

**Particle Number Concentrations
and
Nucleation Events
at
Chebogue Point, Nova Scotia**

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Measurements of Total Particle Number Concentration

- WCPC:
 - Water-based Condensation Particle Counter
 - (D50~ 5nm)
- TSI-3010:
 - Butanol-based CPC
 - (D50~8nm)
- TSI-3022
 - Butanol-based CPC
 - (D50~7nm)

Questions

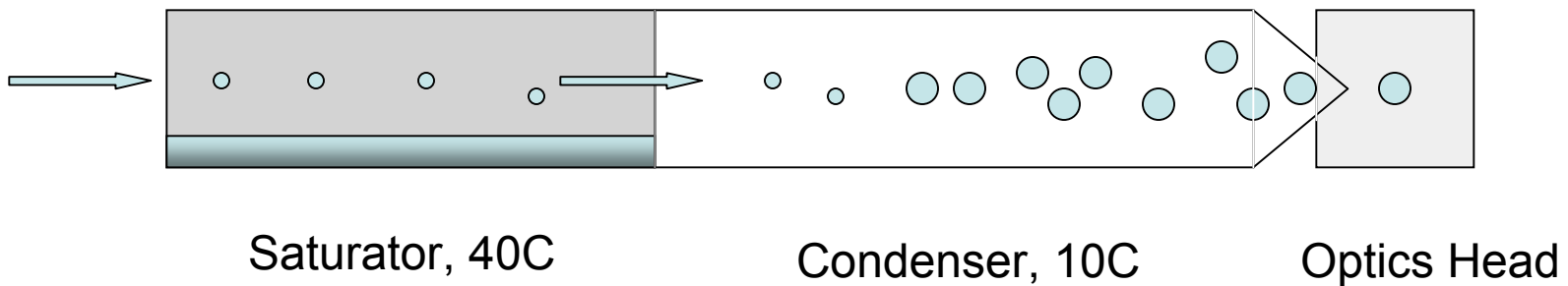
- 1) Can the difference in lower size cut between the two CPCs could tell us anything about the presence of sub-10 nm particles?
- 2) And, if present, do they indicate nucleation events?
- 3) Do total CPC counts indicate influence of local combustion sources, or long range transport of urban air masses.

Condensation Particle Counters (CPC)

Continuous, laminar- flow (thermally diffusive) CPCs:
introduced in 1970s
most use butanol as condensing vapor.

Advantages: continuous flow → good as detector

Disadvantage: requires butanol
(or other slowly diffusing species)



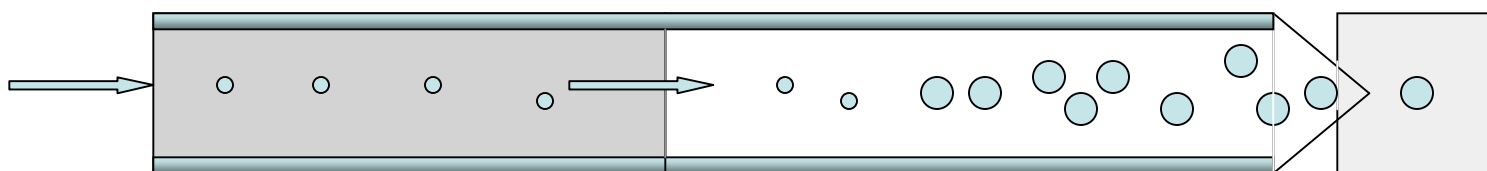
Thermal Diffusivity, air = $0.215 \text{ cm}^2/\text{s}$

Mass Diffusivity, butanol = $0.081 \text{ cm}^2/\text{s}$

Water Condensation Particle Counter (WCPC)

“Growth Tube” allows water as condensing vapor

- Principle: condensation occurs inside a warm, wet walled tube.



First WCPC
(~5 nm) :

Saturator, 20C

Condenser, 60C

Optics Head

Nano-WCPC
(~2.5 nm)

