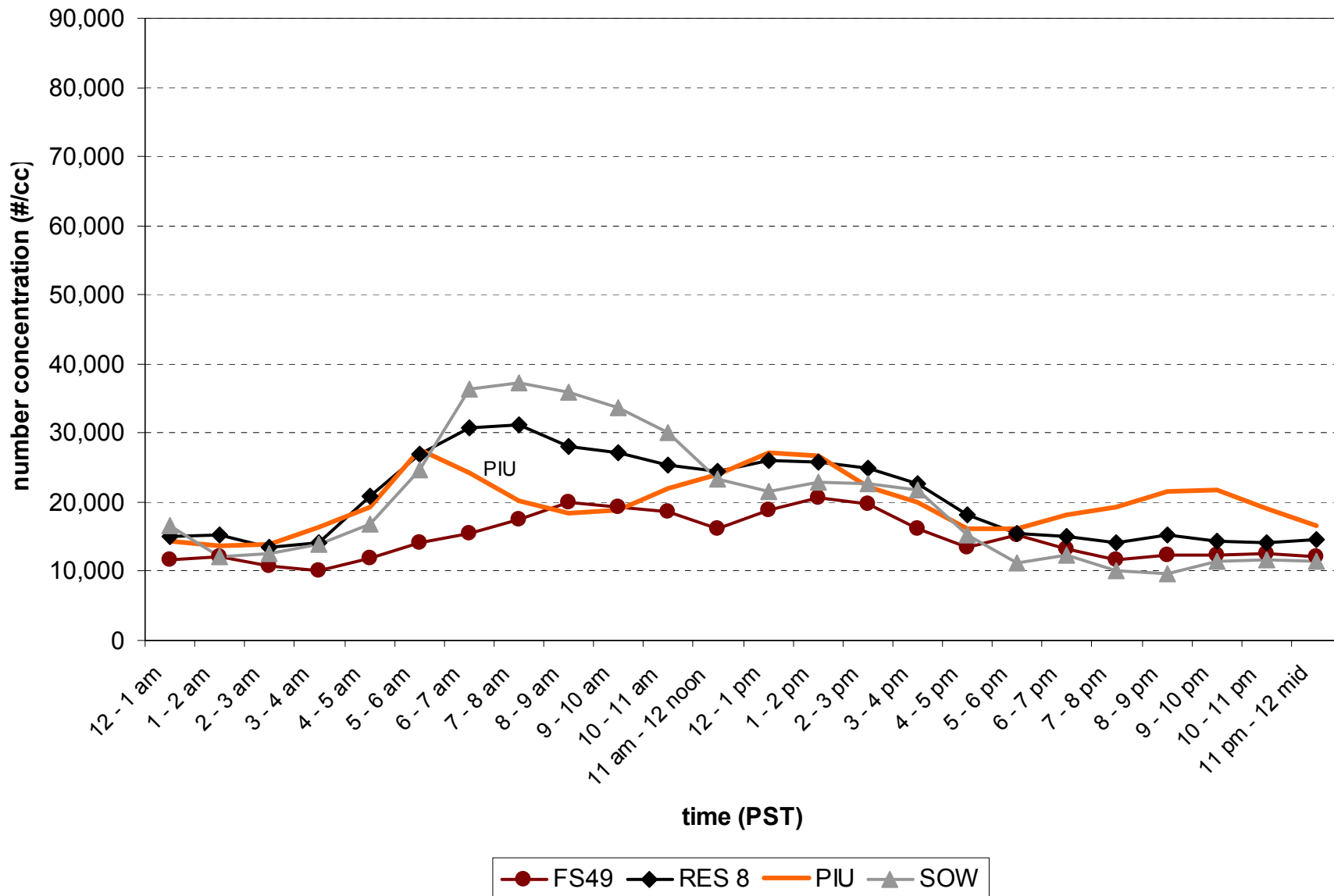
typo alert!



