

Vertical Structure of Ozone over the Gulf of Maine Observed during NEAQS 2002: Implications for Air Quality in New England

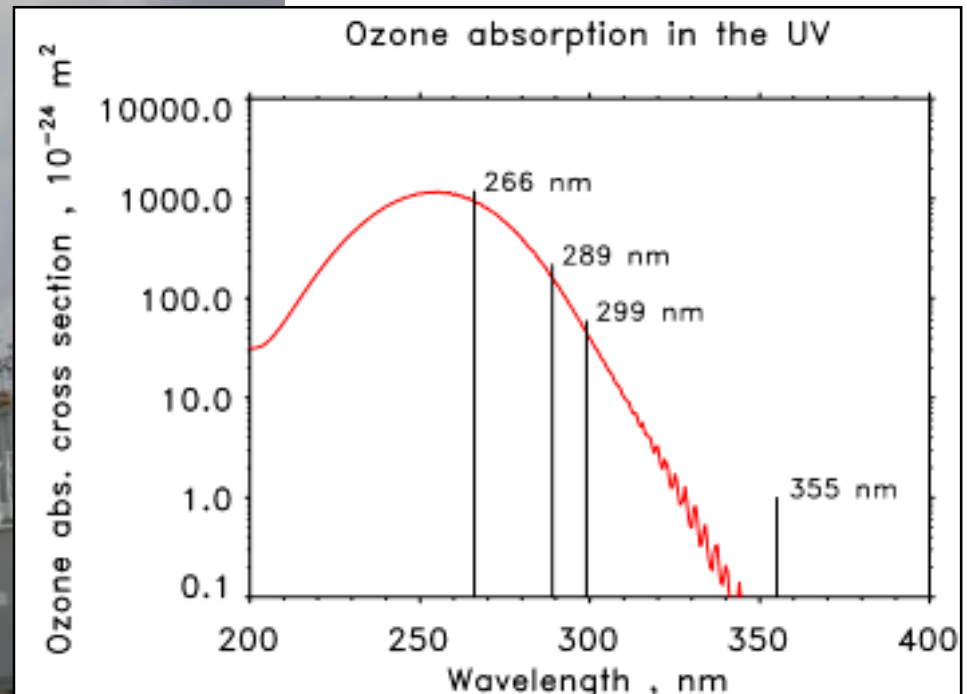
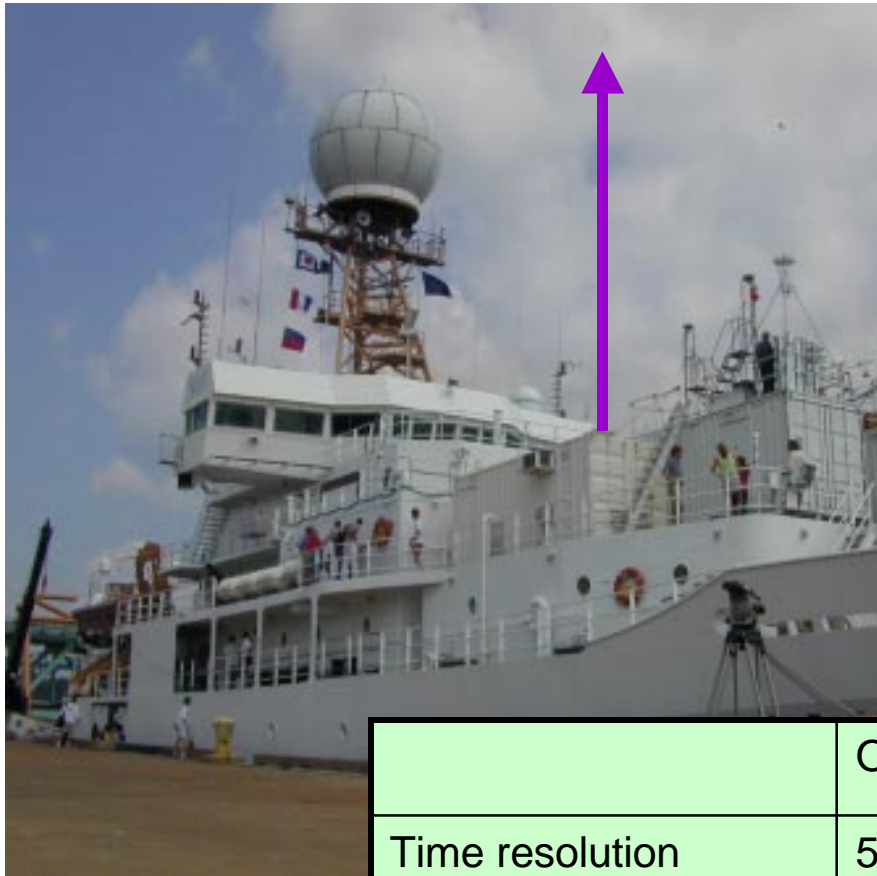
C. J. Senff, W. L. Eberhard, R. J. Alvarez II,
R. D. Marchbanks, J. L. George, B. J. McCarty,
R. M. Banta, A. B. White, W. M. Angevine,
E. J. Williams, K. B. Carpenter