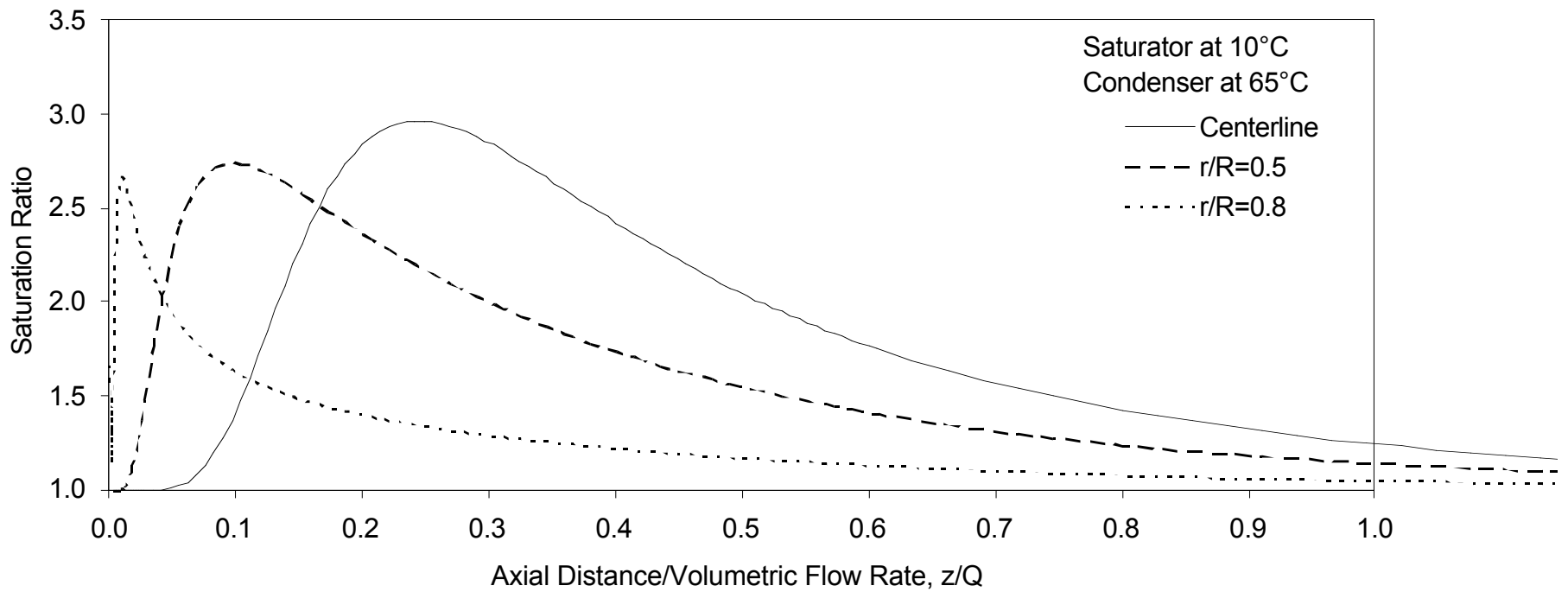
Saturator, 12C

Condenser, 75C

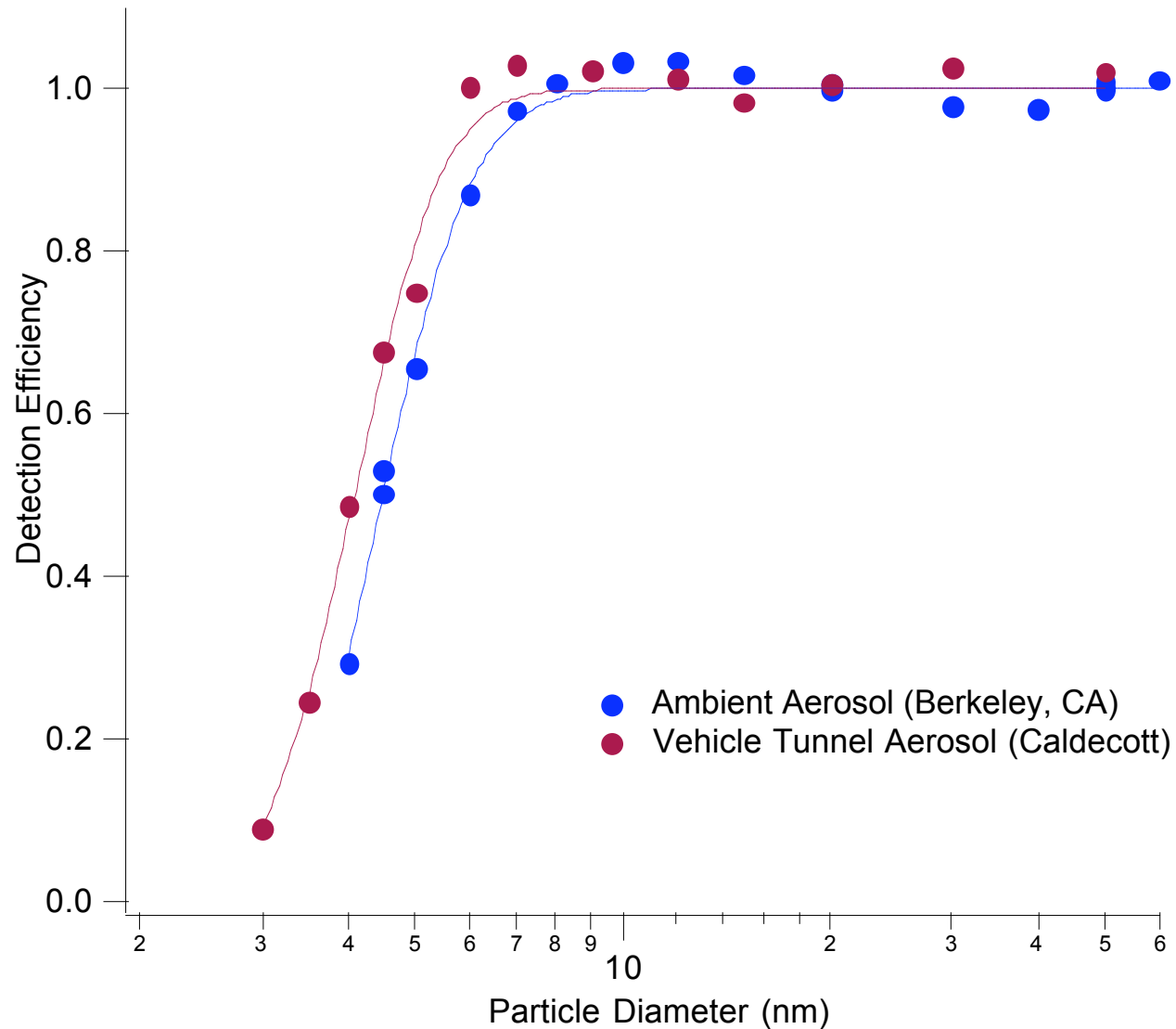
Thermal Diffusivity, air = 0.215 cm²/s

Mass Diffusivity, water = 0.265 cm²/s

Growth Tube Approach: Greatest Saturation Along Centerline

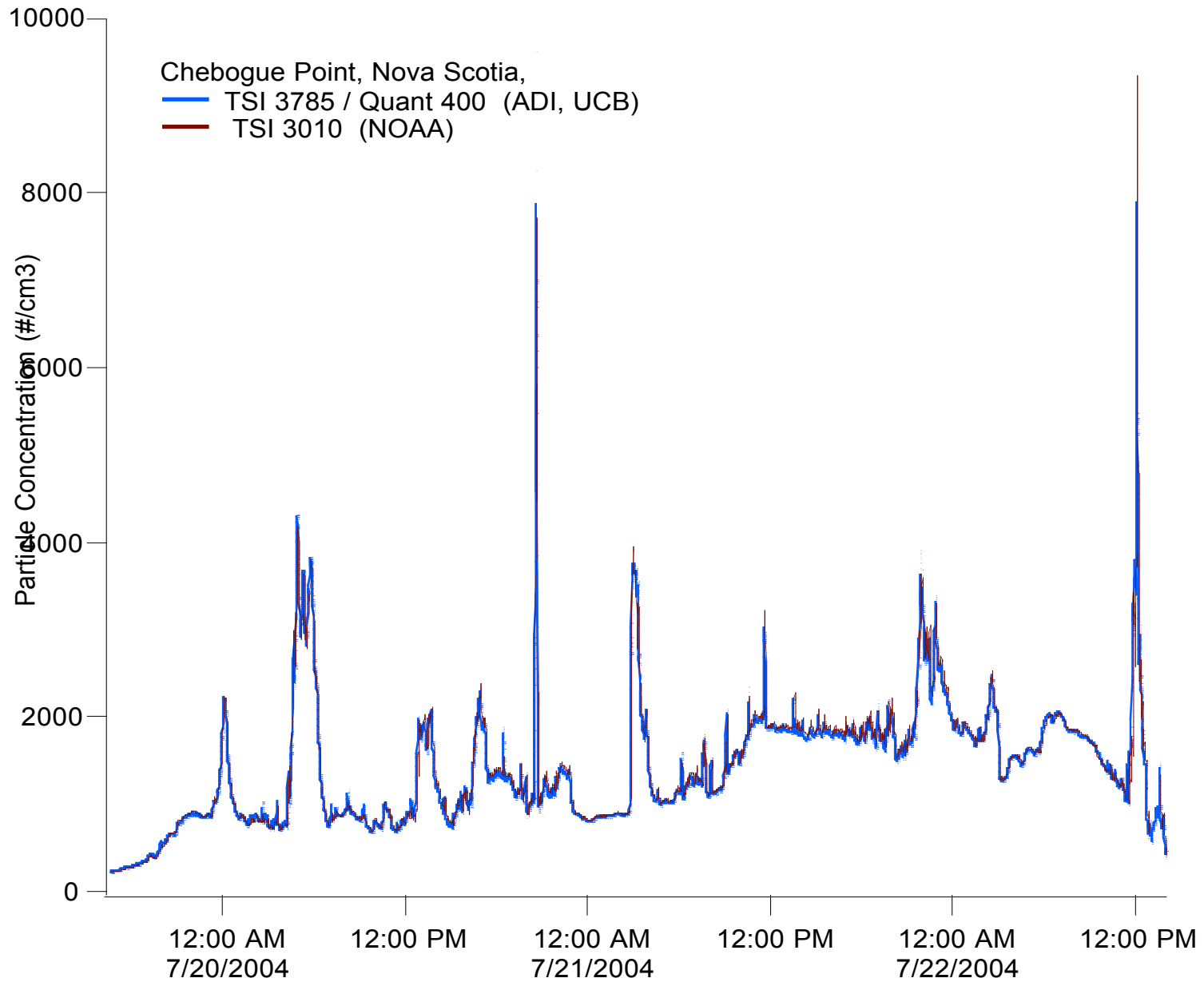


First laminar-flow WCPC TSI-3785 (Q-400) Response to Ambient Aerosols & Vehicle Emissions

