MPL Planetary Boundary Layer Heights at Golden, Fort Collins and Platteville

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Introduction:

Three micropulse lidars and one elastic lidar were employed at three sites in order to get backscatter, extinction, and PBL height estimates. We show here the PBL comparisons between the lidars and the aircraft profiles.

PBL Heights are retrieved from aerosol gradients typically which occur at the top of the PBL where it interacts with a clearer free troposphere. In Colorado, this was not always the case as air aloft had substantially the same aerosol load on many days.

The PBL retrieval uses the Haar wavelet to determine this gradient and the parameters for this wavelet were adjusted for aerosol loading, heating and time of day.

Aerosol mass time series
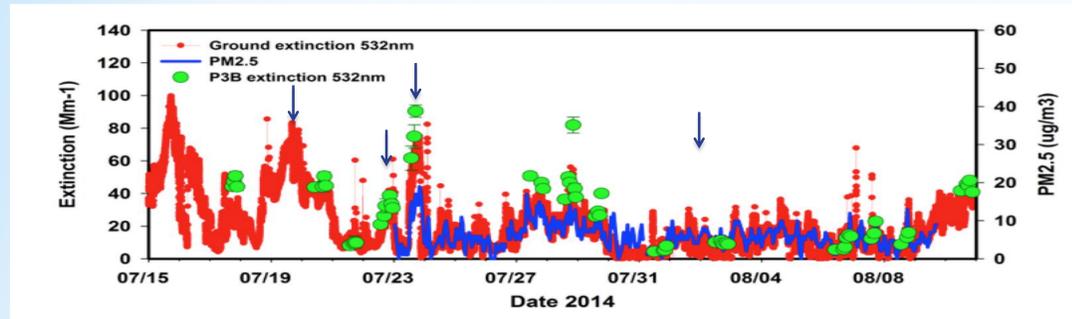
## July 22-23, 2014 Ozone pollution event period

While data was taken continuously for the study period, only daylight hours give reasonable retrieals of PBLH since you need convection, some kind of aerosol gradient and a potential temperature gradient to define the PBLH. The ozone case of August 22 and 23 is an example where the right condicitons existed for much of the time series.

NREL   FORT COLLINS   Platteville
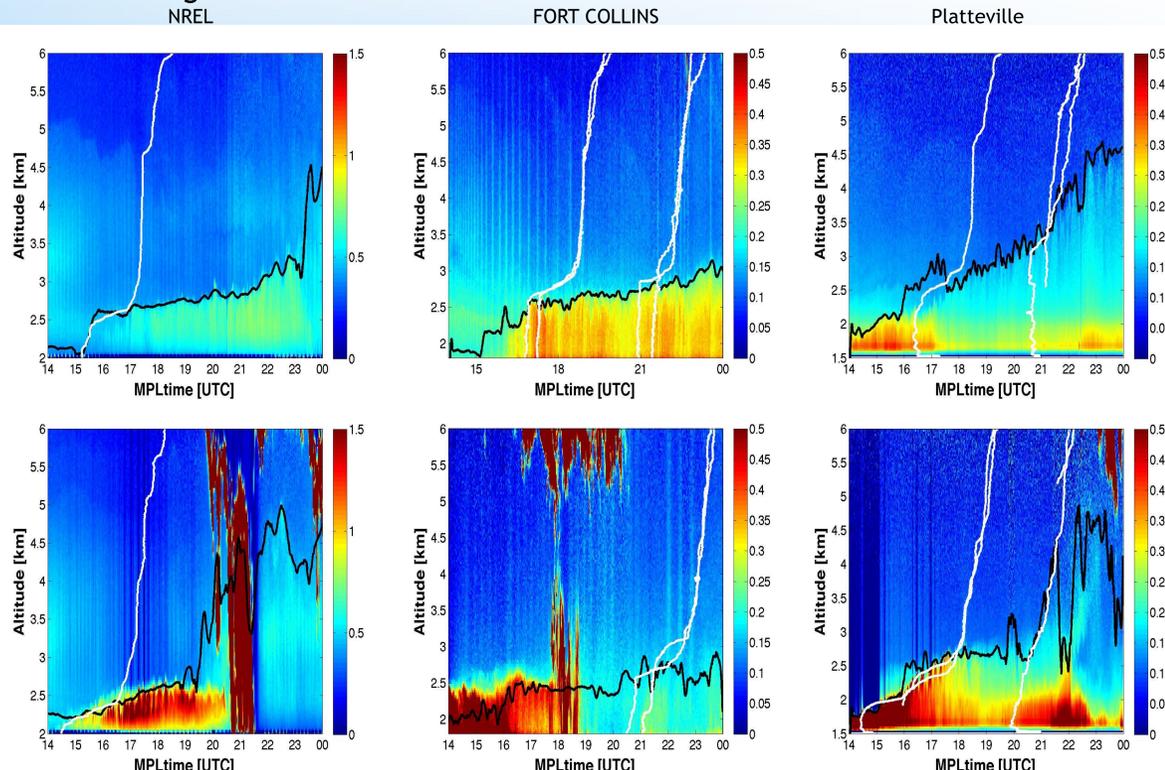
July 22 (top panels) and July 23 bottom panels). Radiosonde potential temperature is plotted with the lowest point at the time and surface elevation and 1°C change in PT equals 100 min.