AGU Fall Meeting
8 - 12 December 2003

Science Questions

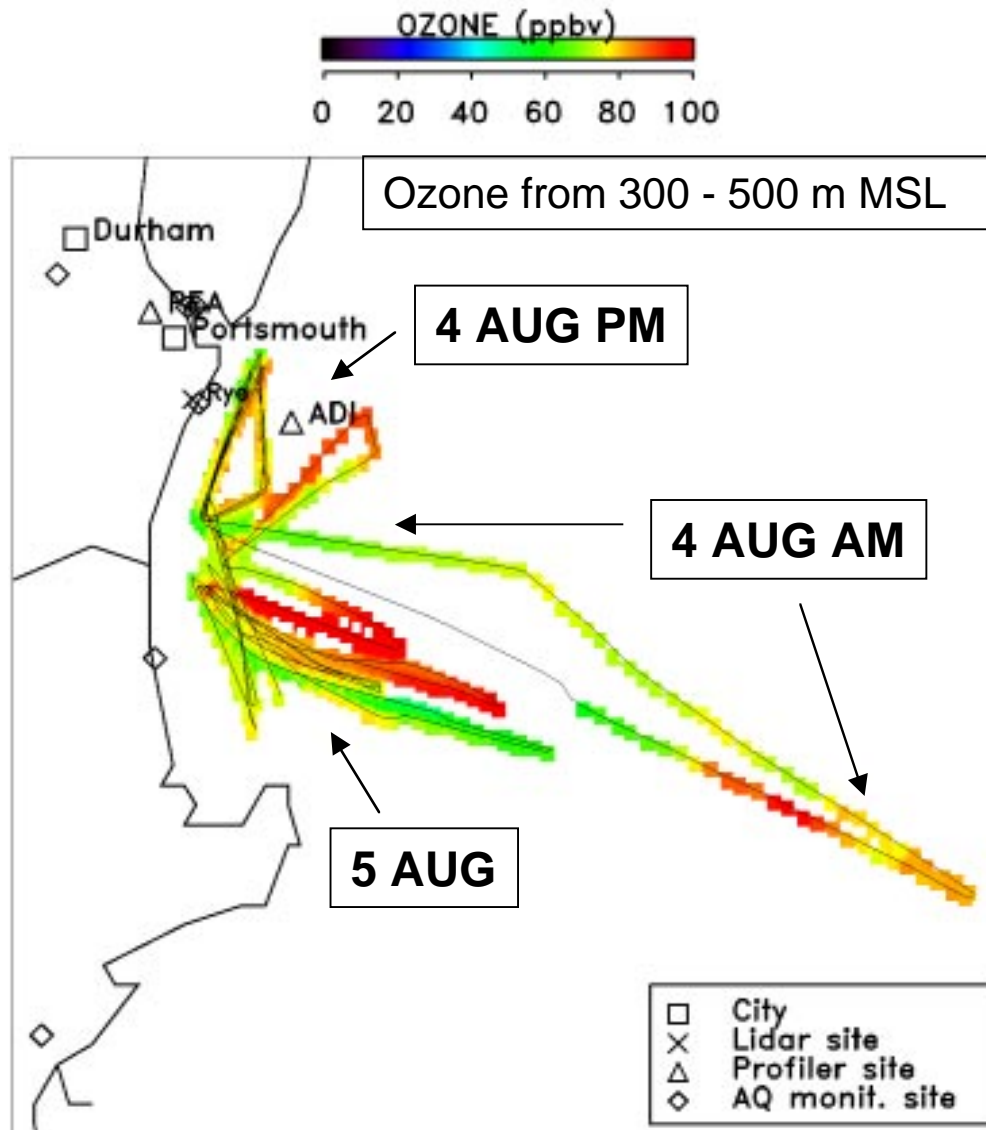
- How representative are surface measurements over Gulf of Maine for conditions aloft?
- When are surface and atmosphere aloft coupled or decoupled?
- How do elevated layers of pollutants impact surface air quality?

