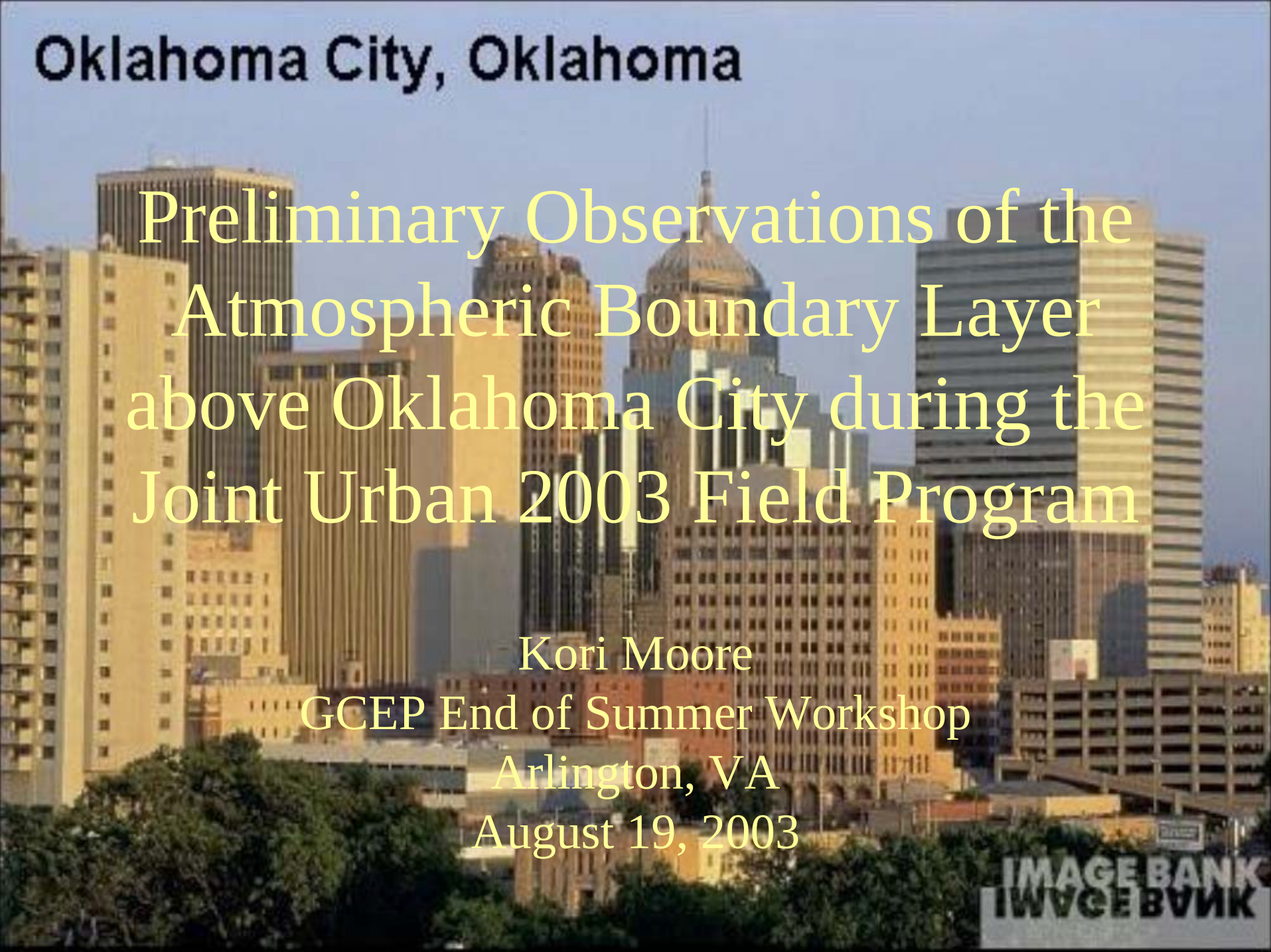

Preliminary Observations of the Atmospheric Boundary Layer above Oklahoma City during the Joint Urban 2003 Field Program

