Measurements of the Boundary Layer at Mauna Loa Observatory, Hawaii

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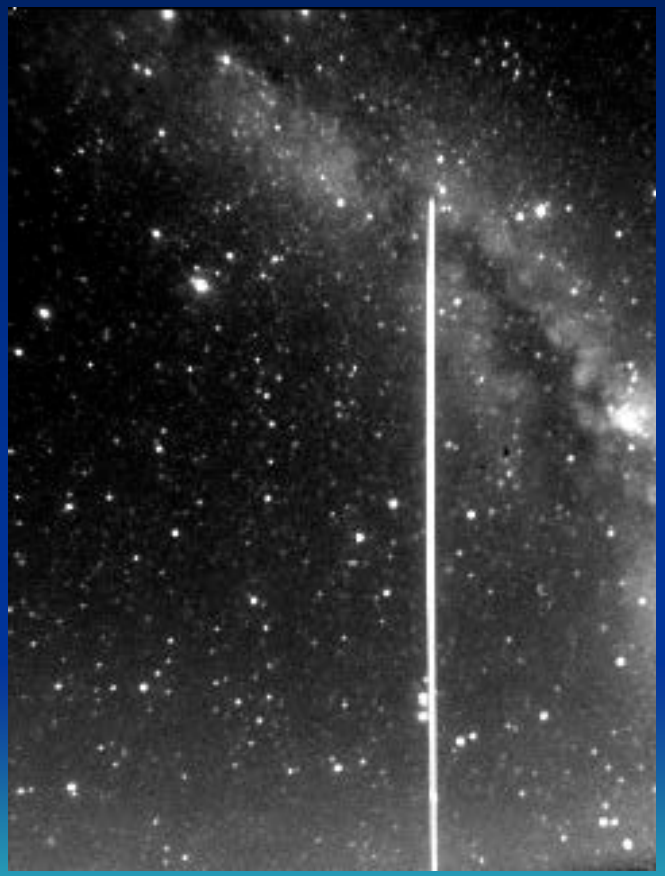


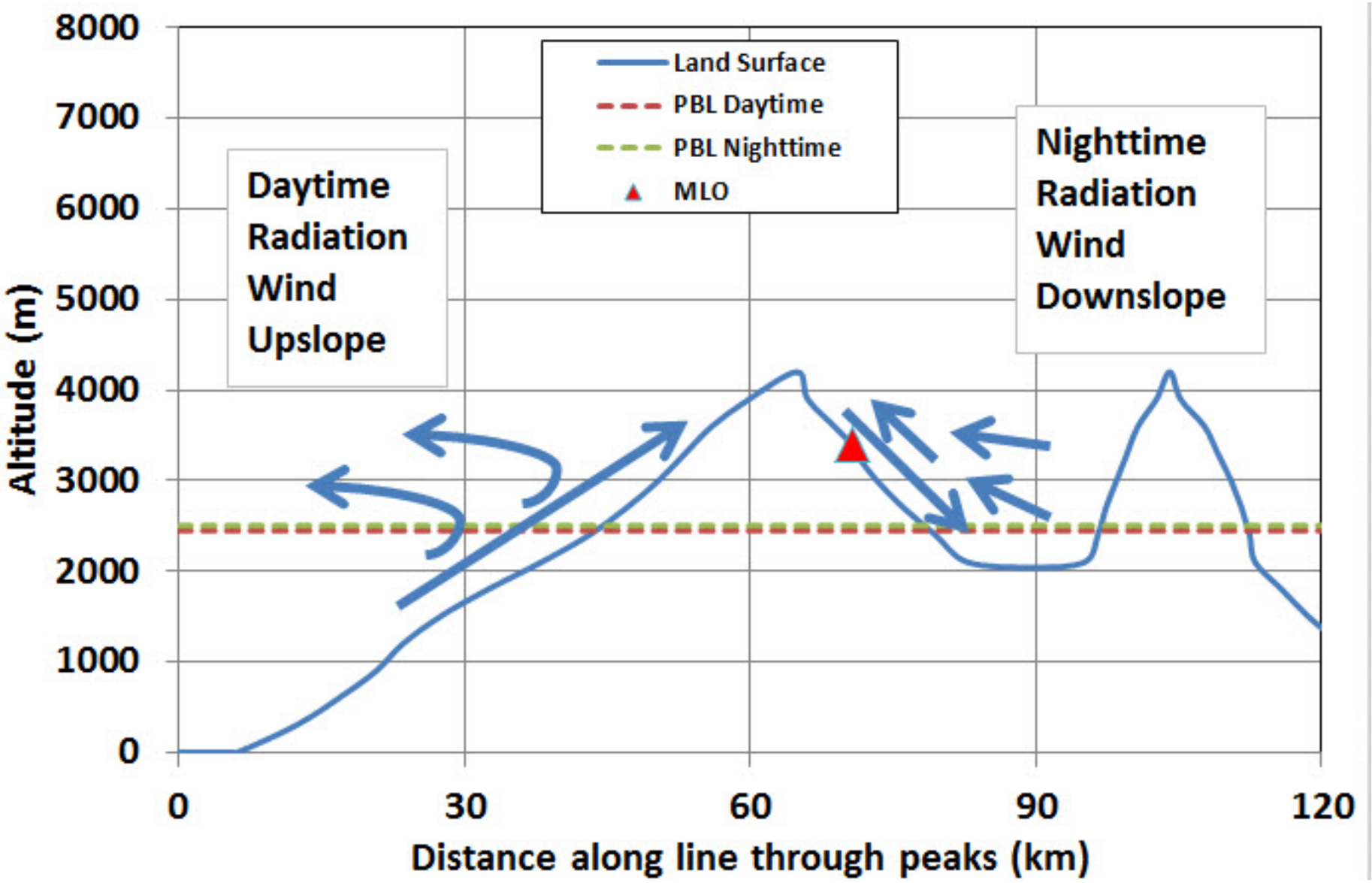
We would like to acknowledge:

GMD Aerosol group
GMD Global Radiation group
Early and present Mauna Loa Observatory Staff

Earlier work on MLO Boundary Layer:

Bernard Mendonca, Characterized Upslope/Downslope with tethered balloon (J. Appl. Meteor. 1969)

Steve Ryan, barrier wind effect, source altitudes of MLO air (JGR, 1997)


8000
7000
6000
5000
4000
3000
2000
1000
0
Altitude (m)
0
30
60
90
120
Distance along line through peaks (km)
Land Surface
PBL Daytime
PBL Nighttime
MLO
Daytime
Radiation
Wind
Upslope
Nighttime
Radiation
Wind
Downslope

Medonca, J. Appl. Meteor. 1969

Tethered balloon measurement of morning transition

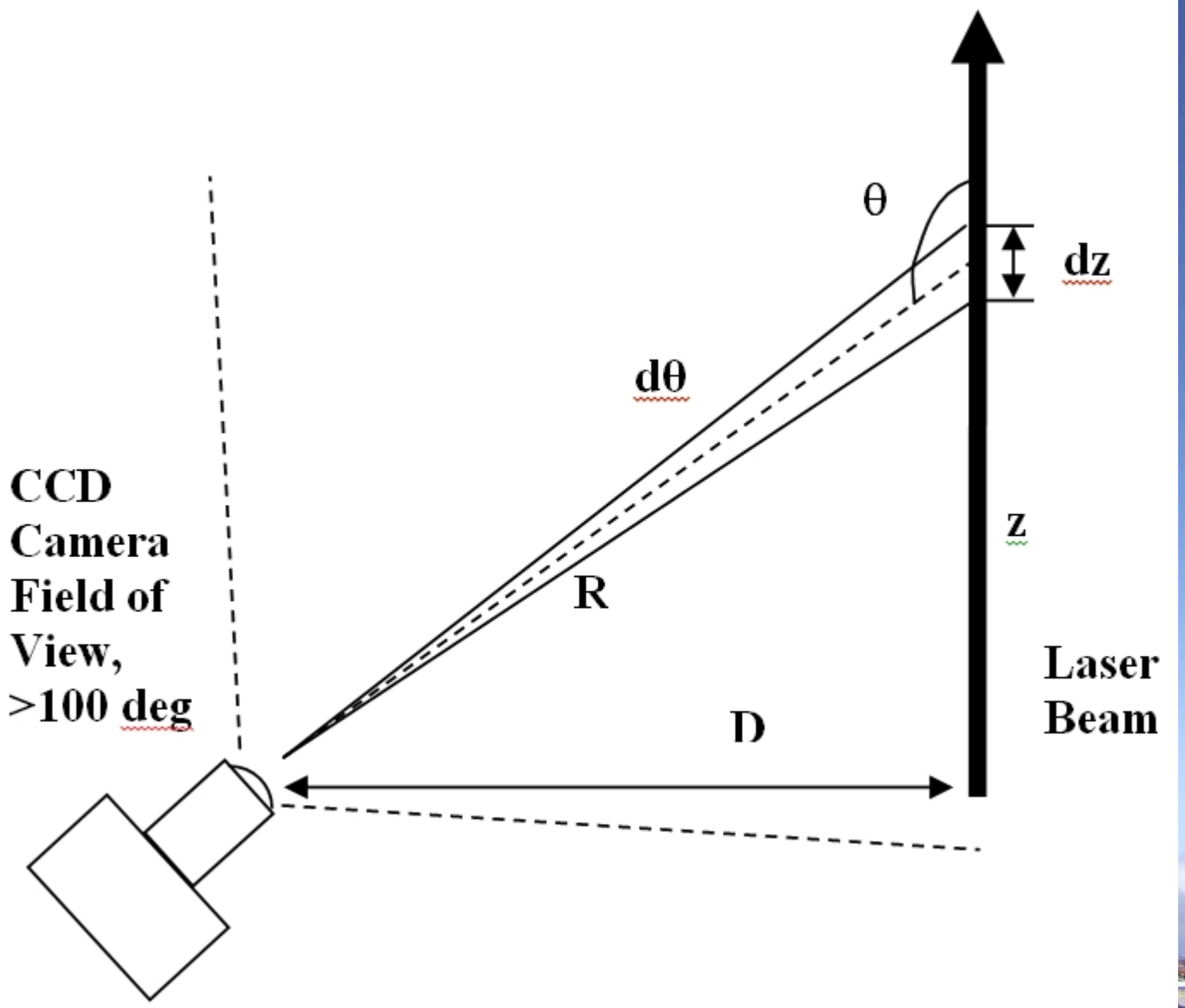
Daytime (Upslope) layer 7 X thicker than Nighttime (Downslope)