NOAA/ETL ozone lidar (OPAL) at NEAQS 2002

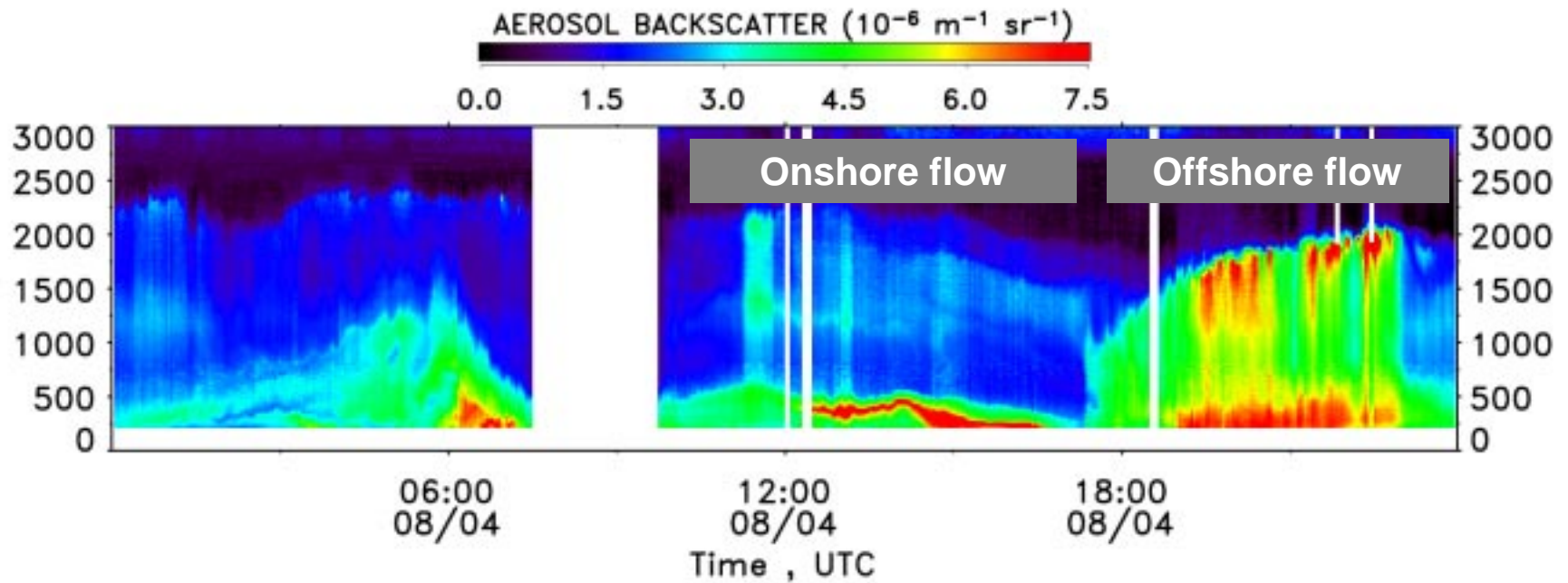
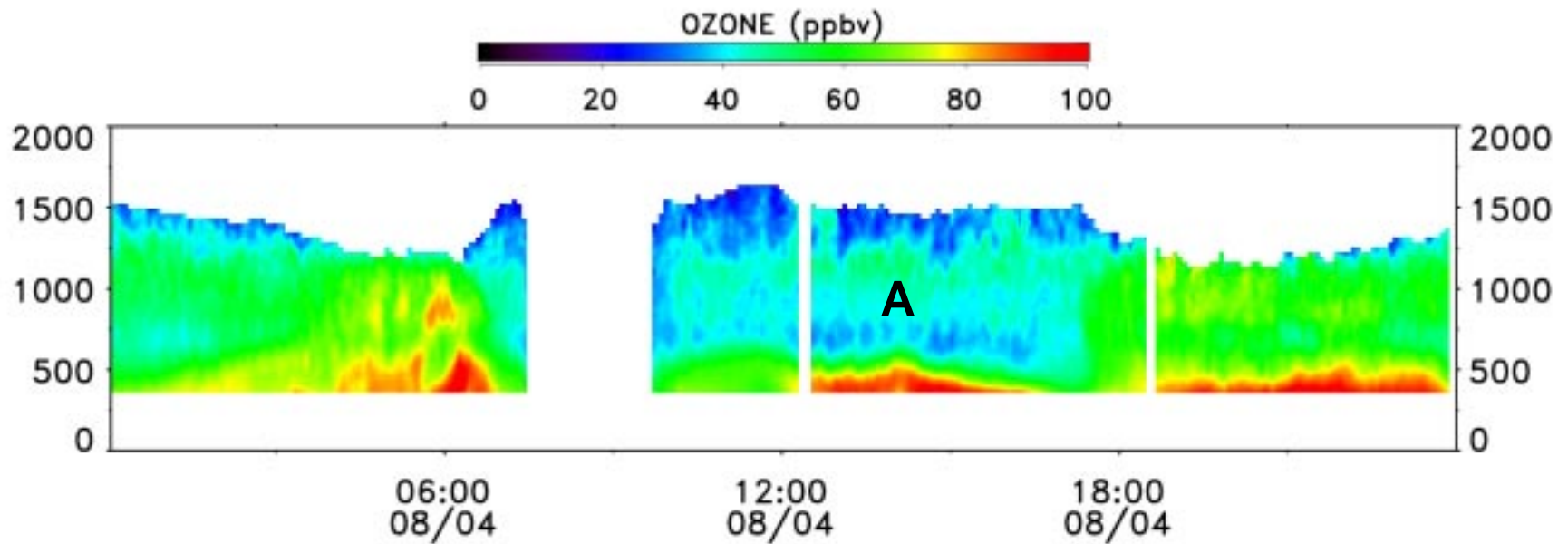


	Ozone	Aerosol
Time resolution	5 min	2 min
Vertical resolution	30 m	5 m
Altitude coverage	300 – 1500 m	200 – 3000 m