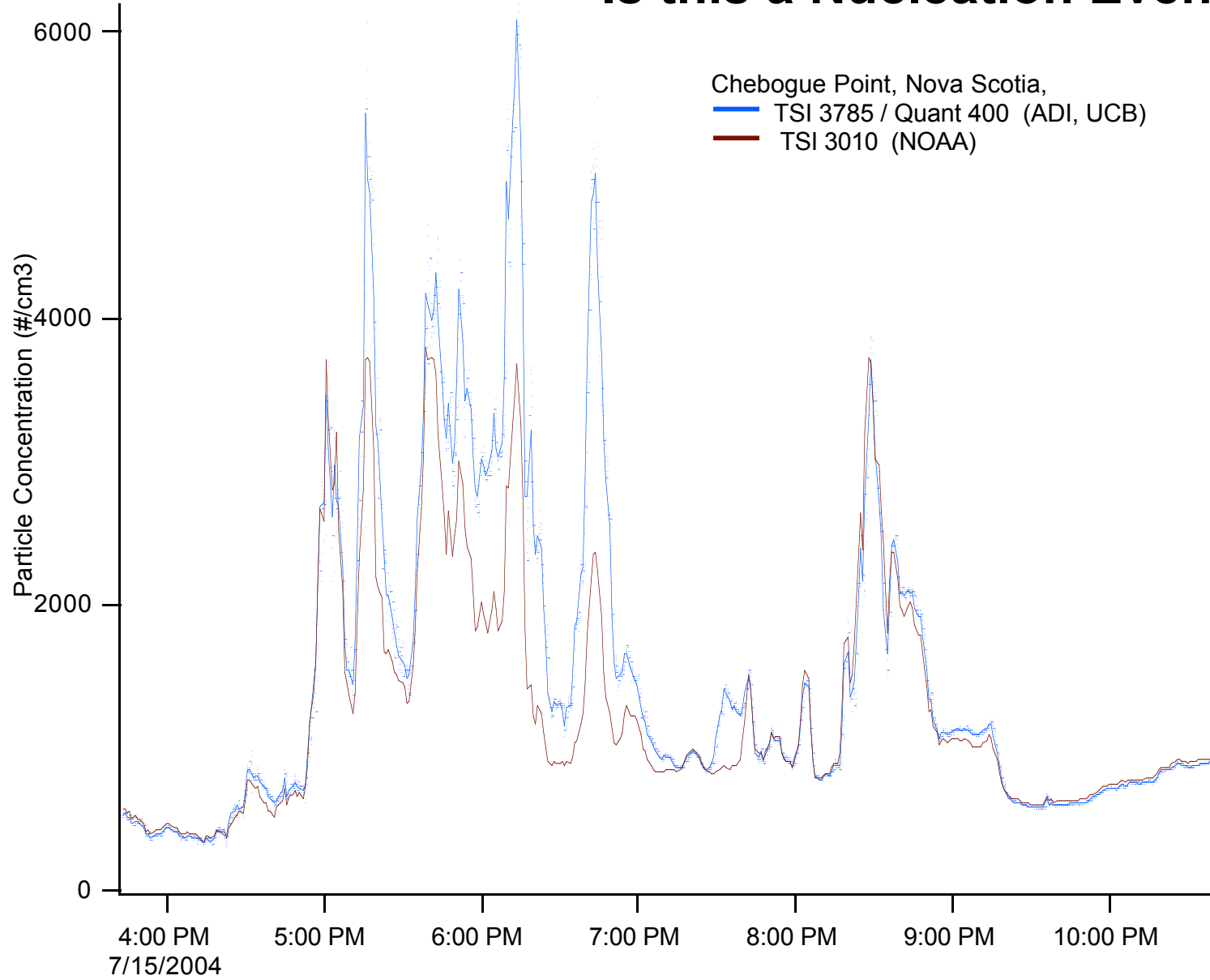


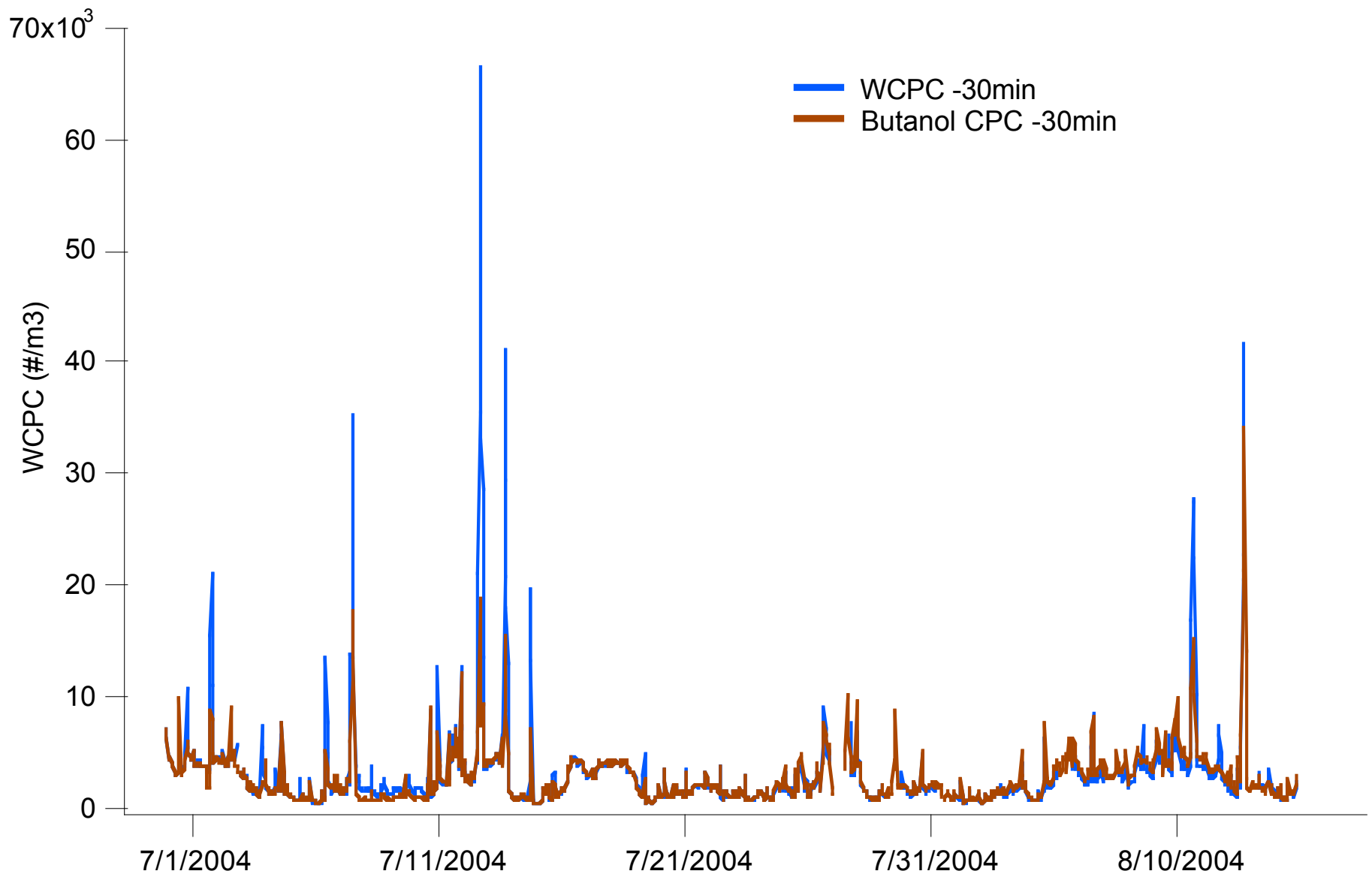
Tunnel Measurements with Antonio Miguel, Arantza Eiguren-Fenandez, UCLA

