

# Ultrafine Particle (UFP) Number Concentrations during the Harbor Communities Monitoring Study

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# Overview/Motivation

## USC UFP network

- 13 sites
- San Pedro/Wilmington and West Long Beach clusters, downtown LA
- Continuous observations
  - Total particle number concentration data (UFP  $\approx$  85 - 90%)
    - Some particle size distribution data
  - meteorology
- mid-February - mid-December 2007

## Goal: quantify Intra-Community variability

- UFP and adverse health impacts
  - Exposure assessments
- Variety of scales
  - Temporal (daily, weekly, monthly, seasonal)
  - Spatial (background vs. impacted sites)

# Key Points

## UFP concentrations vary with

- **Proximity to sources**
  - I-710 vs. PoLA's Berth 47
- **Source emission patterns**
- **“Goods movement” profile**
  - Step function
  - Heavy-duty diesel emissions
- **Meteorology**
  - Summer vs. fall concentrations
  - Changes in wind speed/direction (e.g. Santa Anas)
- **Daily, weekly, monthly, seasonal differences**

*Based upon  
hourly average  
data by month*

## UFP intra-community is similar to inter-community variability

- Comparison Children's Health Study results

## Quantify UFP intra-community spatial variability

- Coefficients of Divergence
- **“moderately heterogeneous”**



Condensation Particle Counter (3022A)



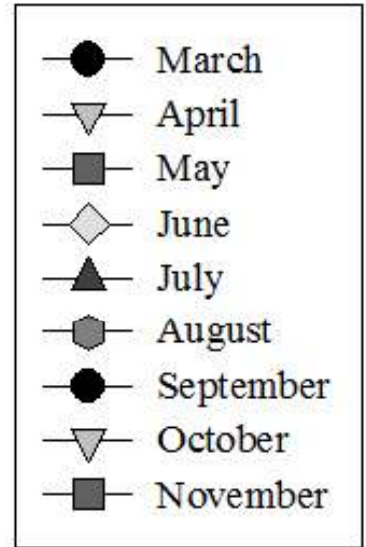
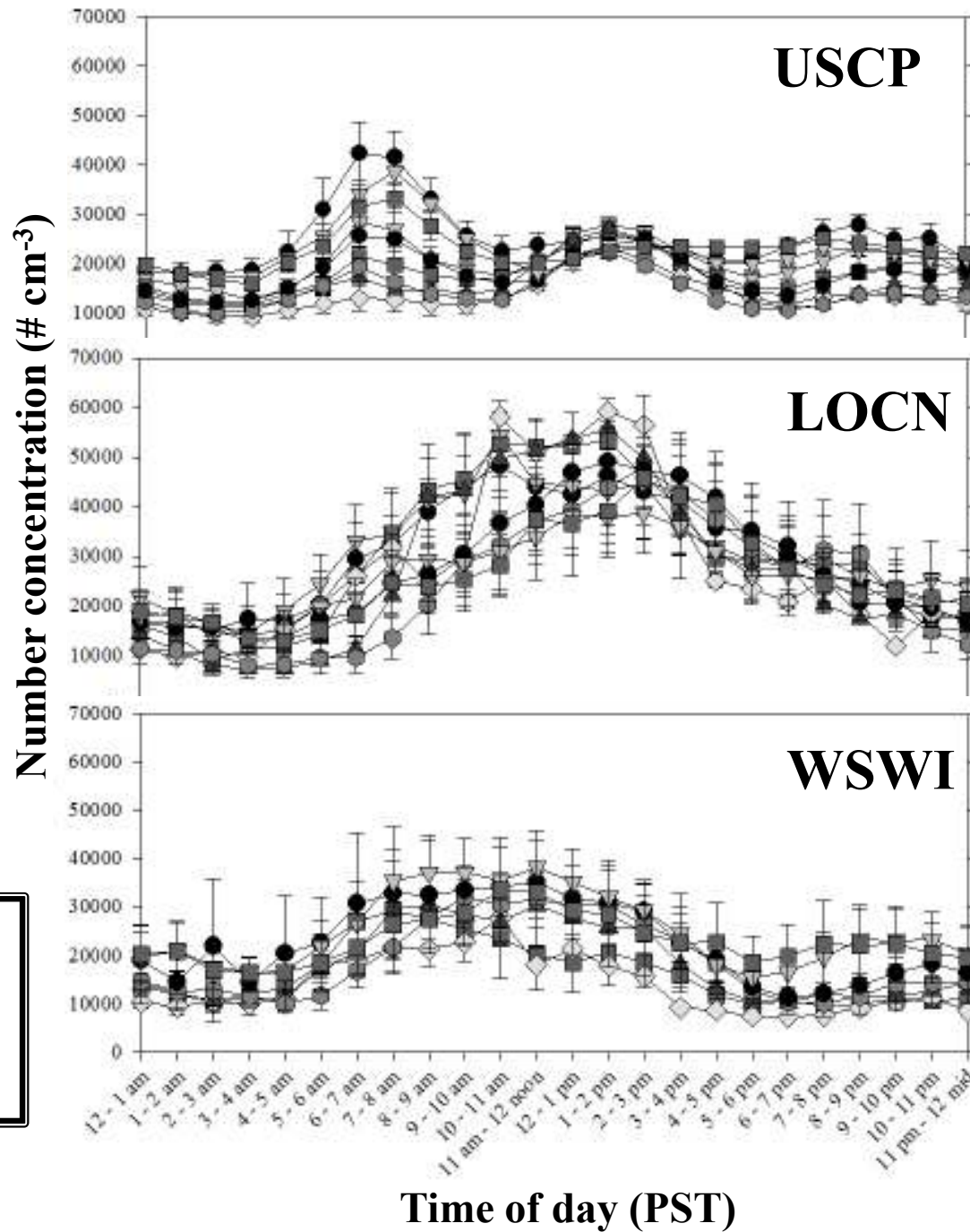
# USC Network