Full day images:

Full day images are available under the site locations in the DISCOVER-AQ database. Numerical PBL heights are available there as well.

NREL-GOLDEN   FORT COLLINS   Platteville
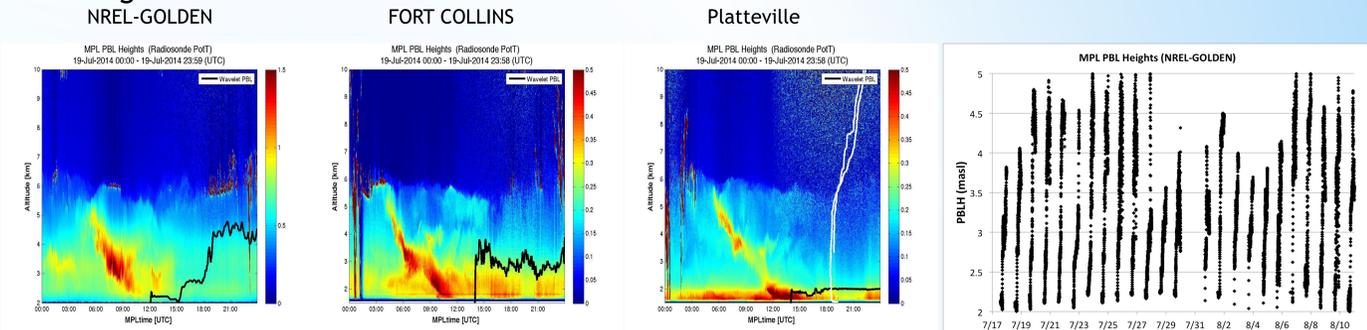
Left: Smoke event overnight on July 19, 2004, at the MPL sites

MPL heights at NRL-GOLDEN (see MPL_SiteName_PBLH.ict)

Comparison between Golden MPL and P3-B LARGE Bscat / PotT profiles:

MPL 3.29 km
MPL 2.67 km
MPL 2.83 km
MPL 2.08 km

MPL 3.1 km
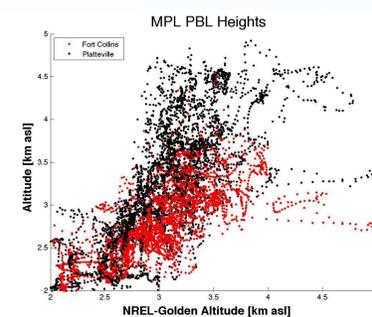MPL 2.7 km
MPL Surface?
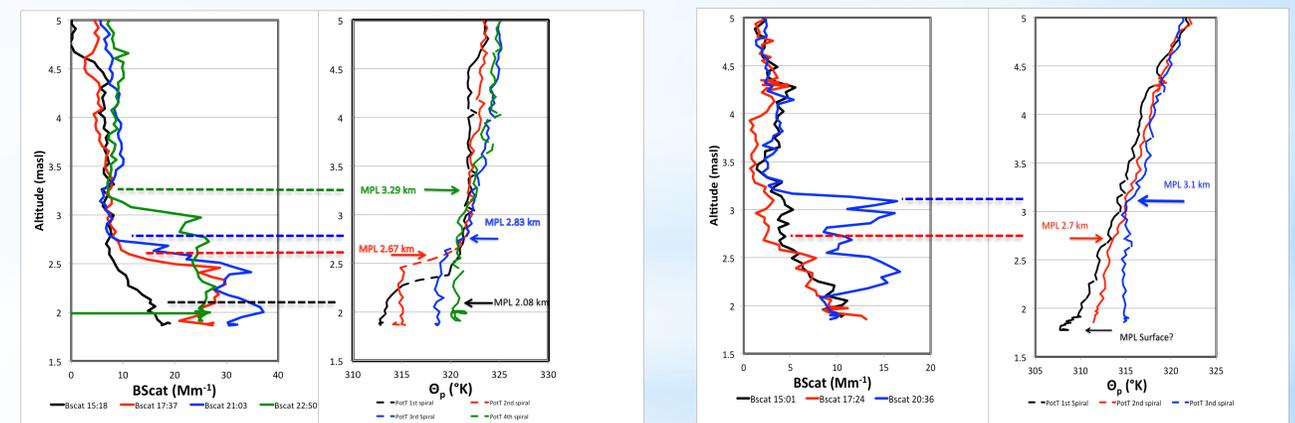
July 22 spirals   August 2 Spirals

Overall comparison of PBLH Between Sites:

Site altitude (1851m NREL, 1576m FC, 1522m FC matters) for low PBLs. NREL always starts higher forcing slopes and intercepts. Overall though, for 10 of 14 days correlation exists and slopes of PV/NREL > FC/NREL.

MPL PBL Heights

NREL vs Fort Collins (red)
NREL vs Platteville (black)

	Fort Collins						Platteville					
	Int.	+/-	Slope	+/-	r^2	N	Int.	+/-	Slope	+/-	r^2	N
17-Jul	1.02	0.04	0.56	0.01	0.74	560	na	na	na	na	na	na
22-Jul	1.38	0.04	0.43	0.01	0.63	523	-0.88	0.1	1.41	0.04	0.72	531
27-Jul	1.74	0.09	0.33	0.03	0.35	363	1.72	0.07	0.41	0.03	0.31	527
28-Jul	0.98	0.08	0.54	0.03	0.46	483	-1.24	0.22	1.54	0.07	0.48	483
29-Jul	0.77	0.14	0.74	0.04	0.37	479	-0.34	0.20	1.12	0.06	0.41	479
31-Jul	1.55	0.39	0.57	0.12	0.09	219	1.86	0.10	0.45	0.03	0.29	447
2-Aug	1.66	0.06	0.42	0.02	0.54	431	1.39	0.11	0.71	0.04	0.49	431
3-Aug	1.39	0.06	0.43	0.02	0.58	418	-0.67	0.18	1.36	0.06	0.57	416
4-Aug	1.20	0.07	0.65	0.02	0.64	419	0.48	0.13	0.85	0.04	0.48	419
10-Aug							0.32	0.07	0.95	0.02	0.78	468
Summary	1.30	0.11	0.52	0.03	0.49	433	0.29	0.13	0.98	0.04	0.50	467

Basic linear regression