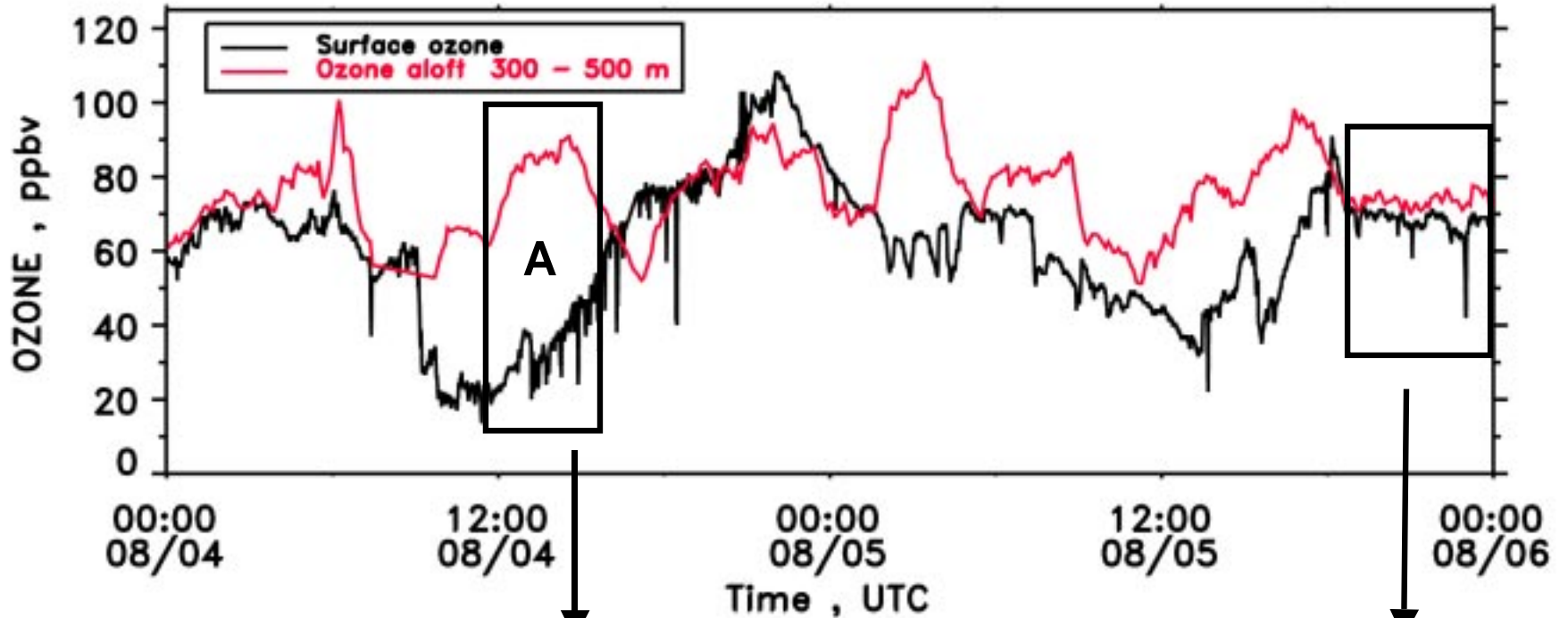
Ronald H. Brown ship track on 4 & 5 AUG 2002



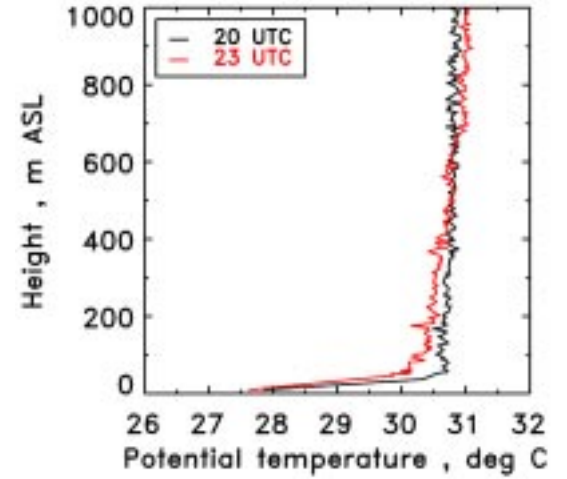
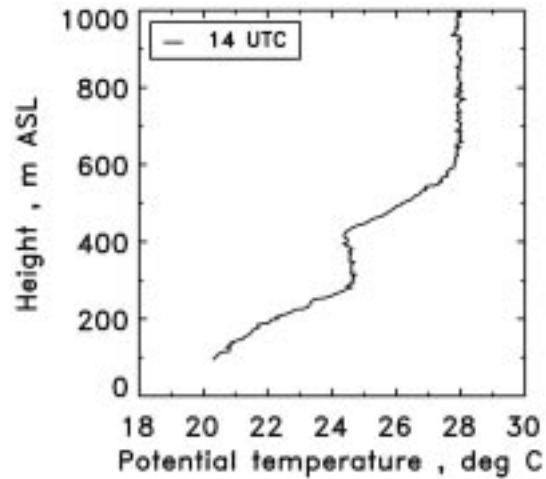
4 AUG 2002