- prevailing winds
  - “sea breeze” (overnight calms)
  - PM westerlies in WLB

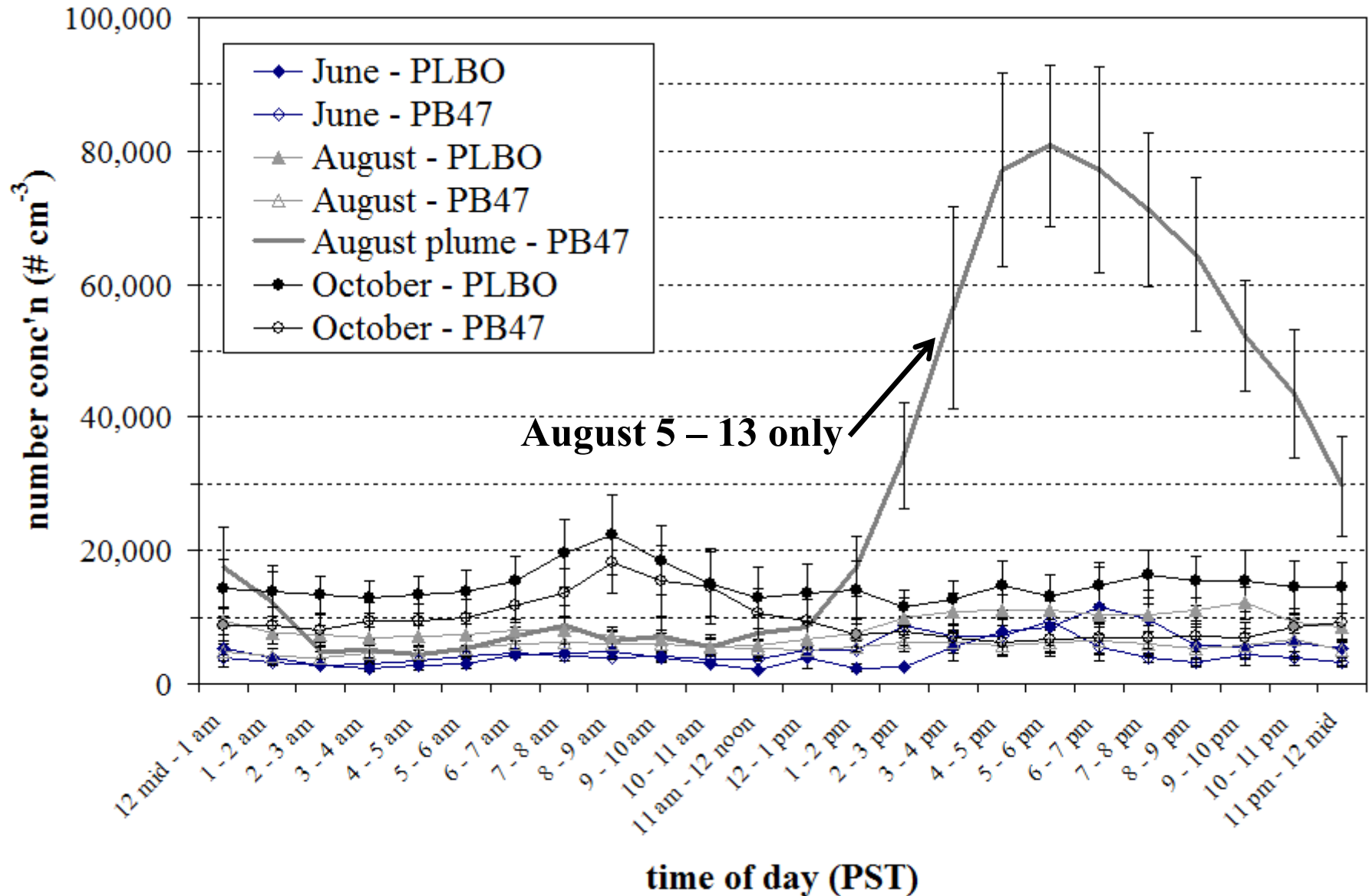


0 - 70,000  
scale