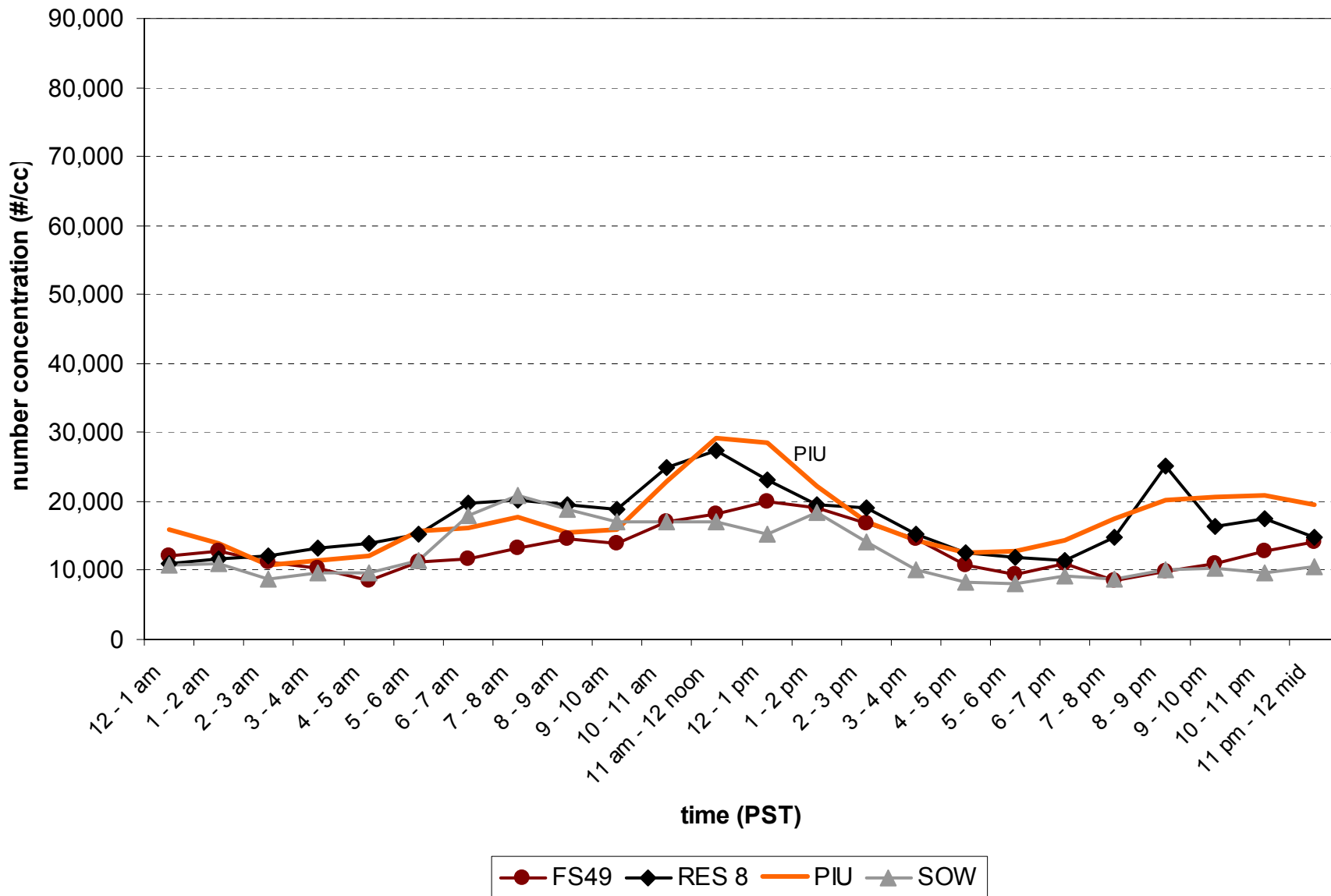
March - WEEKEND - West Long Beach - hourly avg number concentration