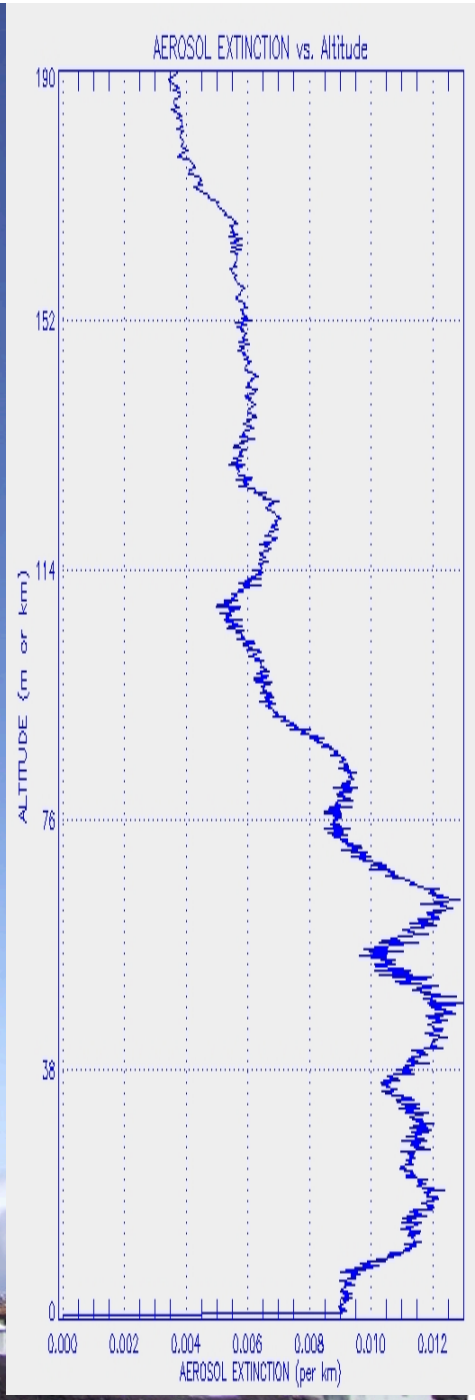
Ryan, JGR, 1997

Daytime source region below MLO: 90% of time