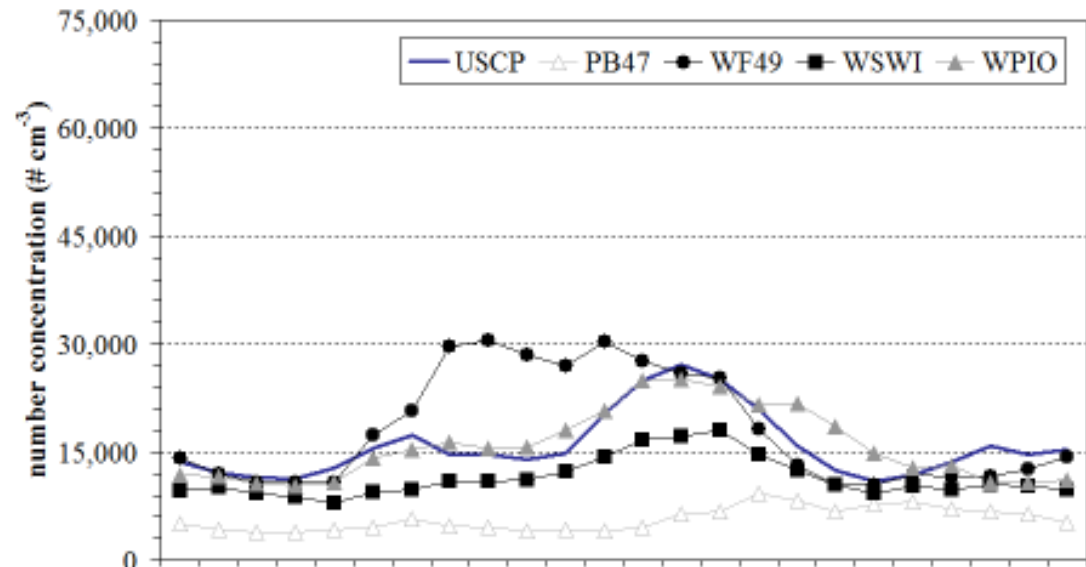
Hourly  
average  
data

# Background sites: PLBO & PB47

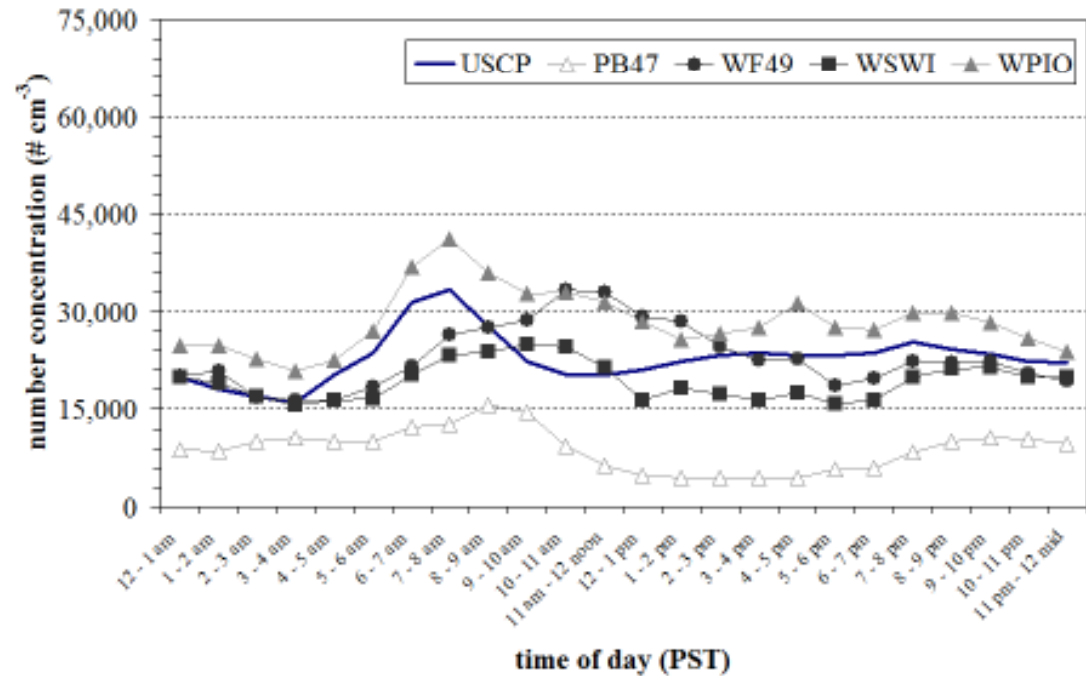