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GCEP End of Summer Workshop

Arlington, VA

August 19, 2003

Joint Urban 2003 Field Program

- Where : Oklahoma City, Oklahoma
- When : July 2003
- Goal : contamination/bioterrorism study
  better models/understanding
- Sponsors

U.S. Department of Homeland Security

U.S. Department of Defense

Defense Threat Reduction Agency (DTRA)

Wind Profiling Systems

Sodar

Radar

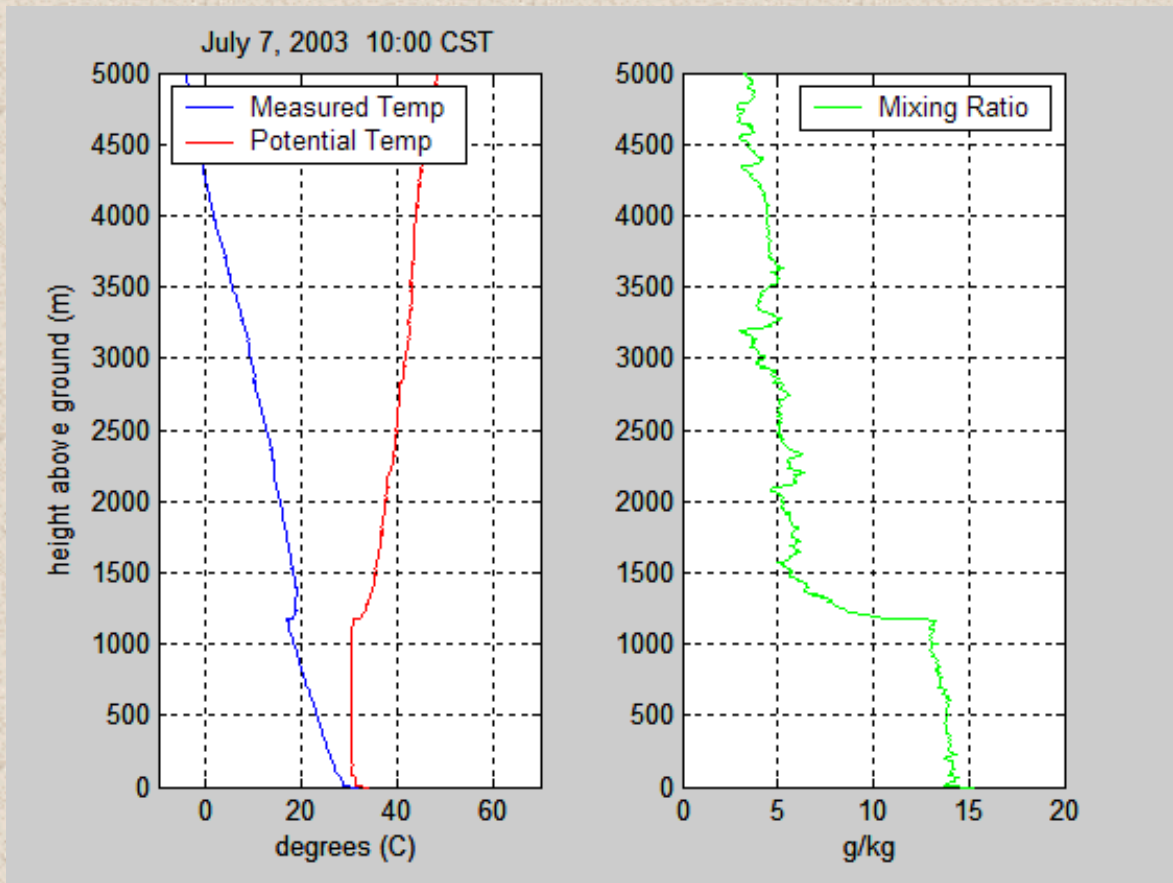
IOP Participation