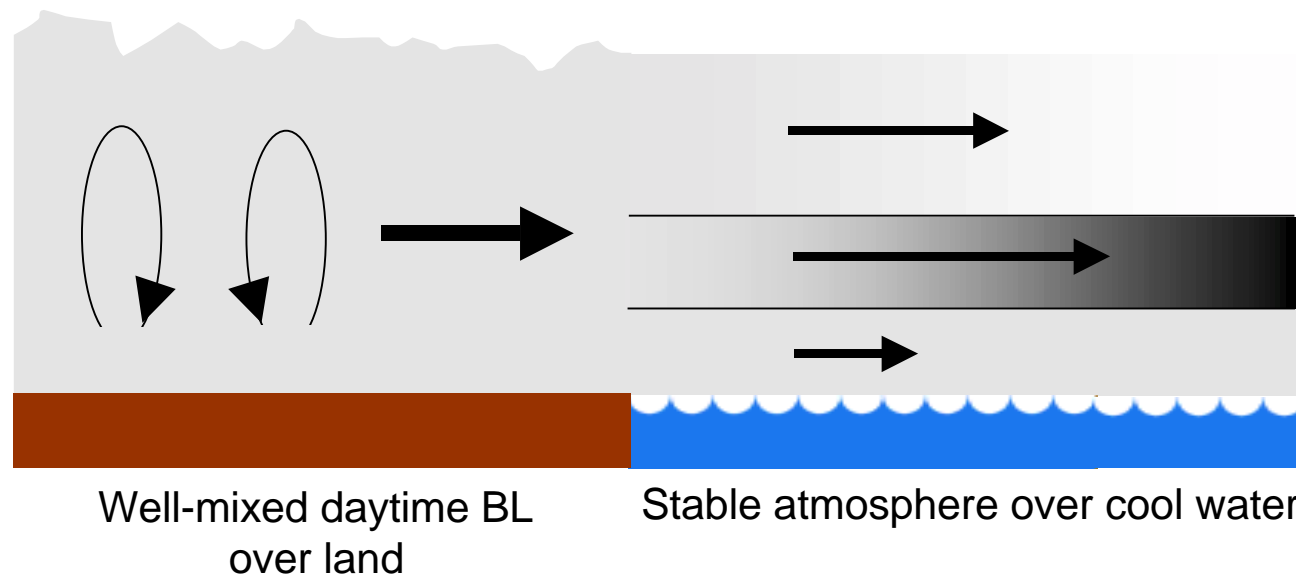
How representative are surface measurements for conditions aloft?