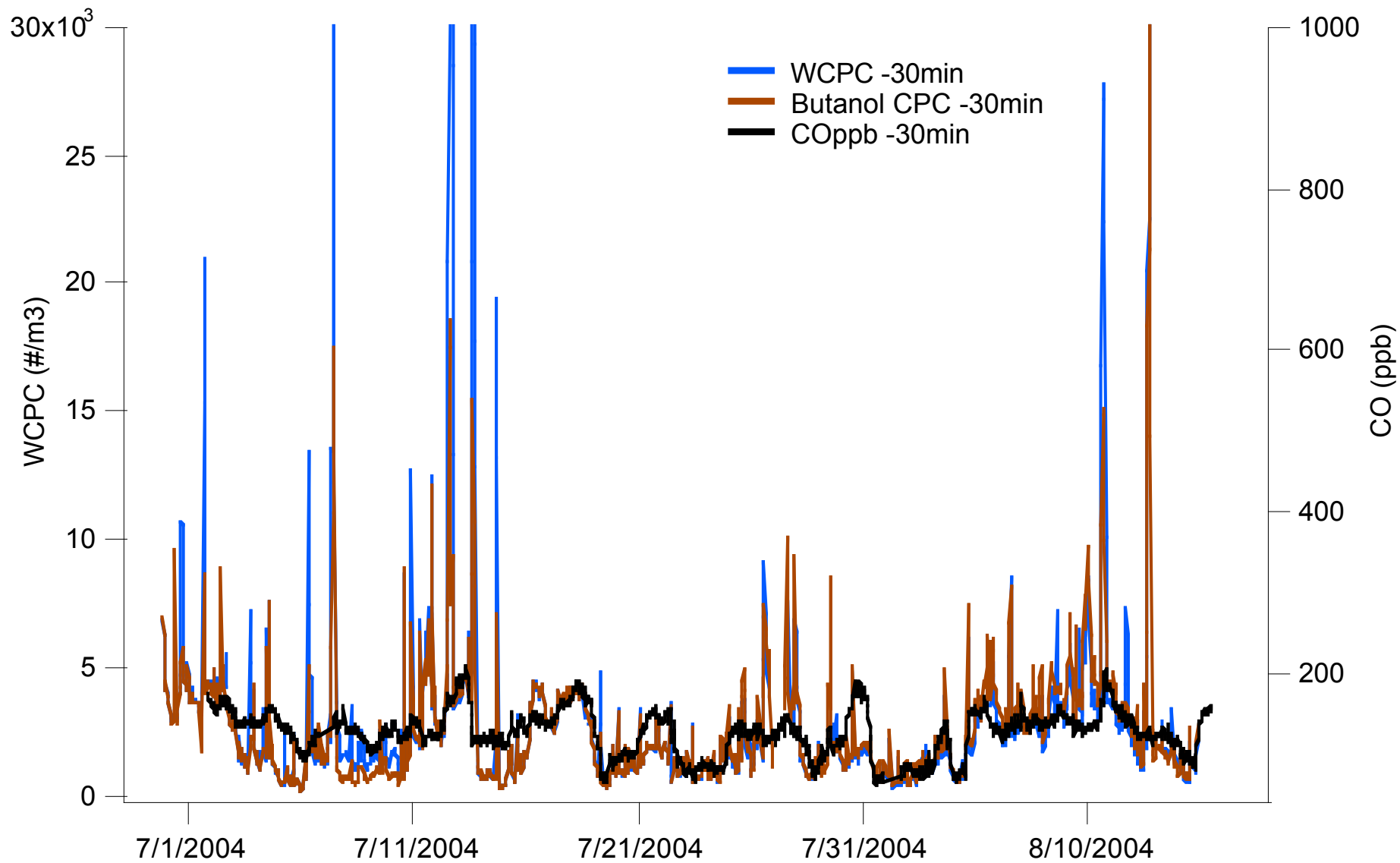
Field Comparison in Nova Scotia, TSI-3010 operated by NOAA