- 10 IOPs : 6 day-time, 4 night-time
- Radiosonde launches during IOPs

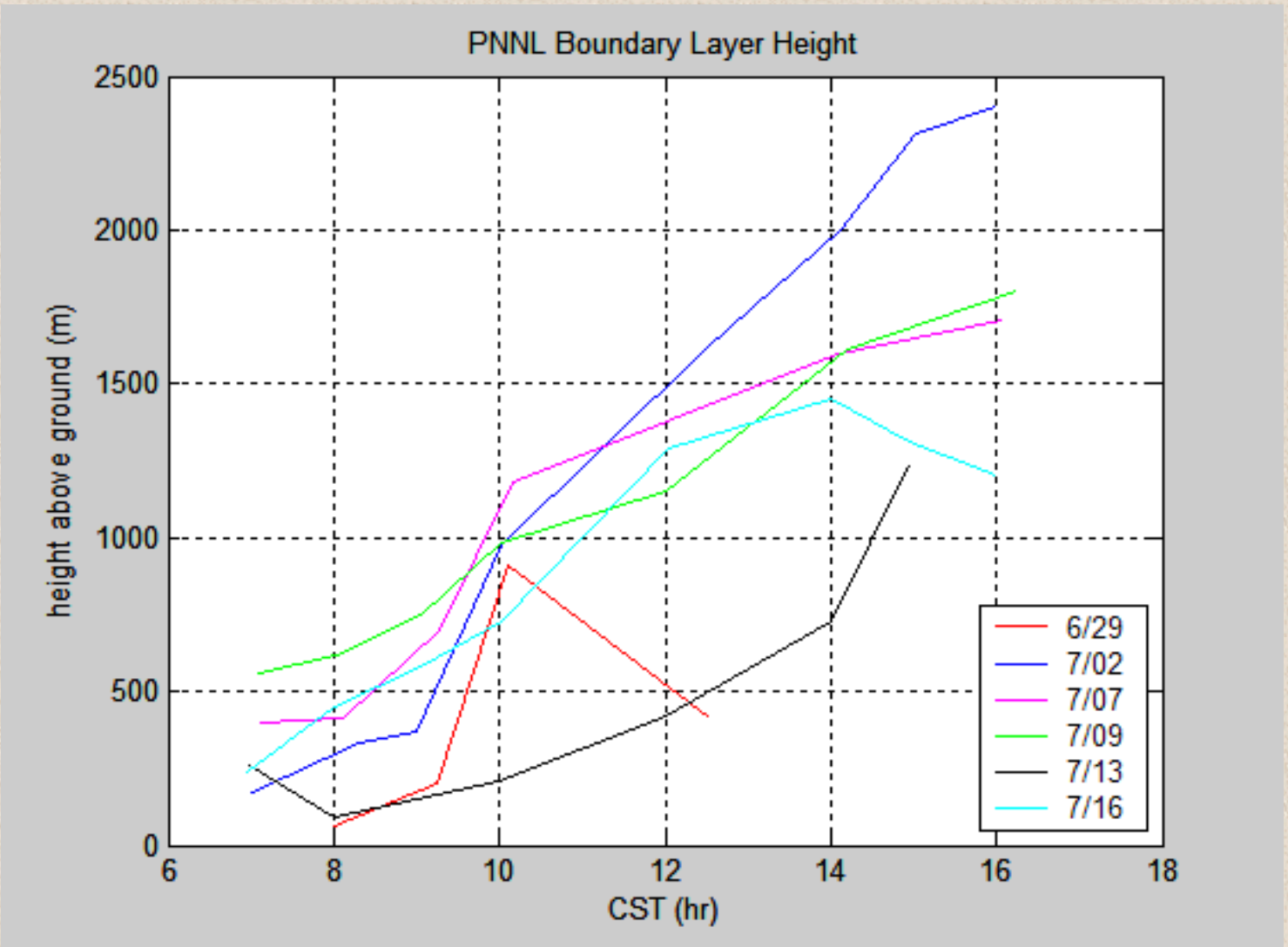
07,08,09,10,12,14,15,16 CST

21,22,23,00,02,04,05,06 CST

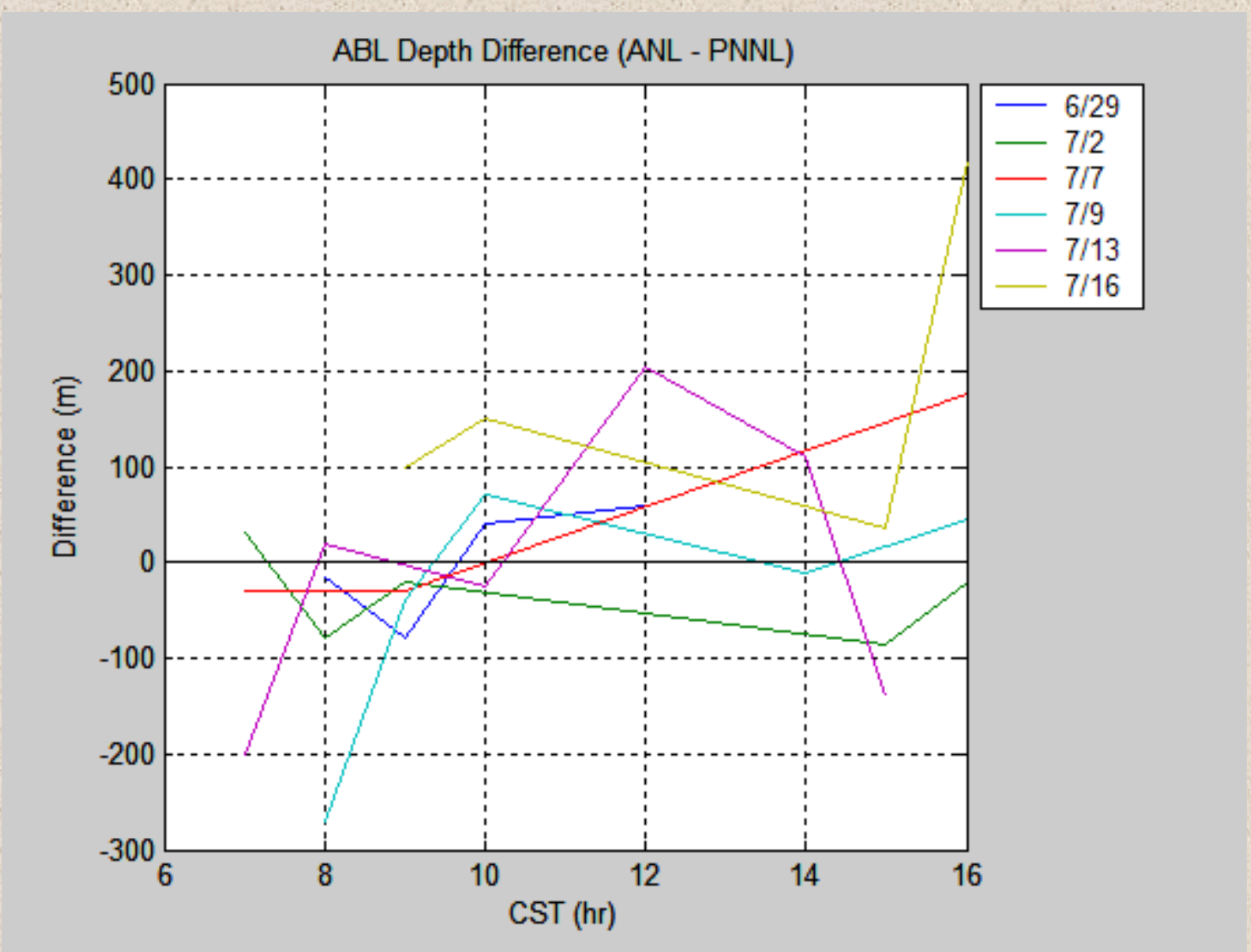
Atmospheric Boundary Layer (ABL)