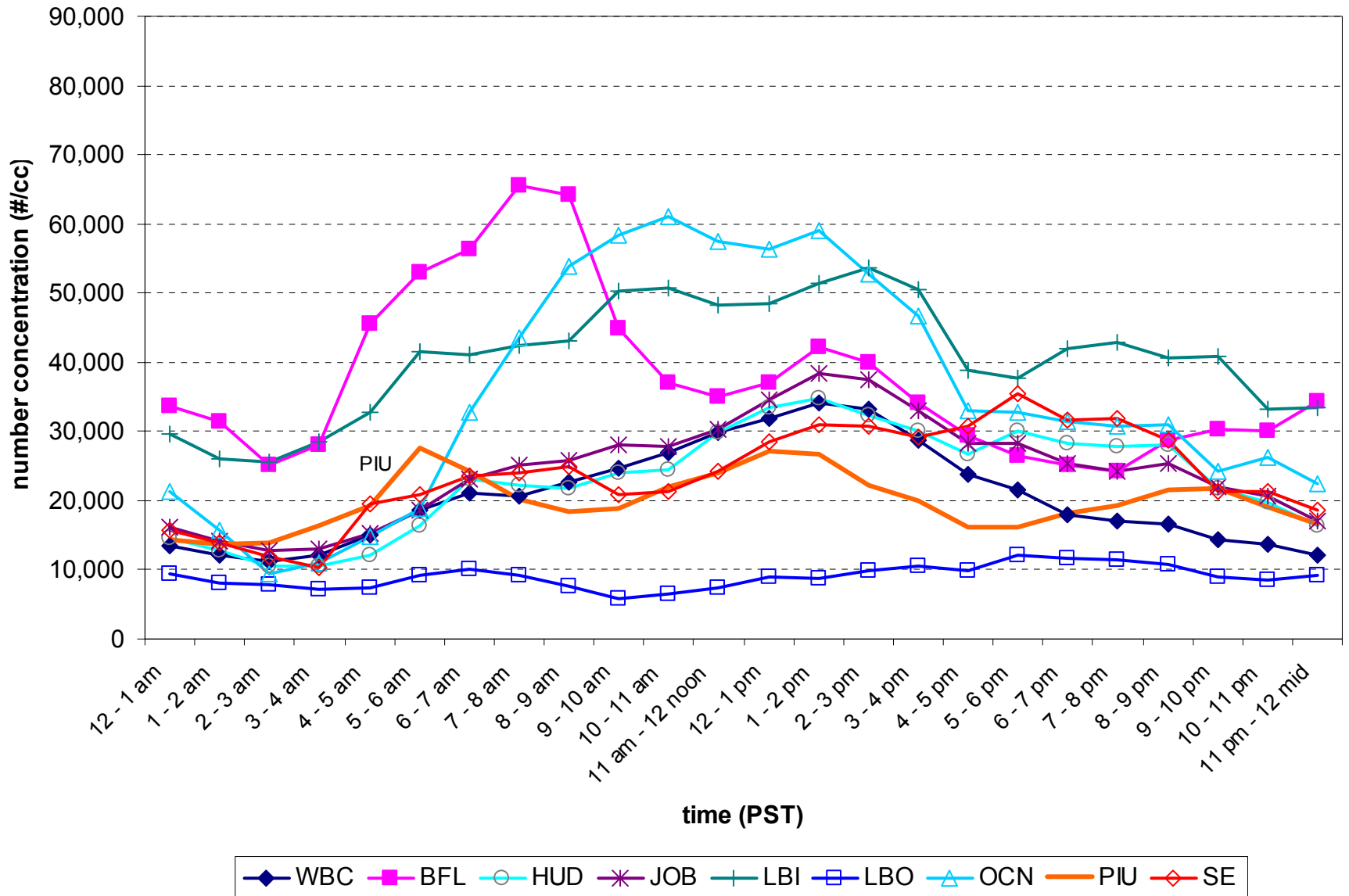
May - WEEKDAY - Wilmington - hourly average number concentration



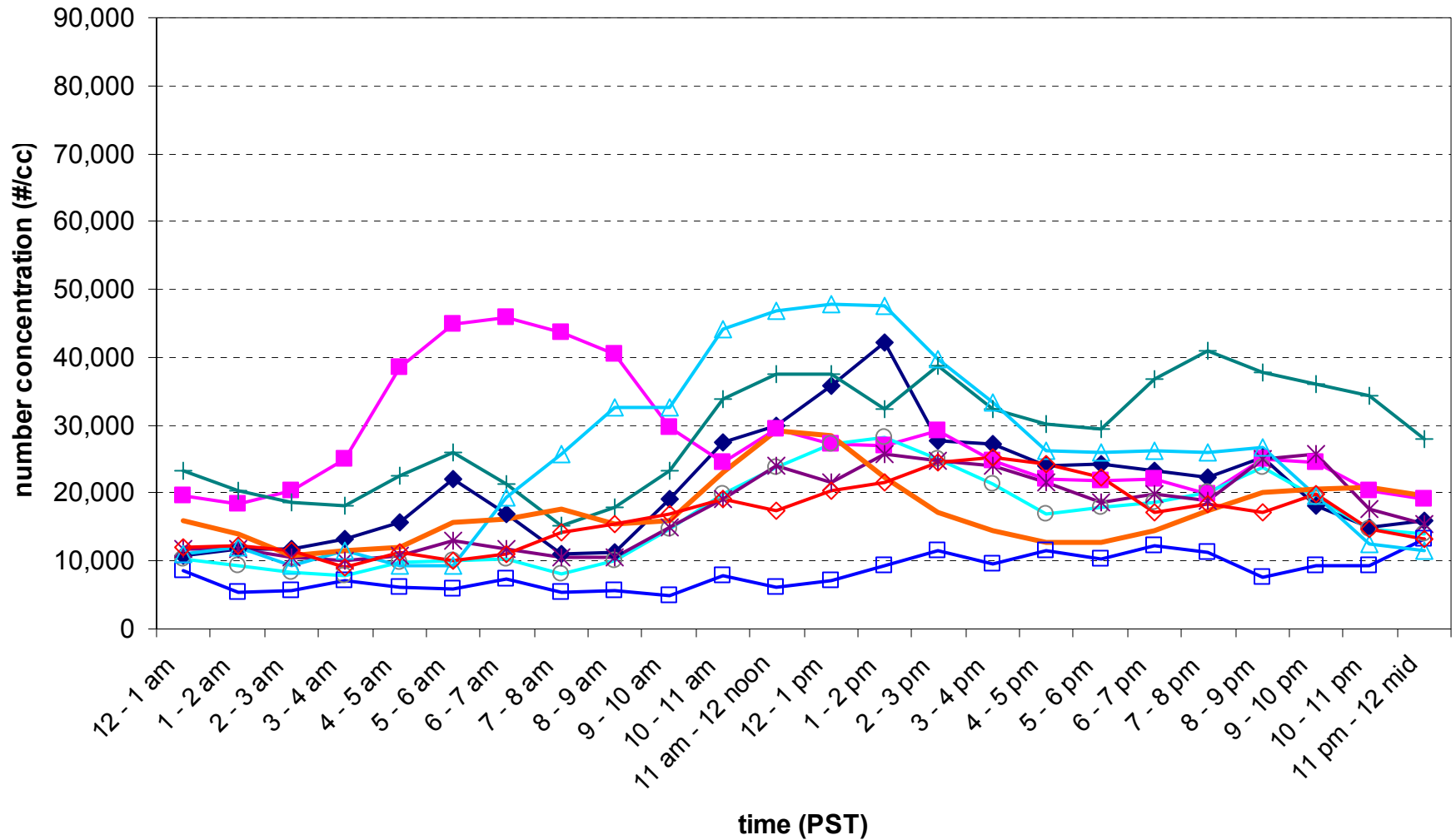
May - WEEKEND - Wilmington - hourly avg number concentration