Ron Brown
radiosonde
data

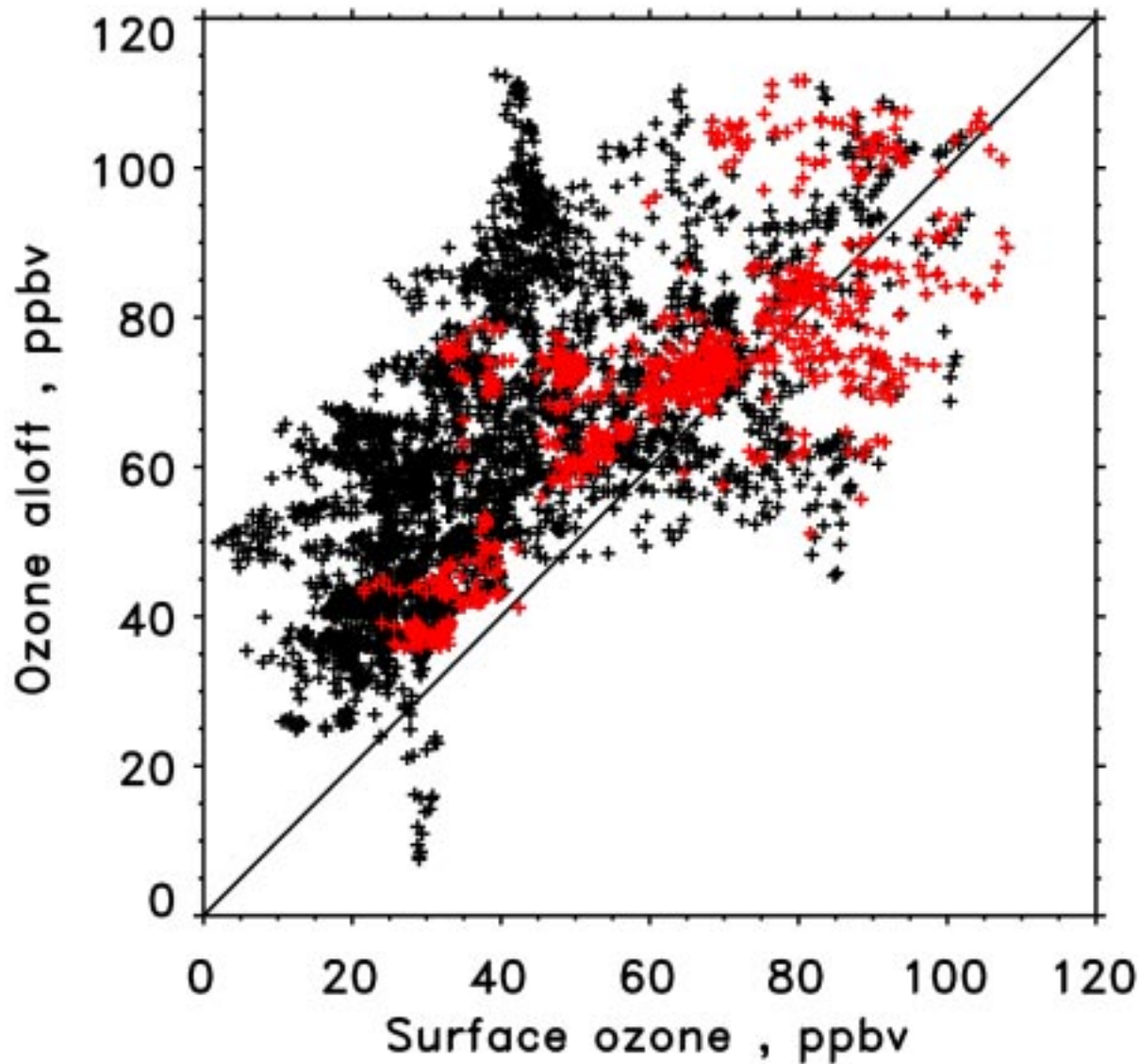


Offshore transport of continental, polluted air



- Stratified atmosphere over ocean
- Layering of pollutants due to wind shear
- Decoupling of layers increases with distance from shore

Surface ozone vs. ozone aloft (300 - 500 m MSL) for 07/18 – 08/05

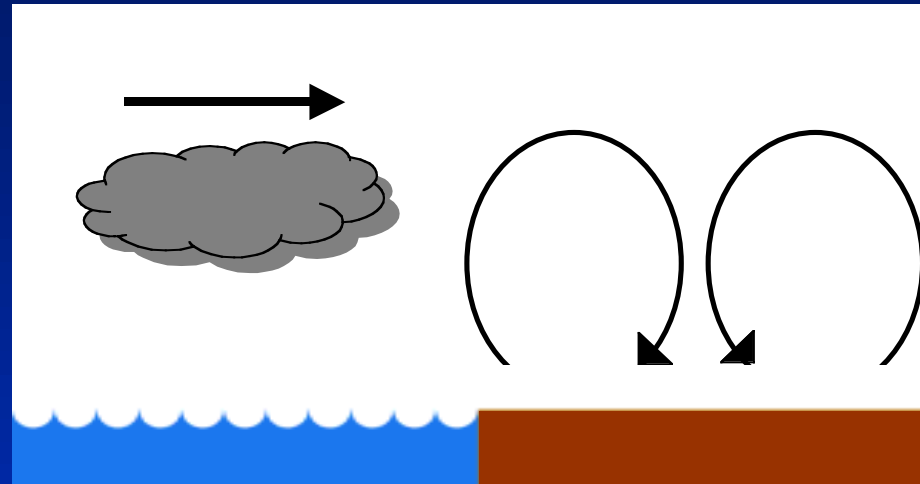


+ all data

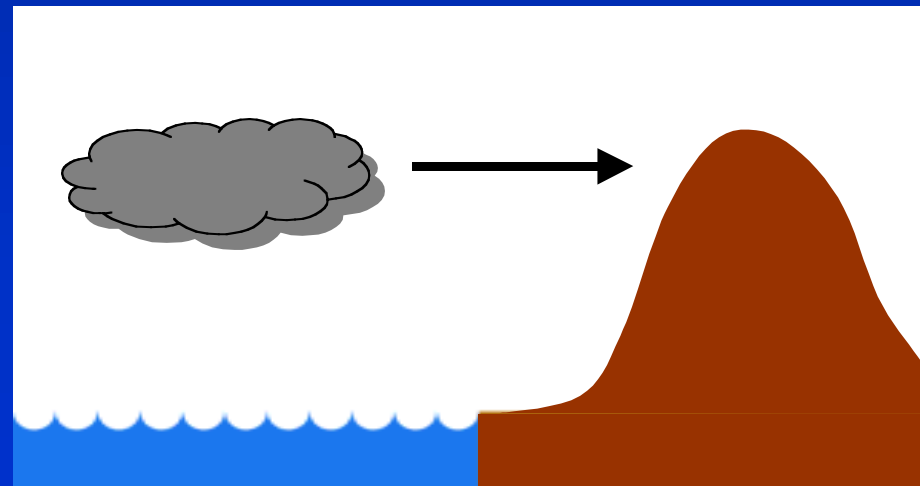
+ 18 – 24 UTC
(11 – 19 LST) &
offshore flow
aloft

How do elevated layers of pollutants over Gulf of Maine impact coastal air quality in New England?