Boundary Layer Evolution per IOP



ANL/PNNL ABL Depth Differences



Heat Balance

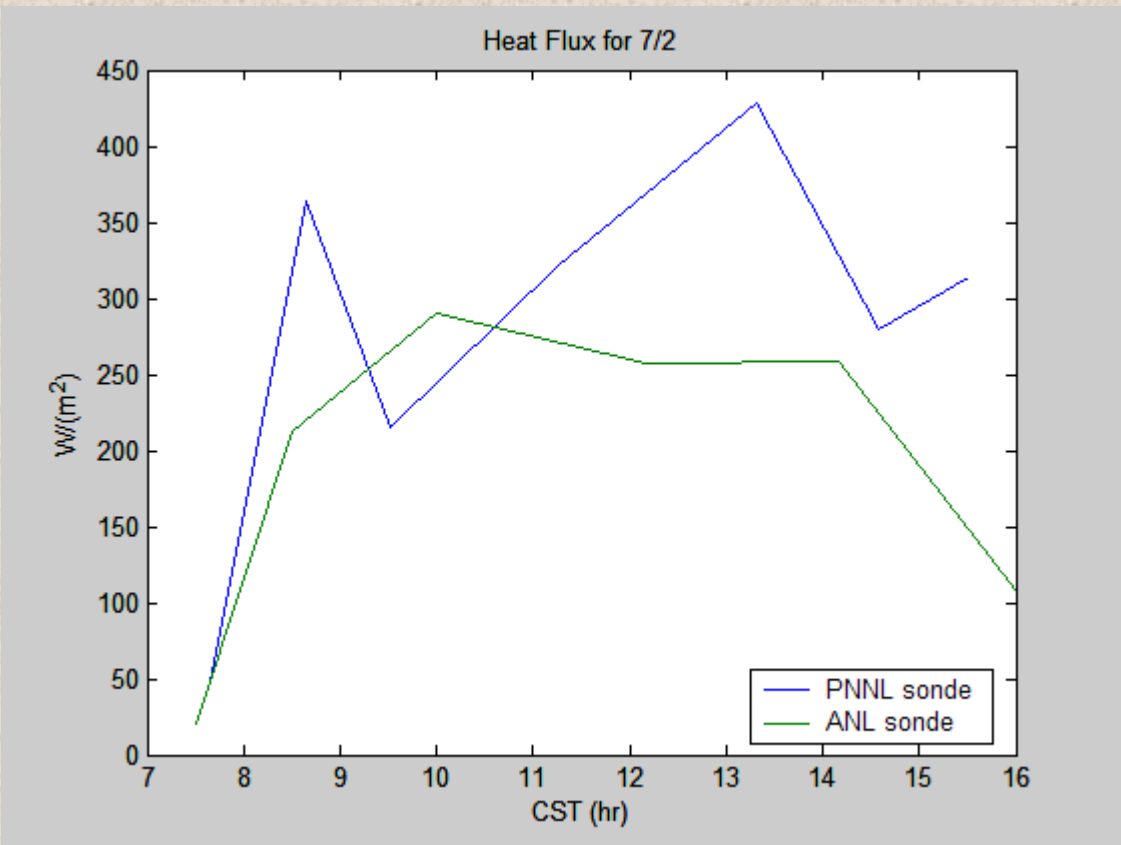
$$\frac{\partial \overline{\theta}}{\partial t} + \overline{u}\frac{\partial \overline{\theta}}{\partial x} + \overline{v}\frac{\partial \overline{\theta}}{\partial y} + \frac{\partial \overline{w'\theta'}}{\partial z} = 0$$

heating rate — *advection* — *flux divergence*

$$\int_0^{h+} \frac{\partial \overline{\theta}}{\partial t} dz = -\int_0^{h+} \frac{\partial \overline{w'\theta'}}{\partial z} dz$$

$$(h+) \cdot \frac{\partial \langle \overline{\theta} \rangle}{\partial t} = \overline{w'\theta'_0} - \overline{w'\theta'_{h+}}$$

Heat Flux


Heat Flux for 7/2
W//(m2)
CST (hr)
PNNL sonde
ANL sonde
0
50
100
150
200
250
300
350
400
450
7
8
9
10
11
12
13
14
15
16

Conclusions

- ABL : Downwind tends to be lower in the morning with a faster rise rate, ending higher in the late afternoon
- Heat Flux
  - Values are plausible
  - Larger values downwind suggest effect of urban heat island

Future Analysis

- Closer examination of each day
- Night time IOPs
- Advection calculation

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- Pacific Northwest National Lab
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