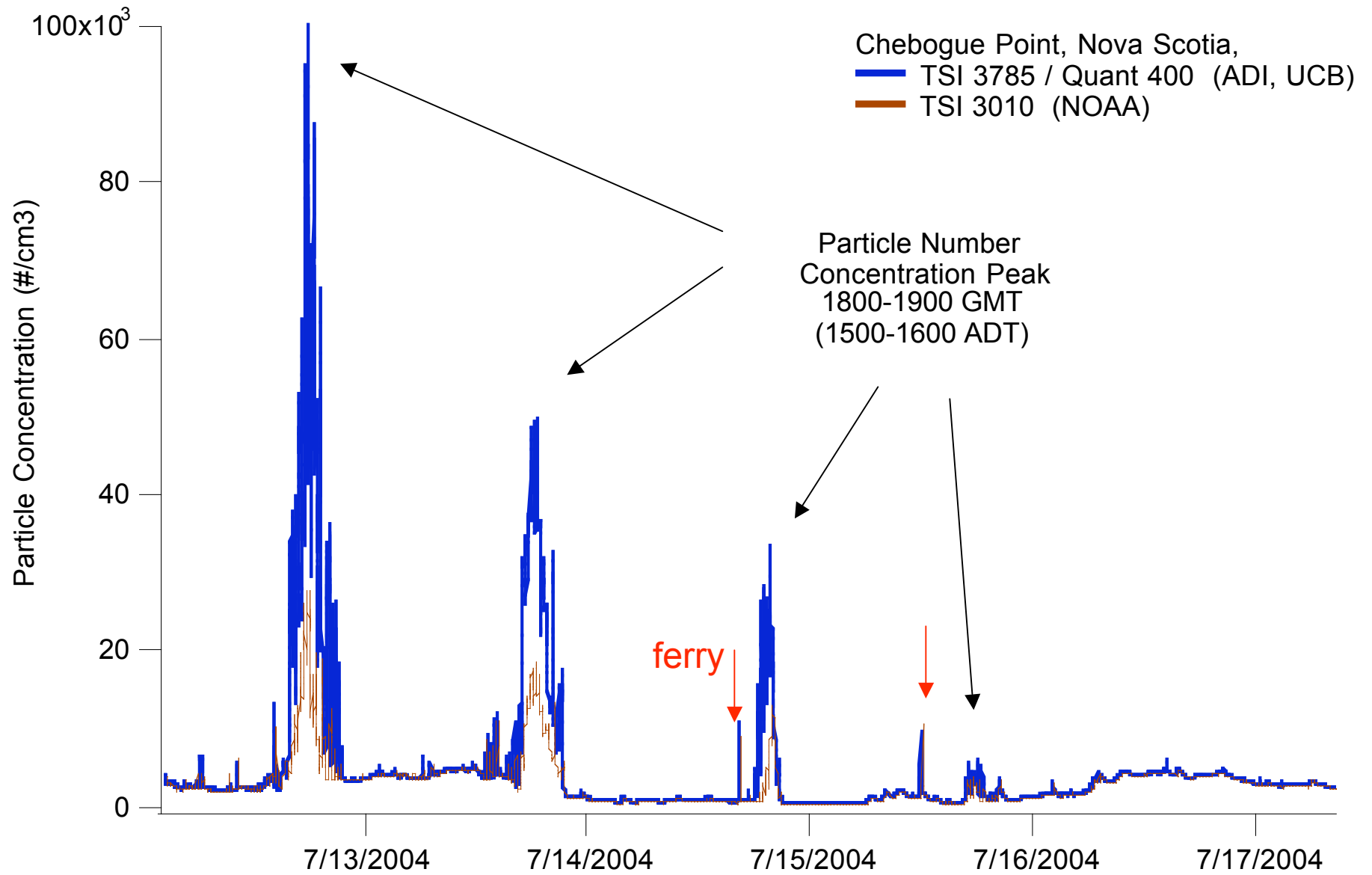


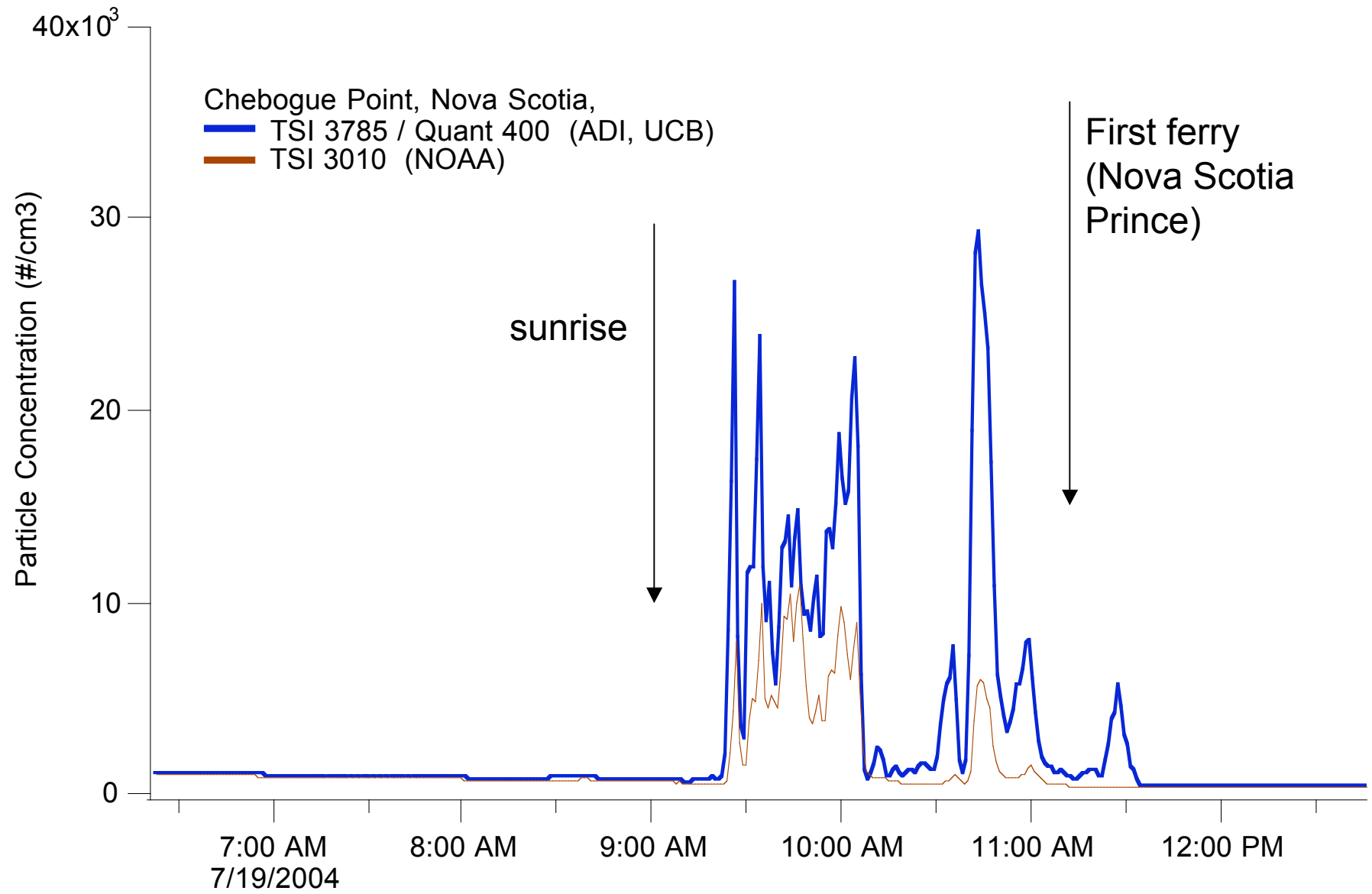
Is this a Nucleation Event ?