# San Pedro/ Wilmington cluster

July



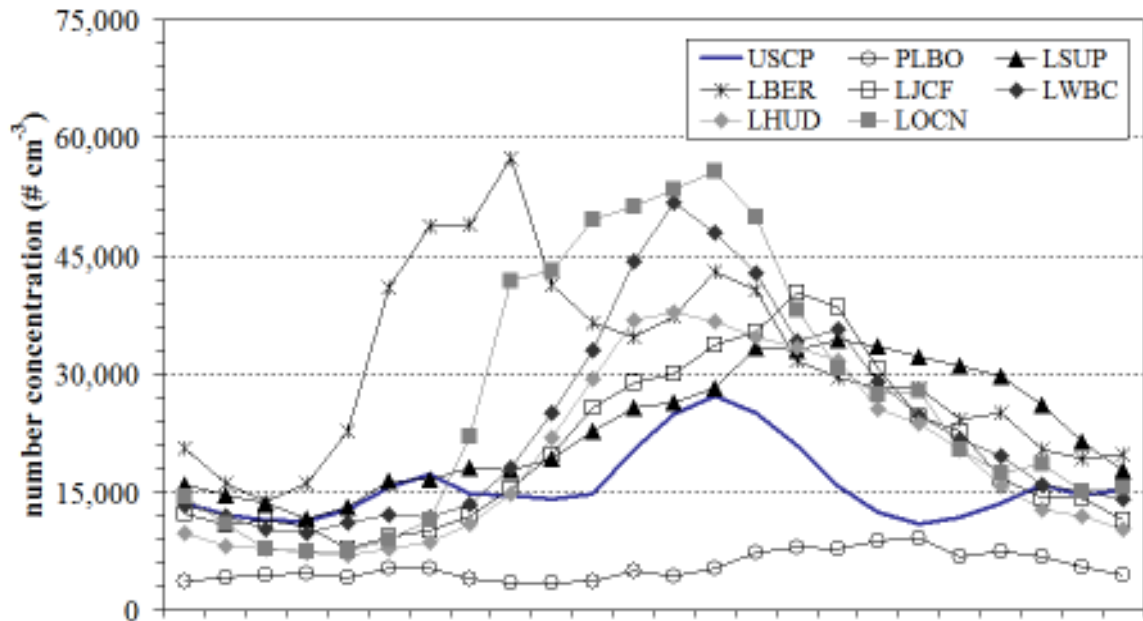
November



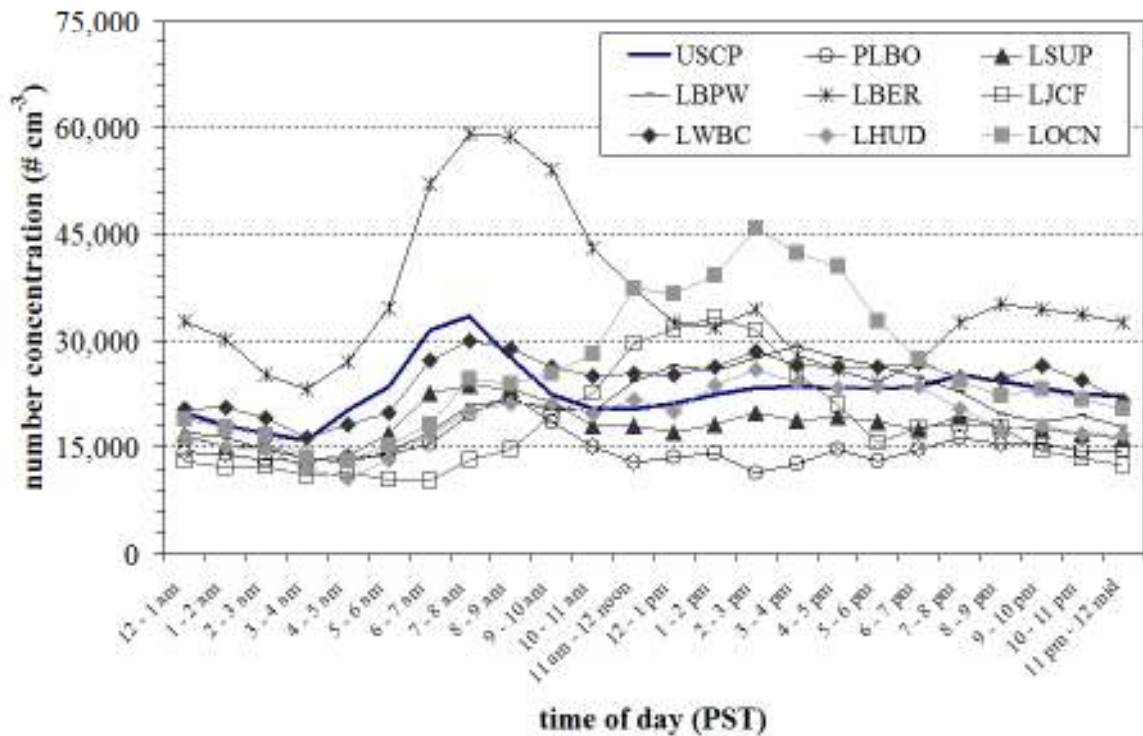


# West Long Beach cluster

July



November



# Coefficients of Divergence (CODs)

- Measure of homogeneity between sites
  - COD = 0 → homogeneous data
  - COD = 1 → heterogeneous data