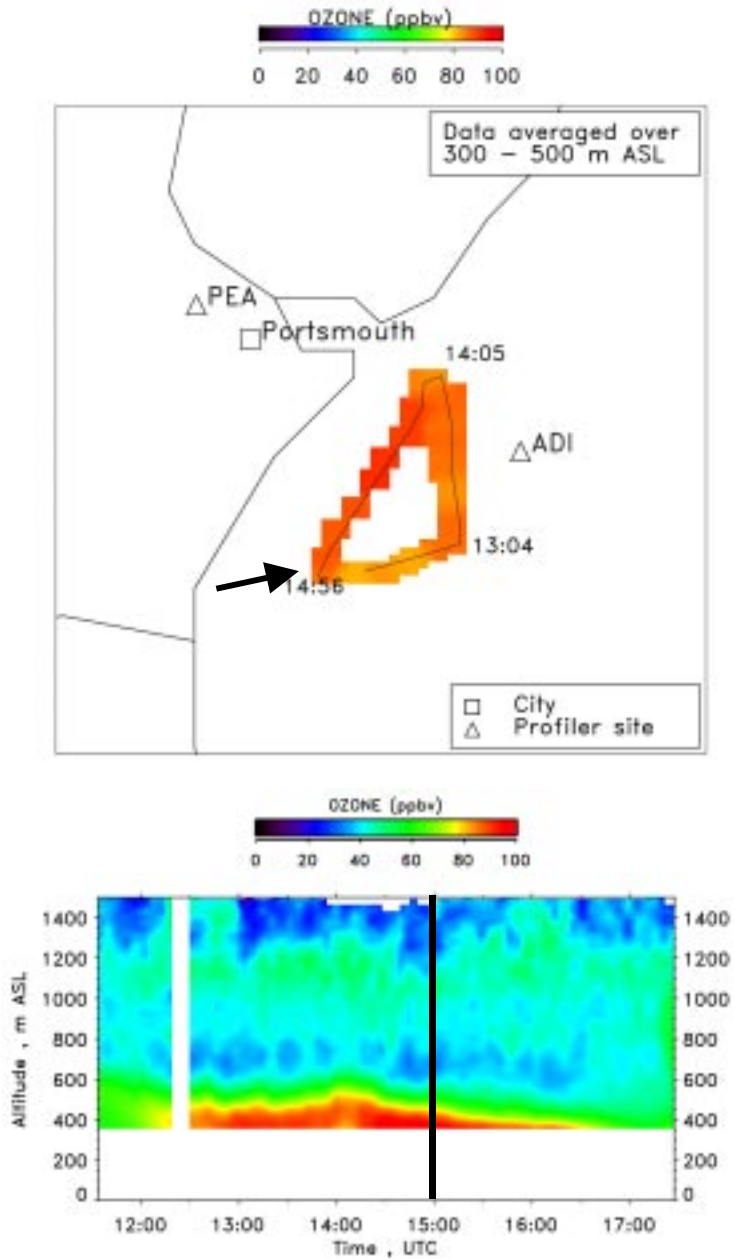
A. Fumigation



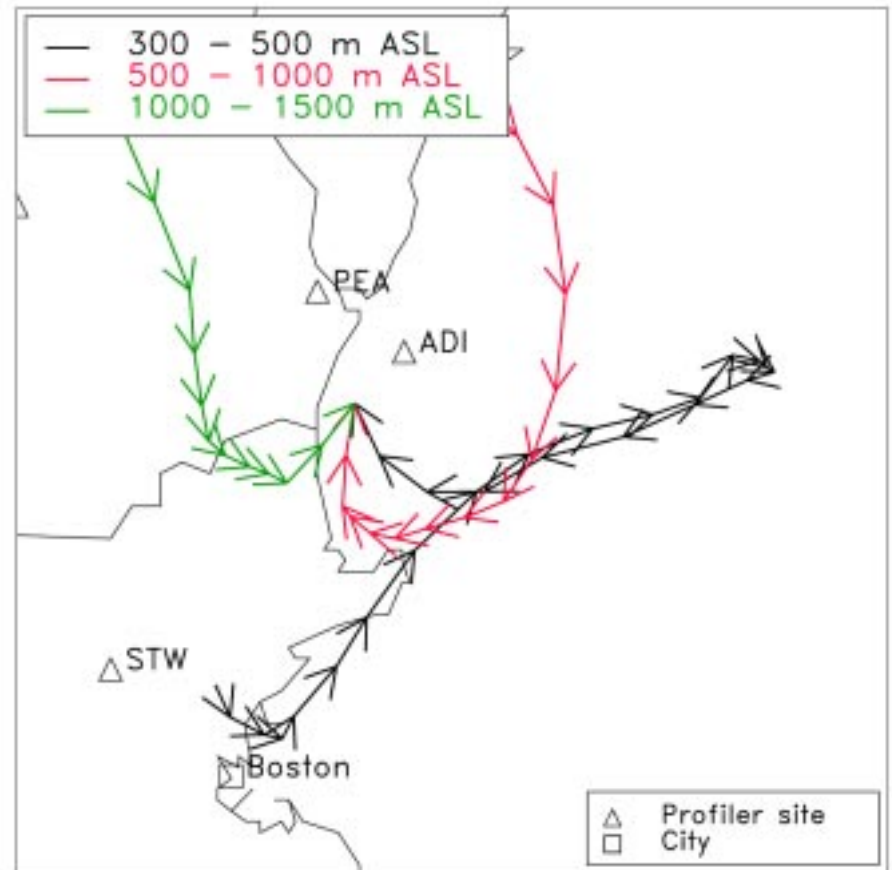
B. Horizontal transport to elevated terrain