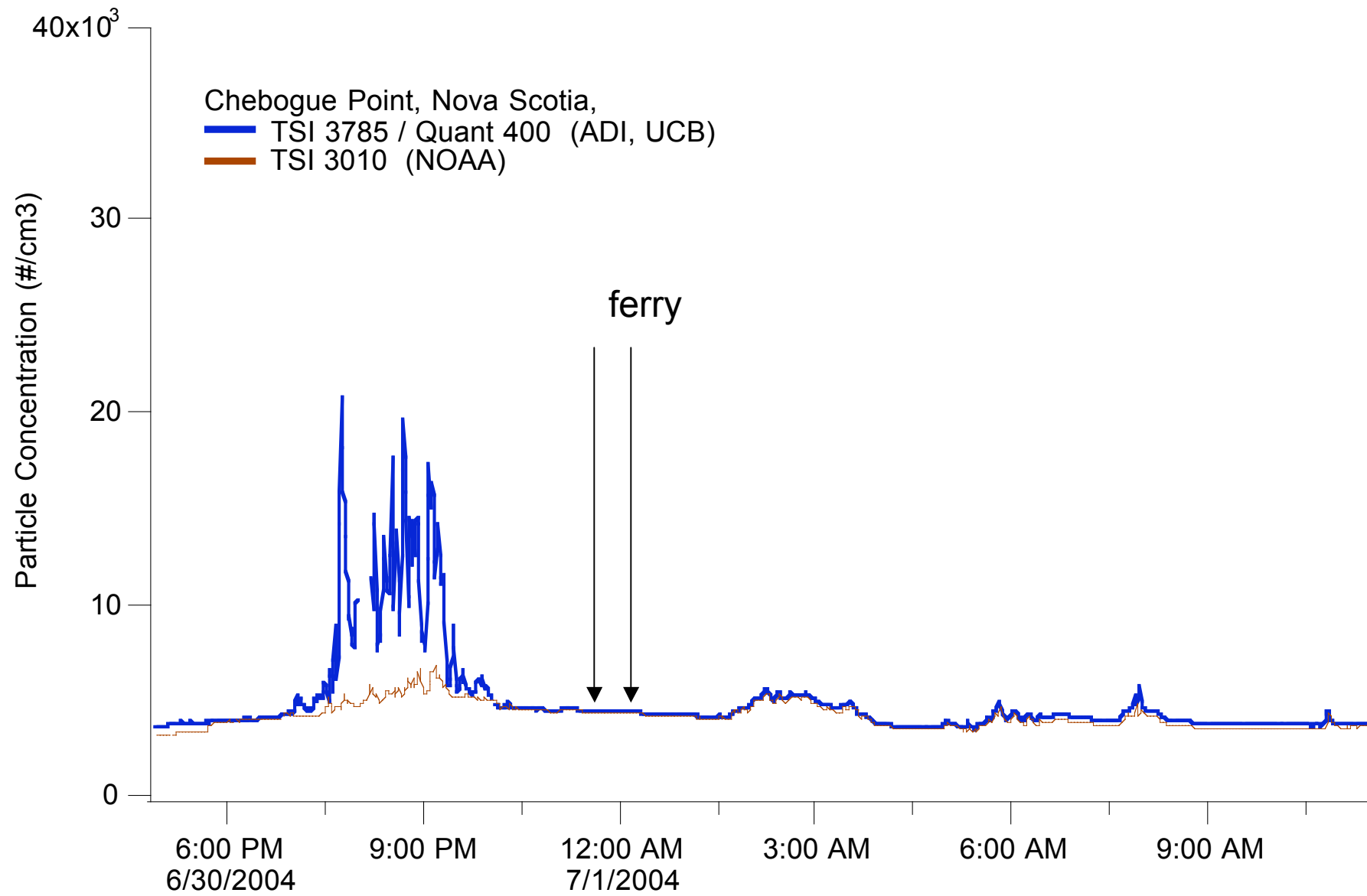


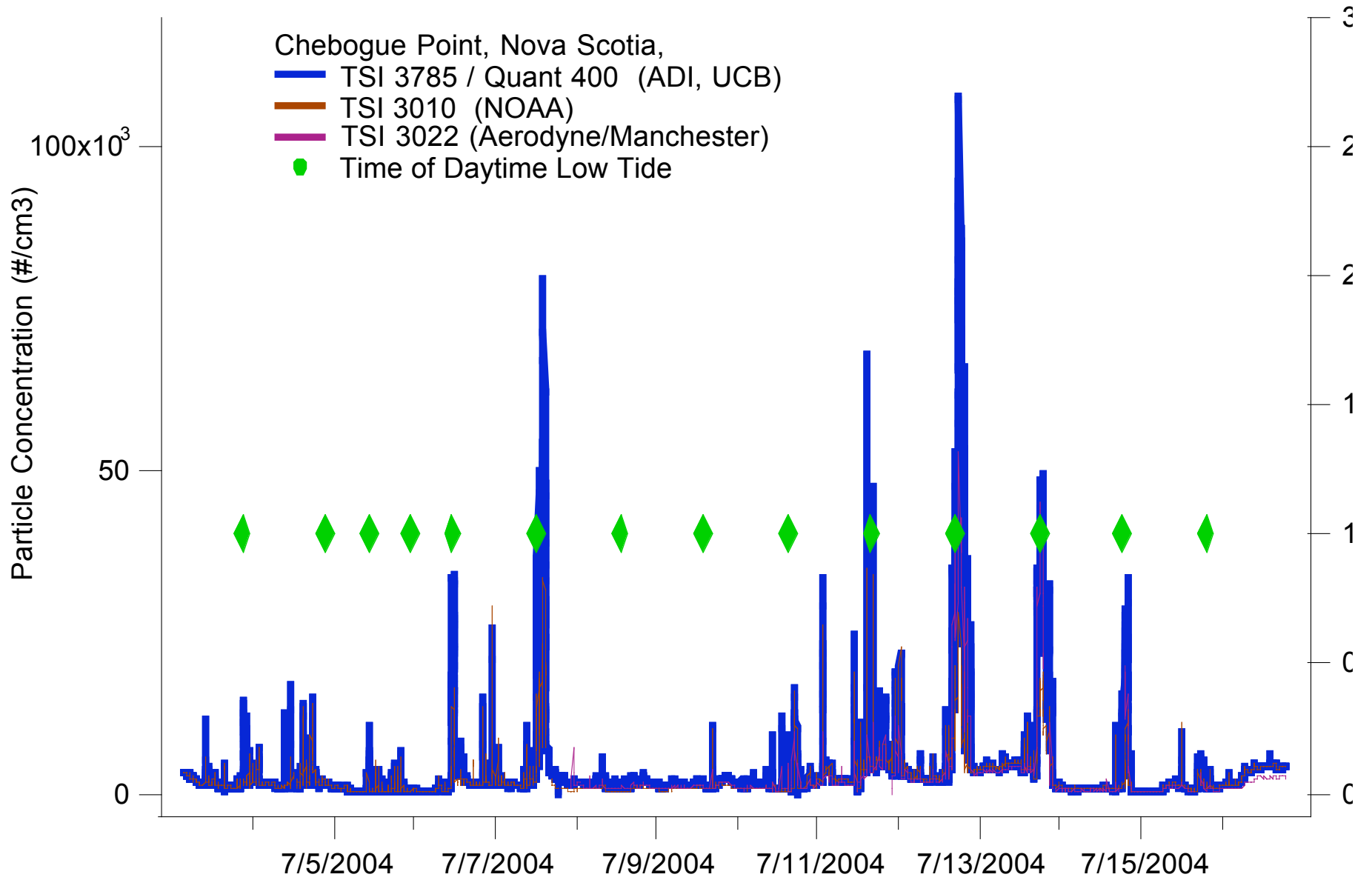


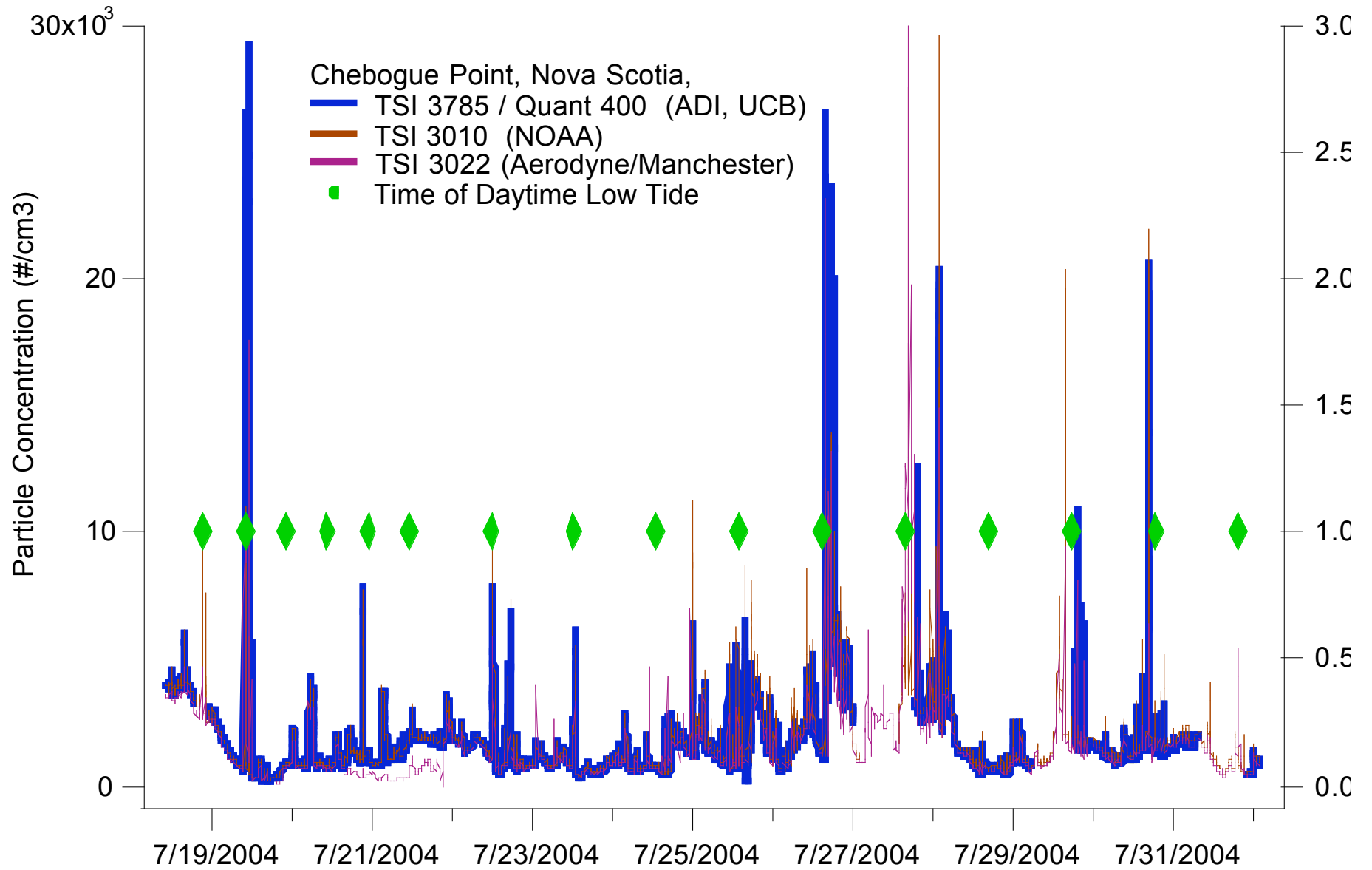


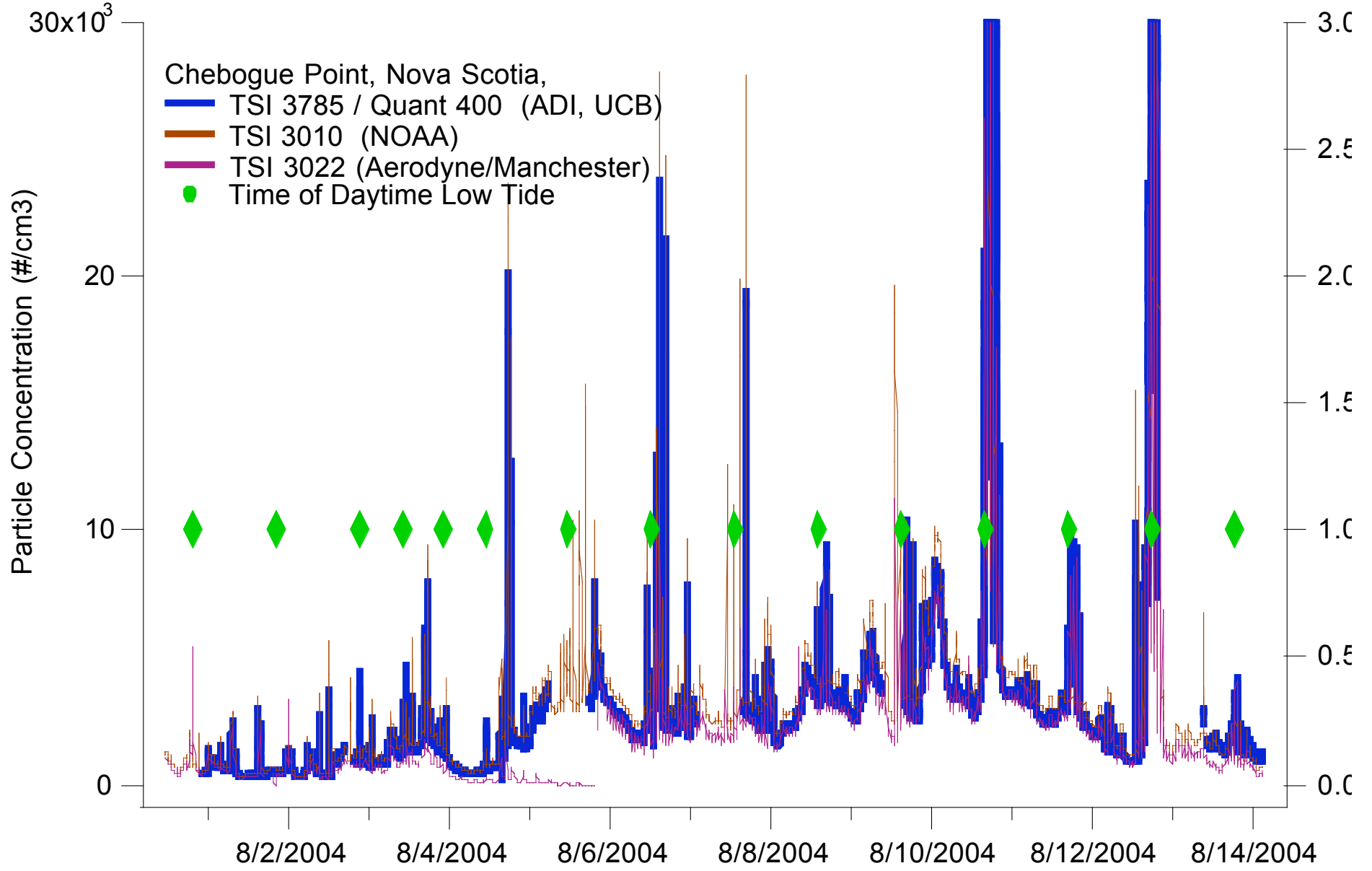


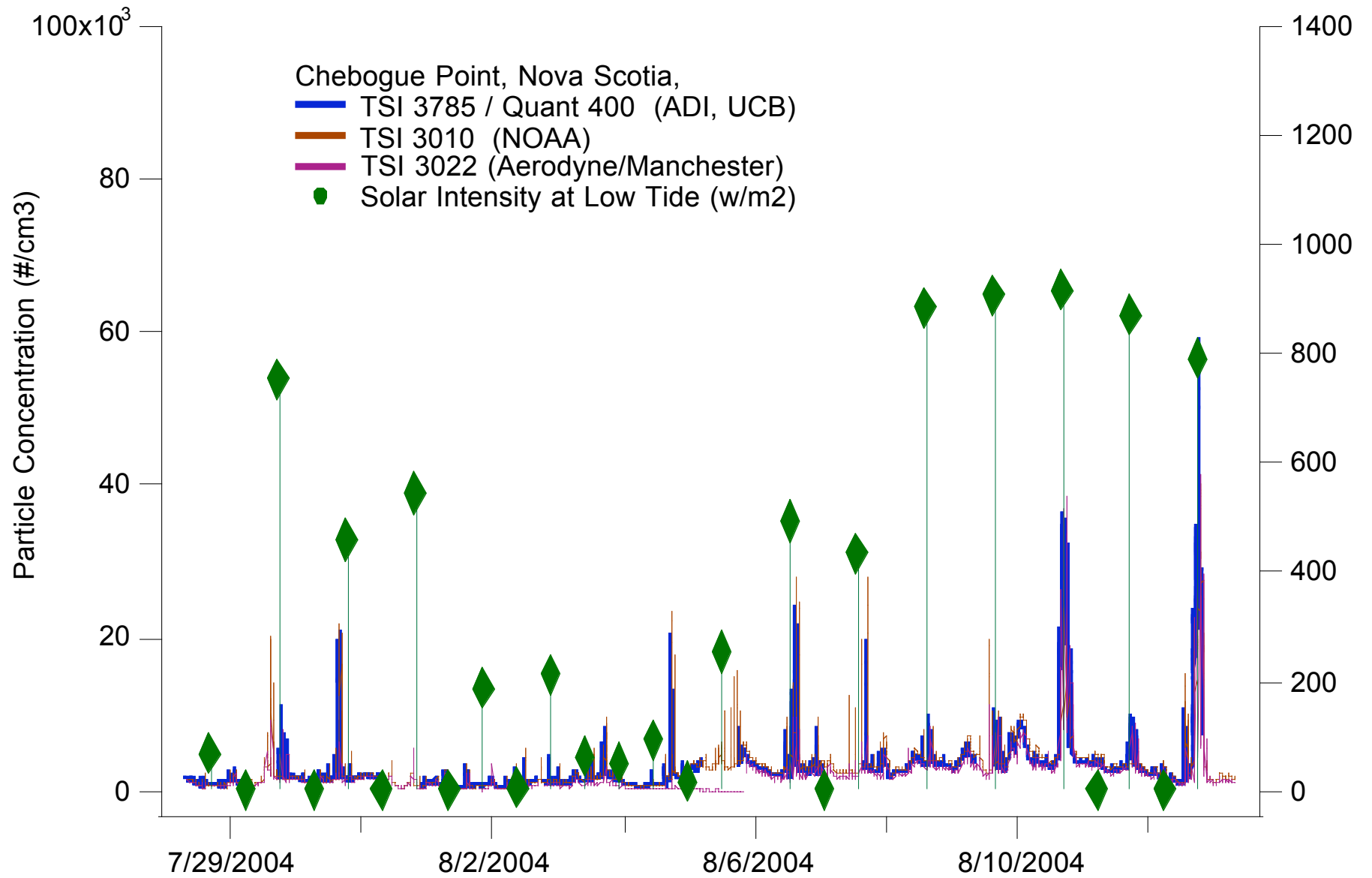