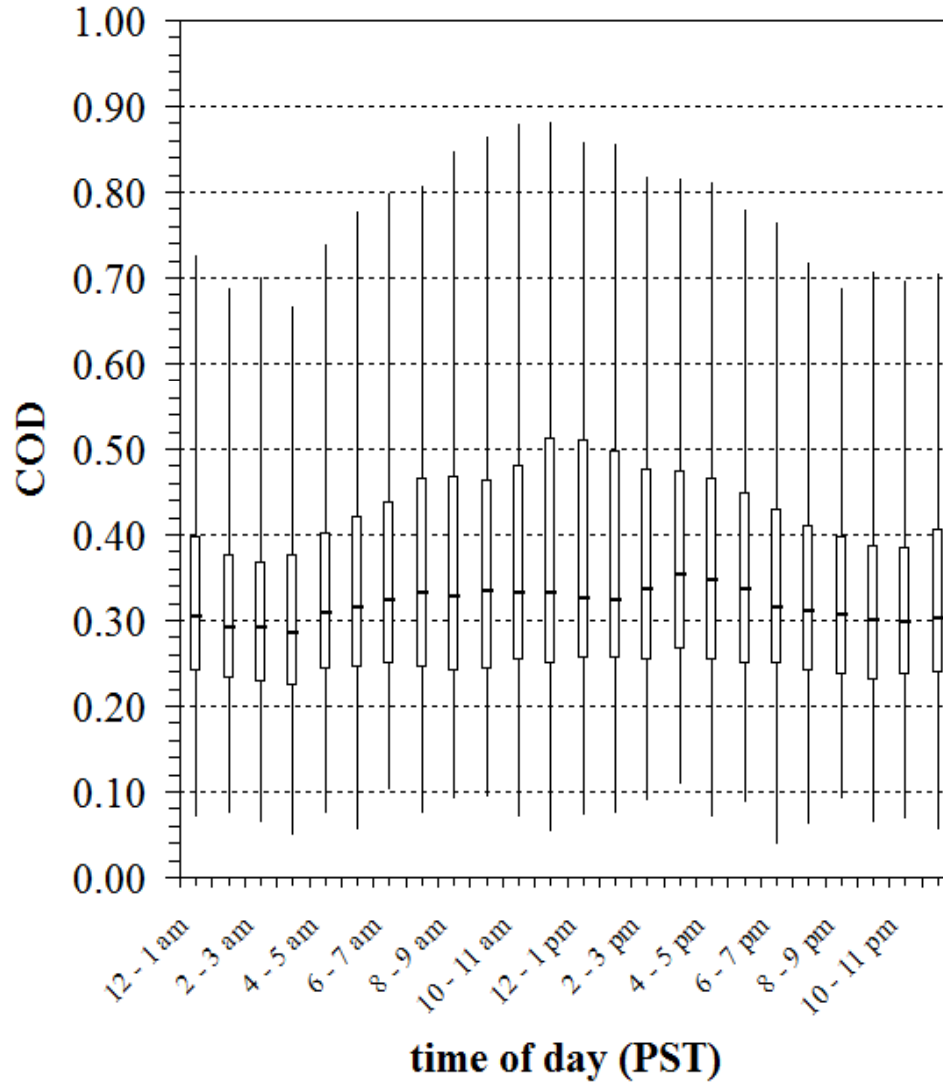
$$COD_{jk} = \sqrt{\frac{1}{n} \sum_{i=1}^n \left[ \frac{(x_{ij} - x_{ik})}{(x_{ij} + x_{ik})} \right]^2}$$