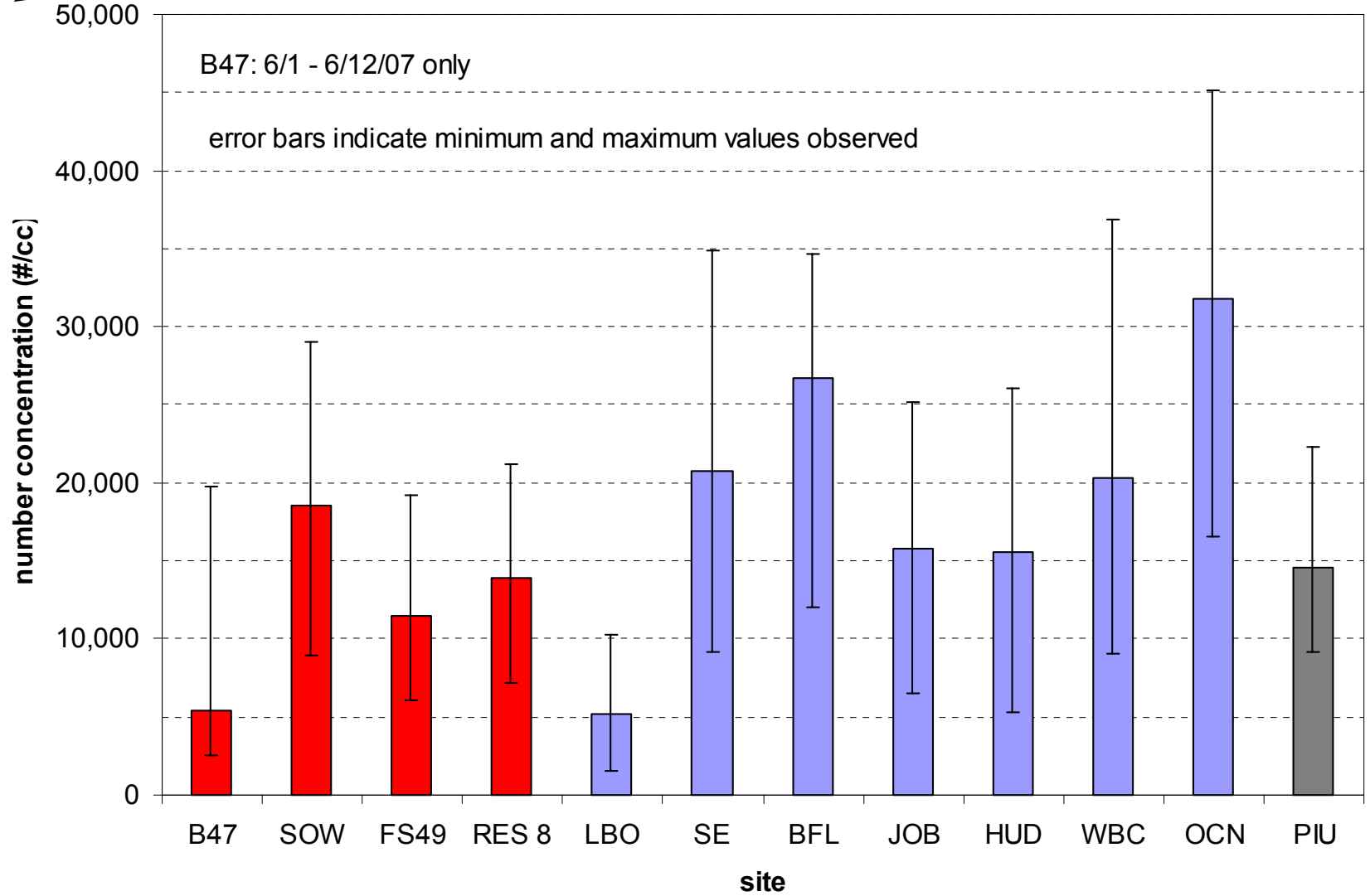
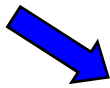
May - WEEKDAY - West Long Beach - hourly avg number concentration