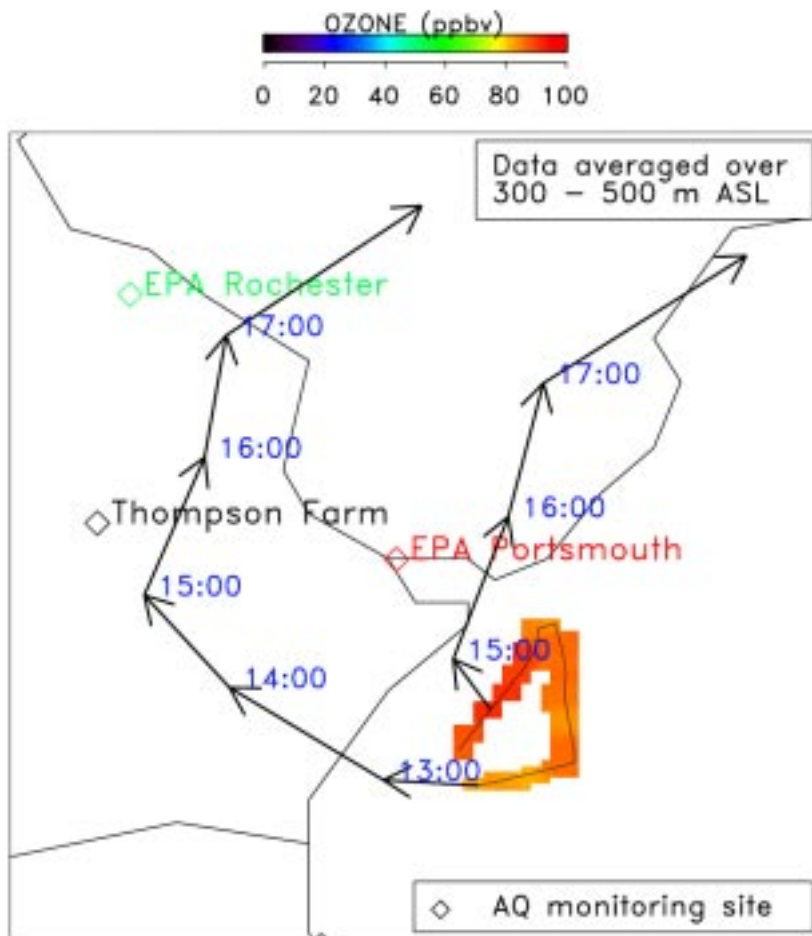
4 AUG 2002



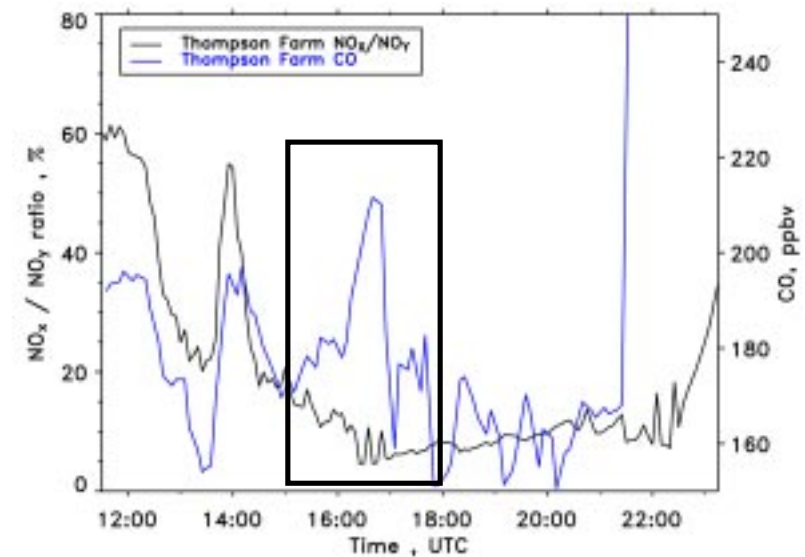
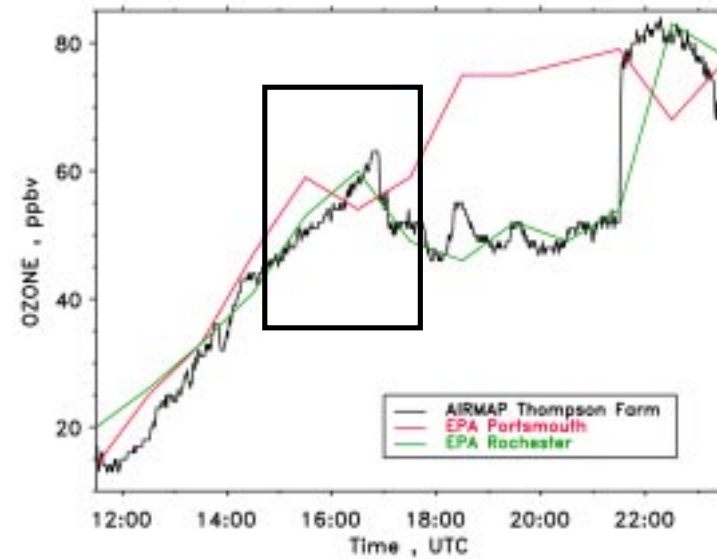
Trajectories end at 15:00 UTC 08/04/02



4 AUG 2002: Fumigation of pollution layer aloft



Surface ozone



Summary

- Surface and atmosphere above 300 m MSL over Gulf of Maine were decoupled most of the time.
- Predominantly higher ozone concentrations aloft.
- Surface measurements only representative for marine BL, which can be as shallow as 50 m.
- Vertical distribution of ozone was fairly uniform when well-mixed continental BL was advected over Gulf of Maine.
- Evidence of fumigation as elevated plume of aged pollutants was transported from the Gulf of Maine over coastal New England.