Nighttime source region below MLO: 60% of time

View of MLO Looking West

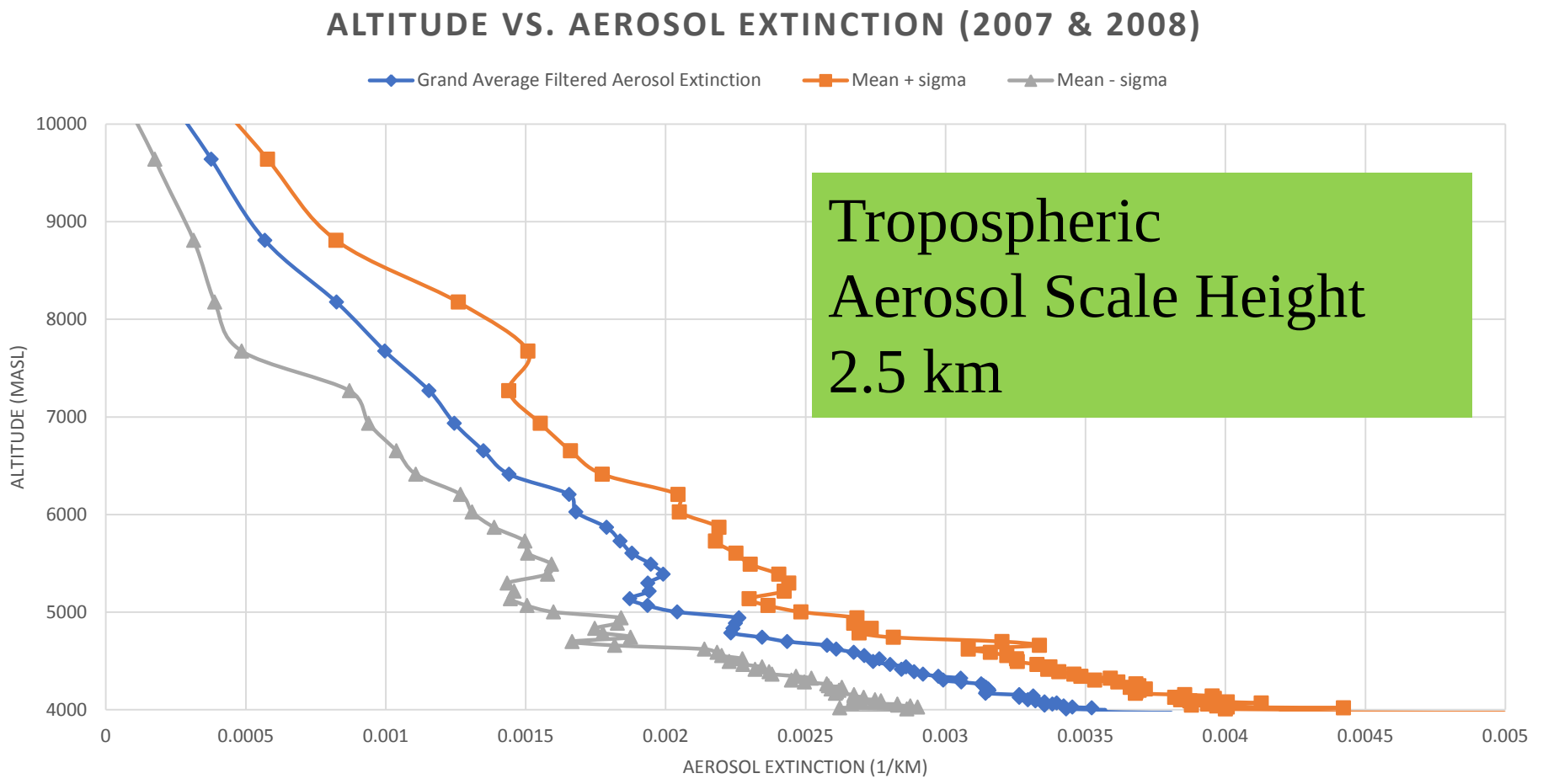


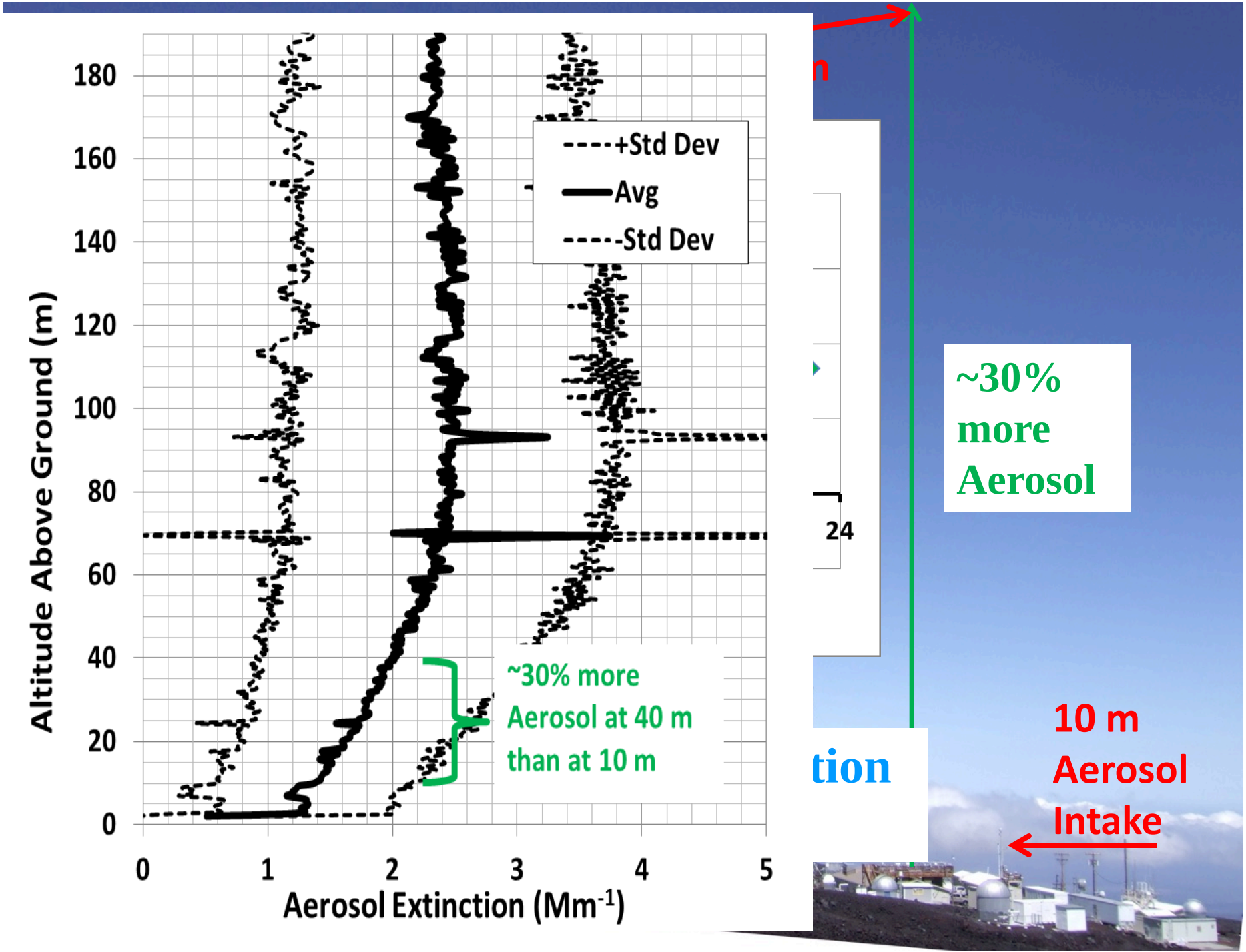


Aerosol Measurements Over Mauna