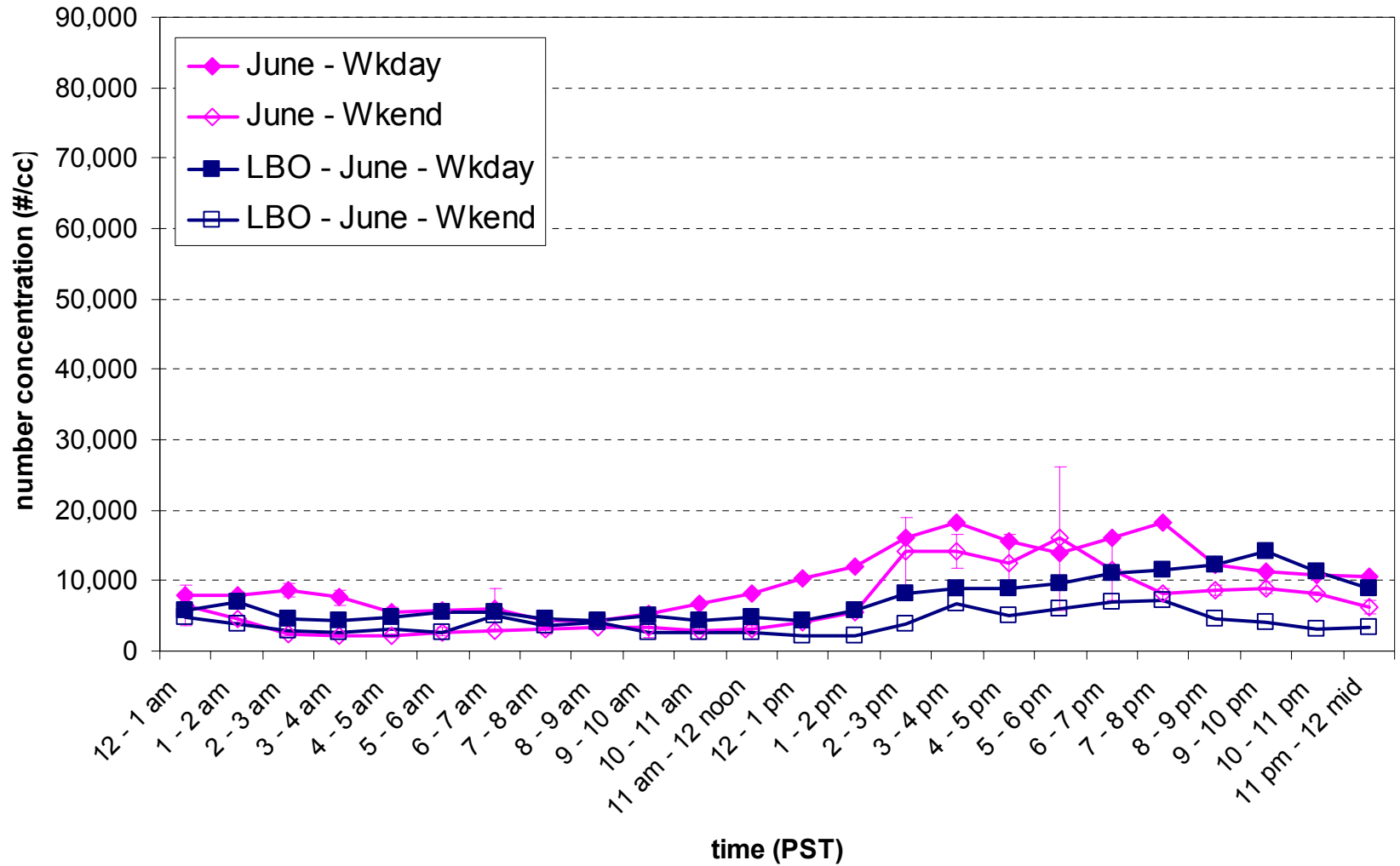
May - WEEKEND - West Long Beach - hourly avg number concentration