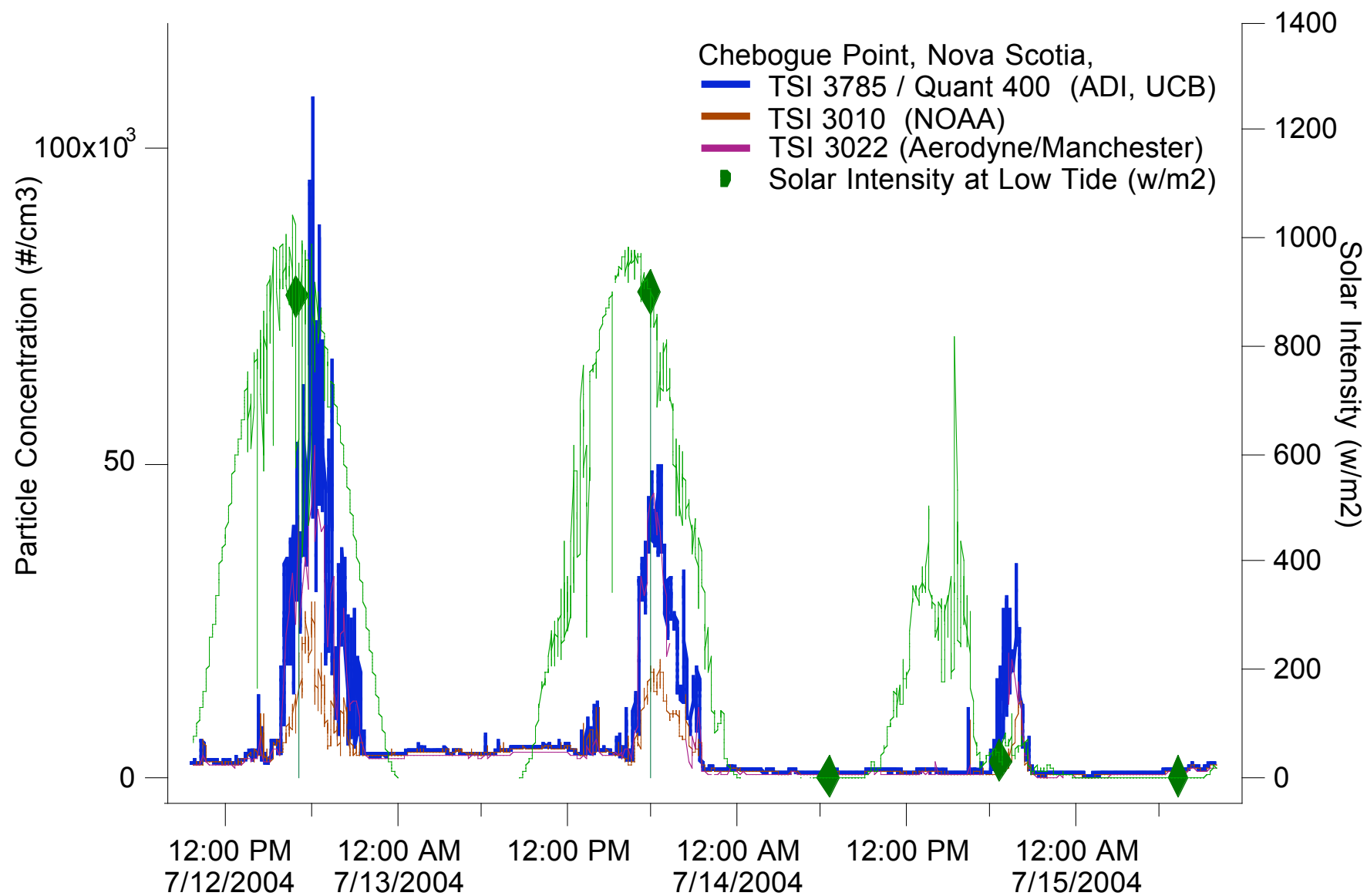












Conclusions

- Total particle number characterized sharp peaks superimposed on a slowly varying baseline.
- Slowly varying baseline correlates with CO, but sharp peaks do not.
- Most sharp peaks are associated with nucleation events that are correlated with low tide. Nucleation intensity related to solar intensity.
- Occassional evidence of the ferry.