Loa Observatory

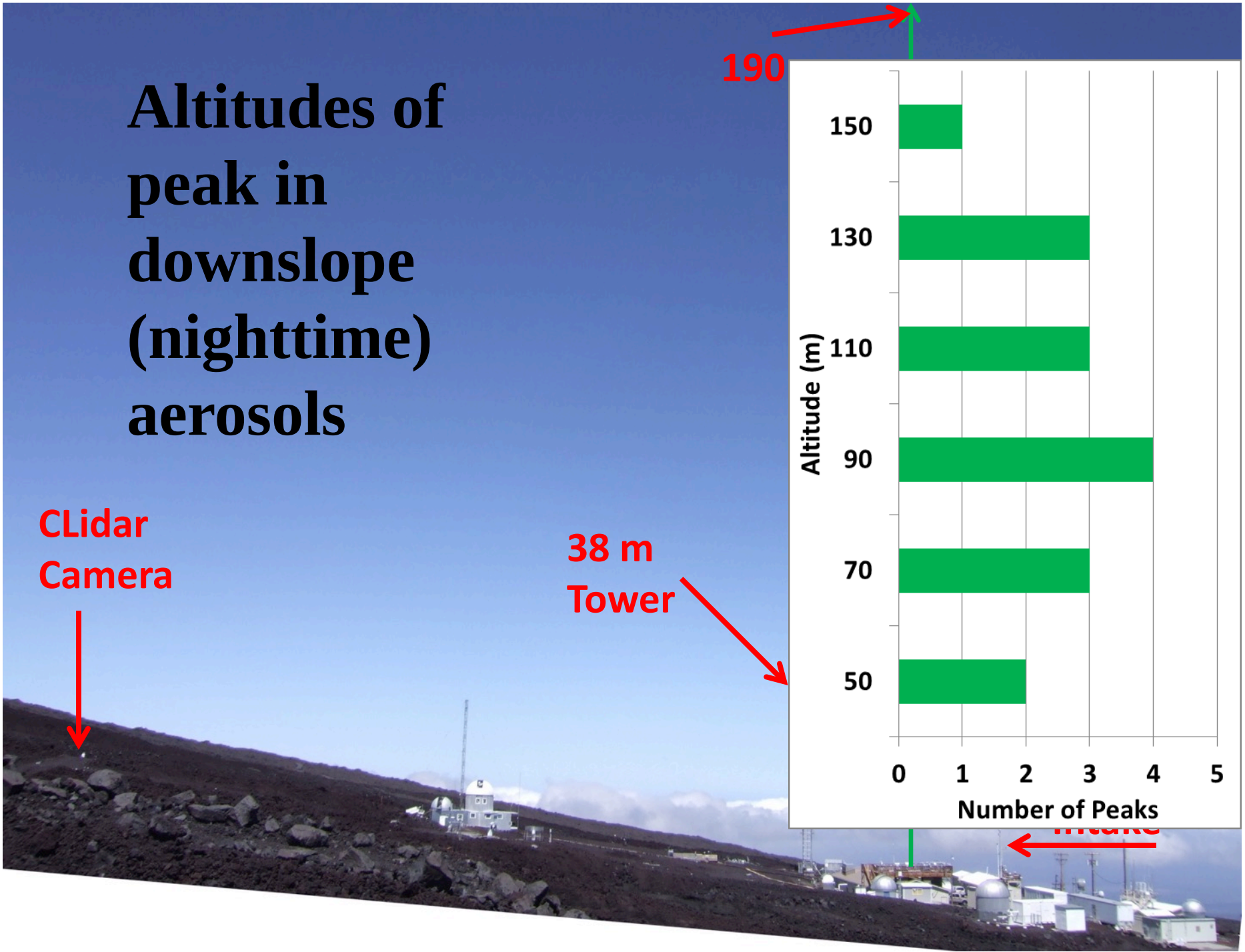
Nimmi C. P. Sharma, John E. Barnes