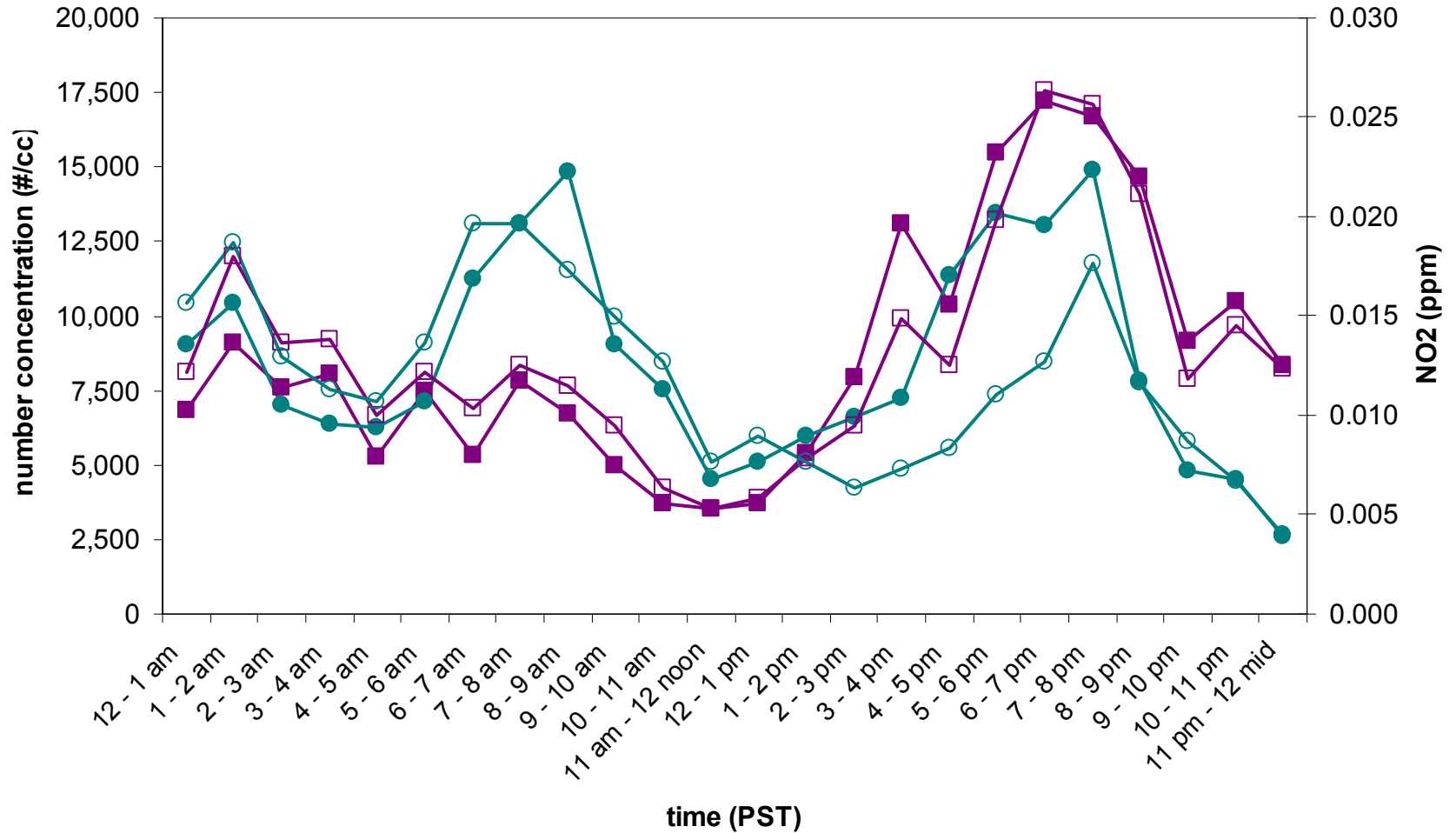
Spring study period -- mean 24-hr average concentrations