*n* = # of values (concentrations, *x*) for paired sites *j* and *k*

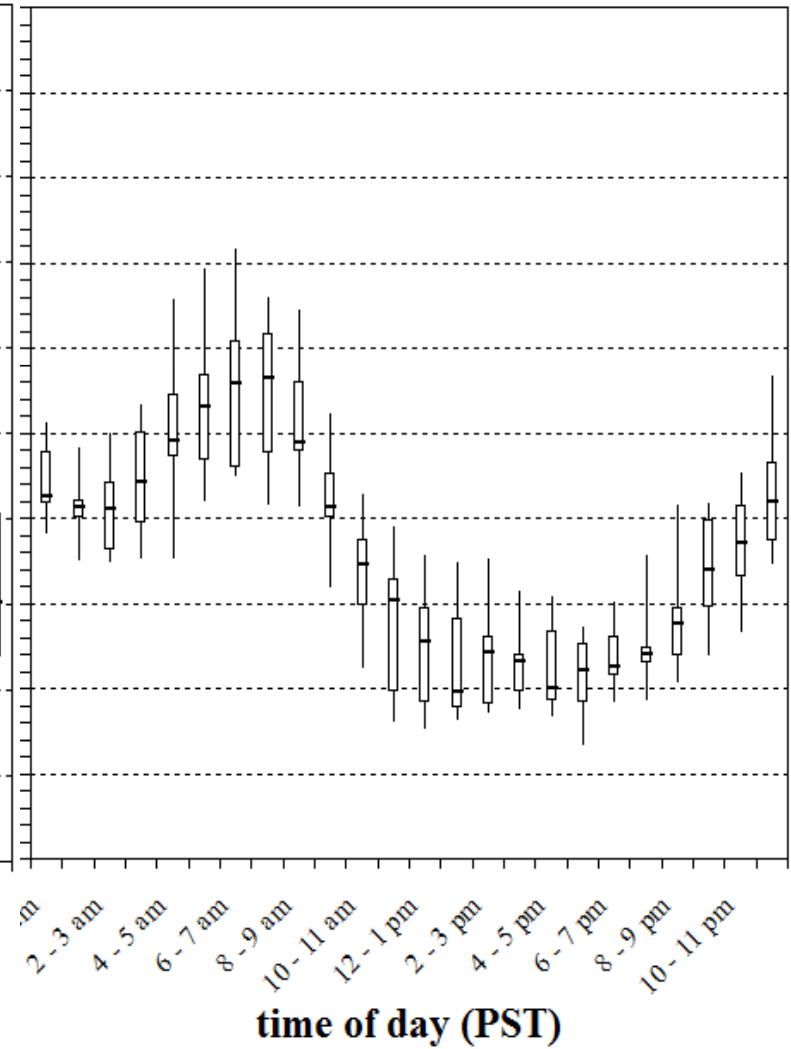
# CODs

## LBER – LHUD pair, all months

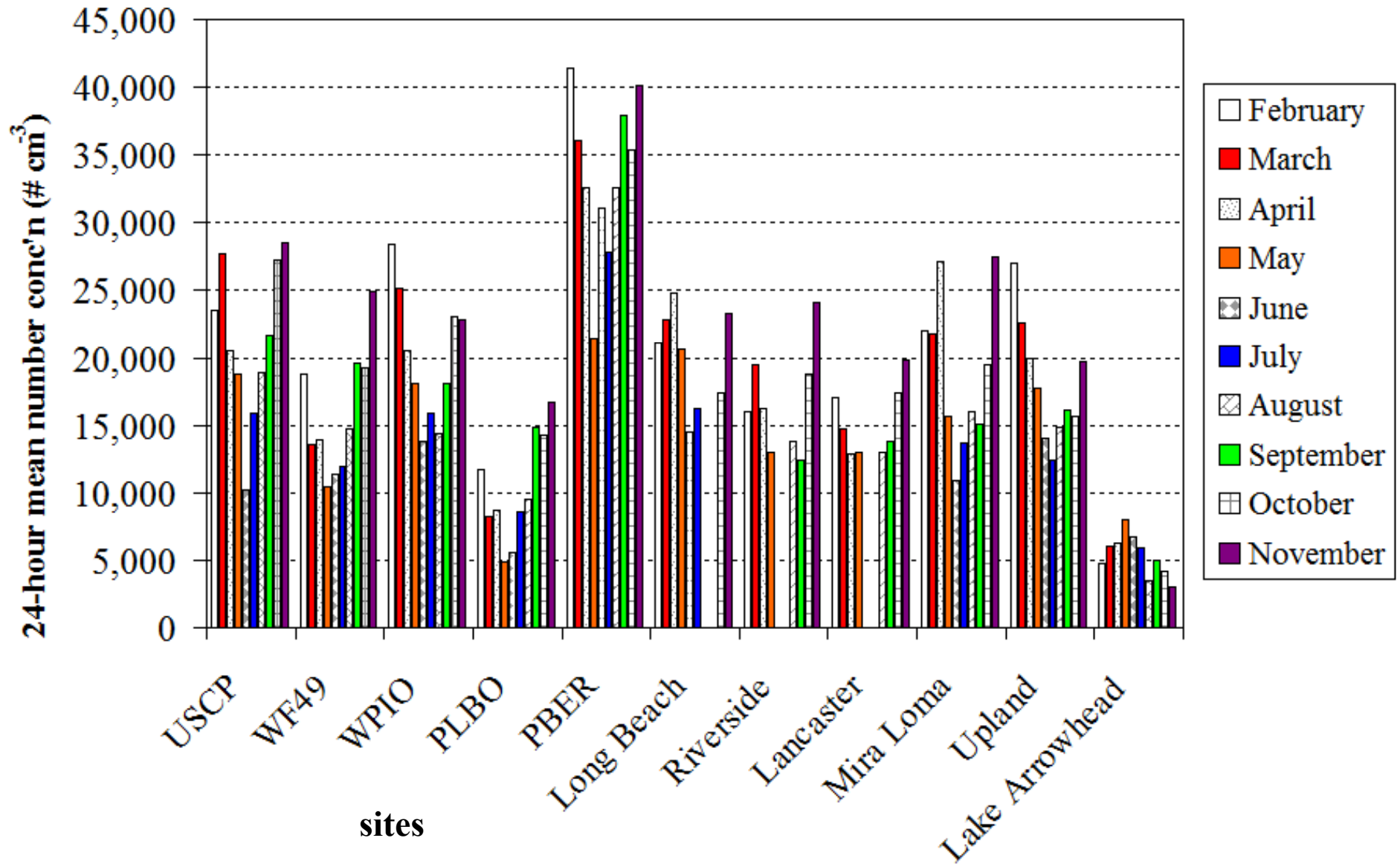
### All data



### all months



# 24-hour mean & CHS sites



# Summary

- **UFP variability** on many **spatial** and **temporal** scales
- **Goods movement profile**
- Moderately **heterogeneous** concentrations overall but broad range observed (COD results)
- Two manuscripts submitted

## On-going analyses

- Modeling (Professor R. Henry/USC)
- Case studies at **higher temporal resolution**
- Combine **size distribution, meteorology** and **UFP number concentration** data
- UFP and additional HCMS measurements (e.g. CO, NO/NO<sub>2</sub>, solar radiation ...)

# Acknowledgments

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- South Coast Air Quality Management District
- Ports of Los Angeles and Long Beach
- HCMS colleagues (DRI and UCLA/ARB)
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  - » T. Diaz
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  - » Southern California Edison
  - » Westside Baptist Church
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