Port of Los Angeles - B47 - hourly average number concentration

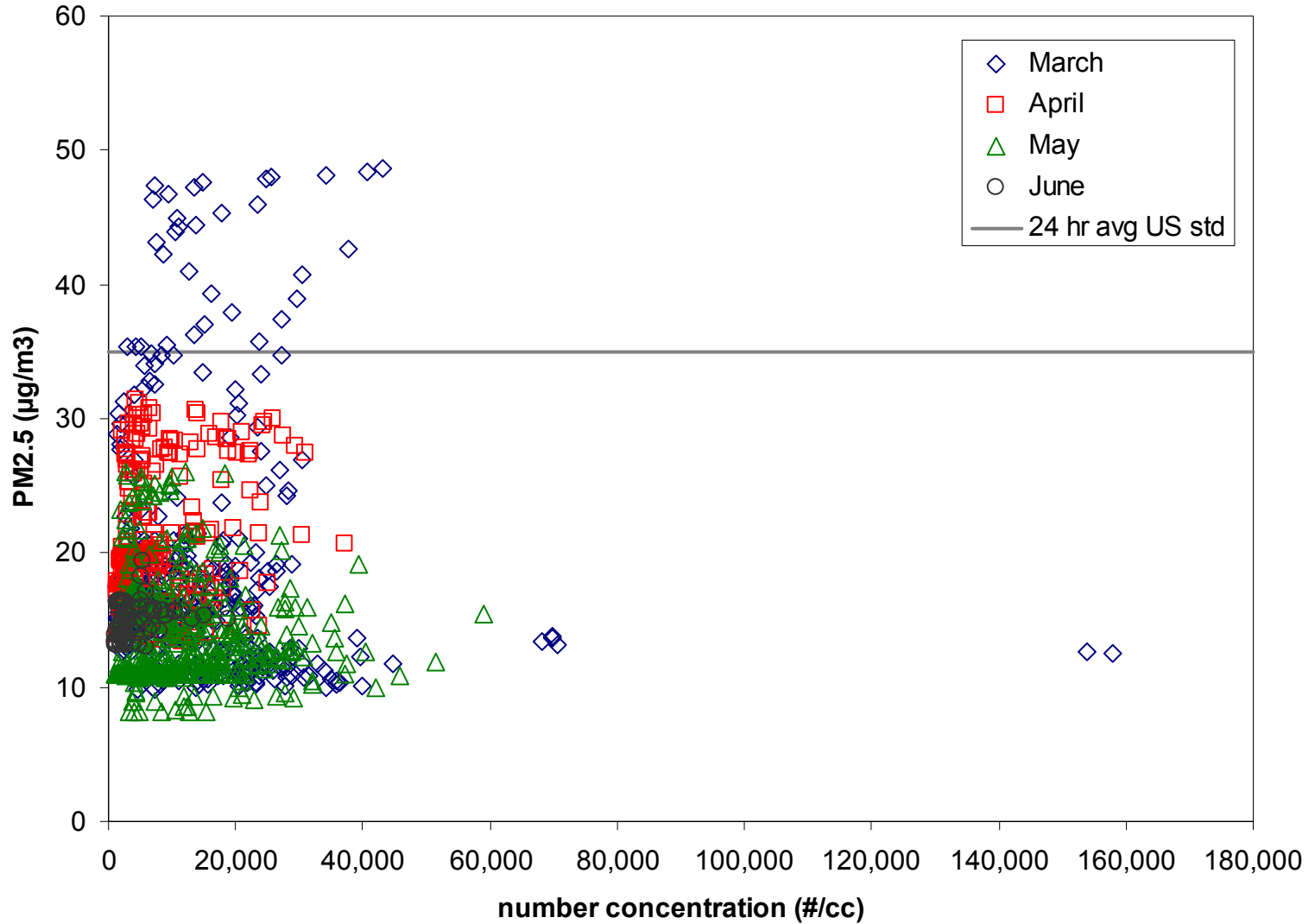


LBO (Port of Long Beach - Outer Harbor) - number (solid) and NO2 (open) concentrations - hourly average time series

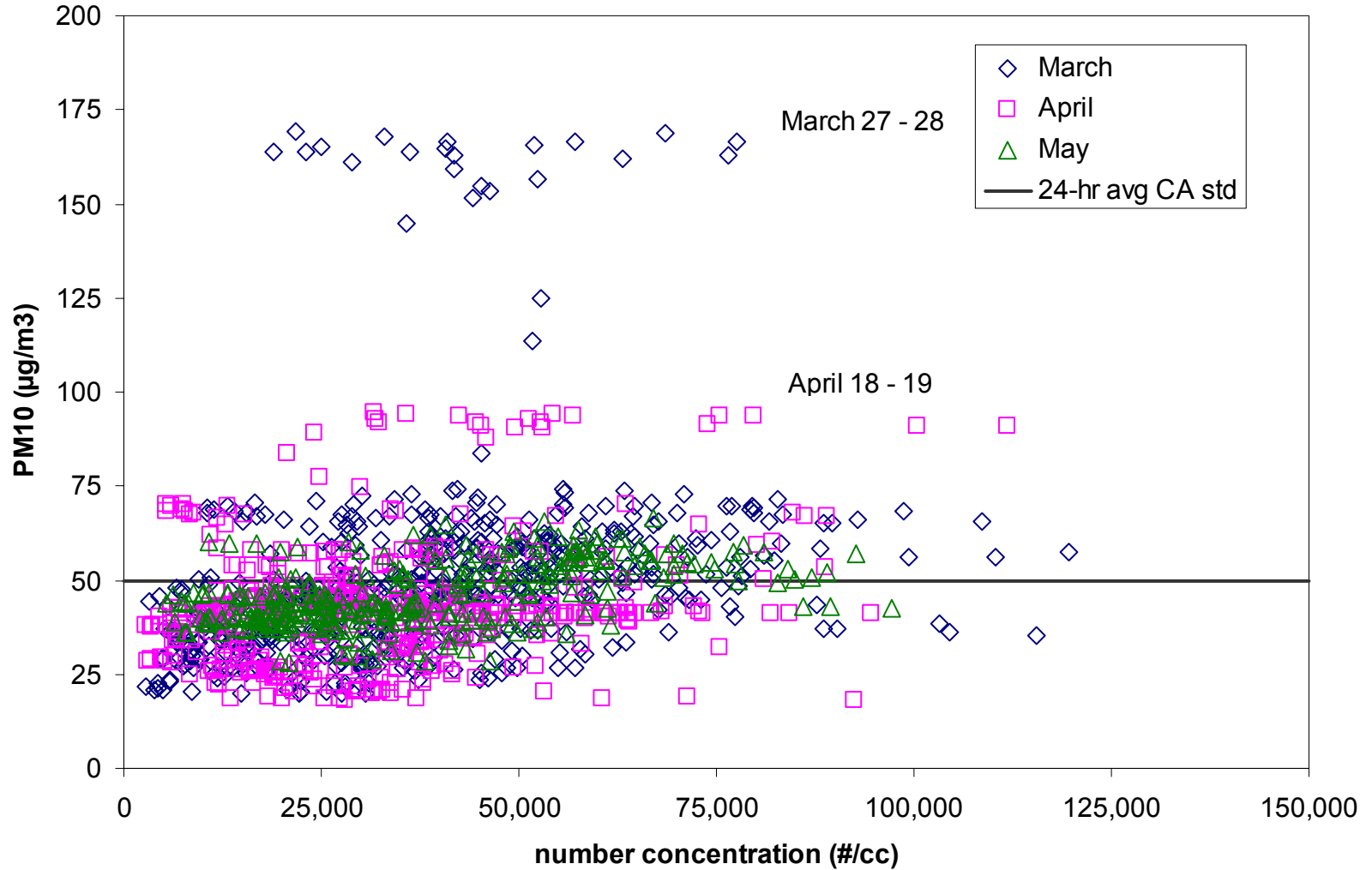


■ April - Wkday
 ● April - Wkend
 □ April - Wkday
 ○ April - Wkend

LBO (Port of Long Beach - Outer Harbor) - PM2.5 vs USC Number concentration (hourly average)



LBI (Port of Long Beach - Inner Harbor site) - PM10 vs Number concentration - hourly average by month



Summary

- Day-of-week, time-of-day, monthly variations
 - Weekday conc'ns > Weekend conc'ns
 - Morning traffic peaks → sharp conc'n peaks
 - Broad afternoon/evening peaks observed at some locations
 - Different pattern than previously observed in LA Basin
 - Overall concentrations (in general) decreasing into the spring/summer
- Consistent differences between sites
- NO₂/particle number concentration relationship
- Work in progress
 - Continue through November 2007
 - Data validation
 - Meteorological conditions, additional gas composition and particle mass concentration data
 - Size distribution data
 - Beyond hourly averages...

Acknowledgments

- California Air Resources Board
- South Coast Air Quality Management District
- HCMS Community Participants
 - Port of Long Beach and Port of Los Angeles
 - Balthasar Alvarez, Dan Berns, the Berns Company, City of Los Angeles, City of Long Beach, John Cross, Los Angeles Fire Department
 - Battalion 6, Jesse Marquez, Orange County Nursery, Southern California Edison, Superior Electrical Advertising, Inc., Westside Baptist Church