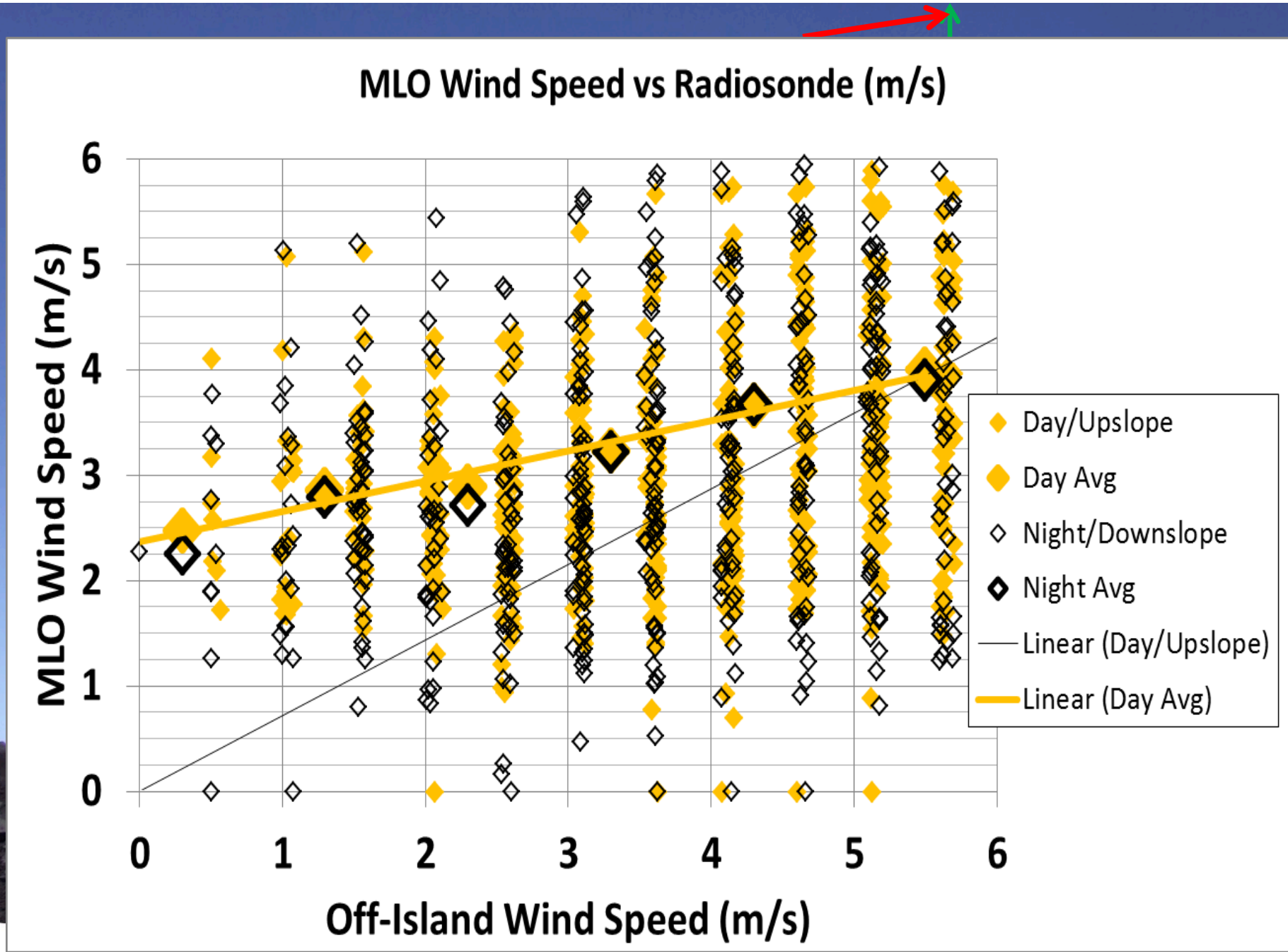
Poster Session

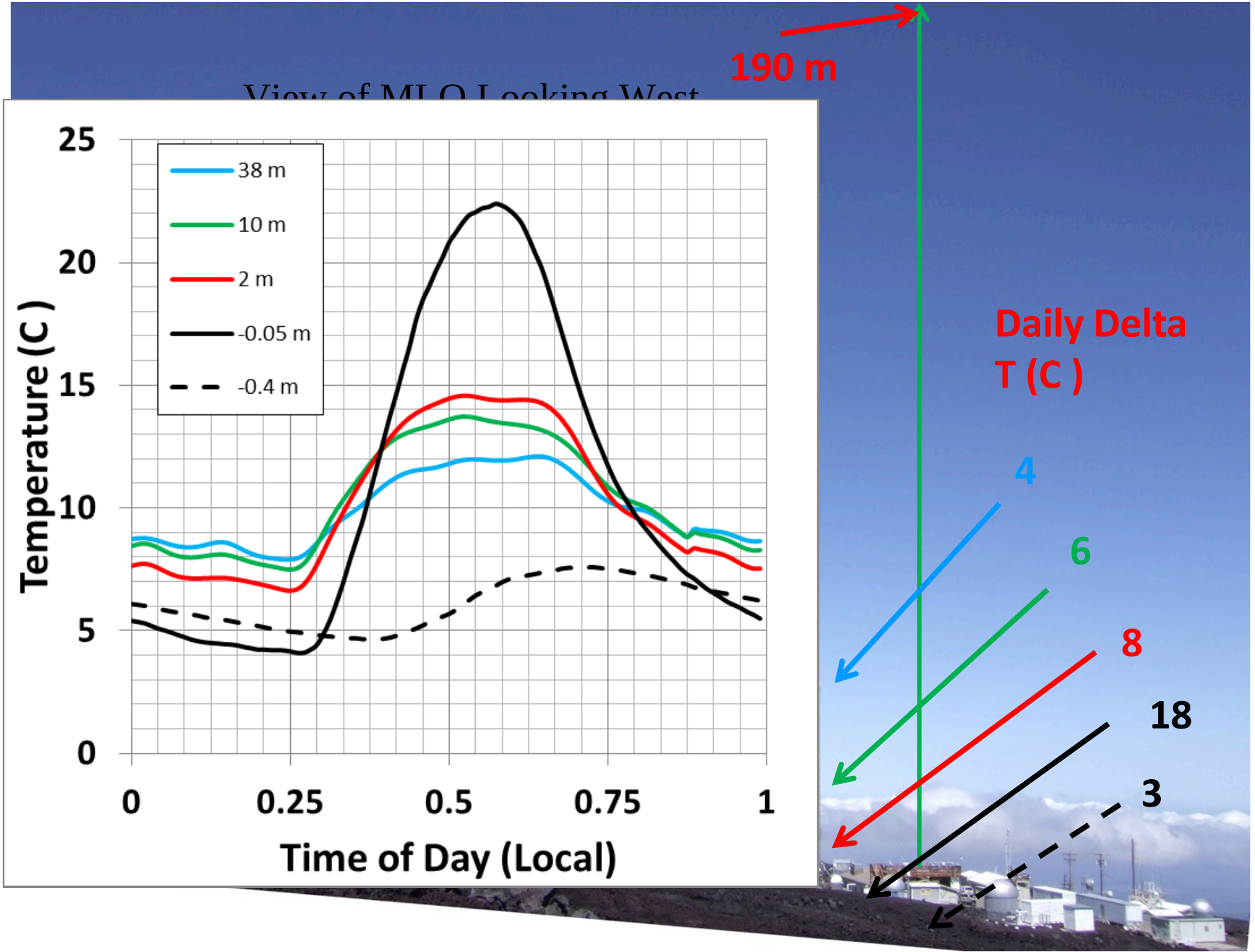


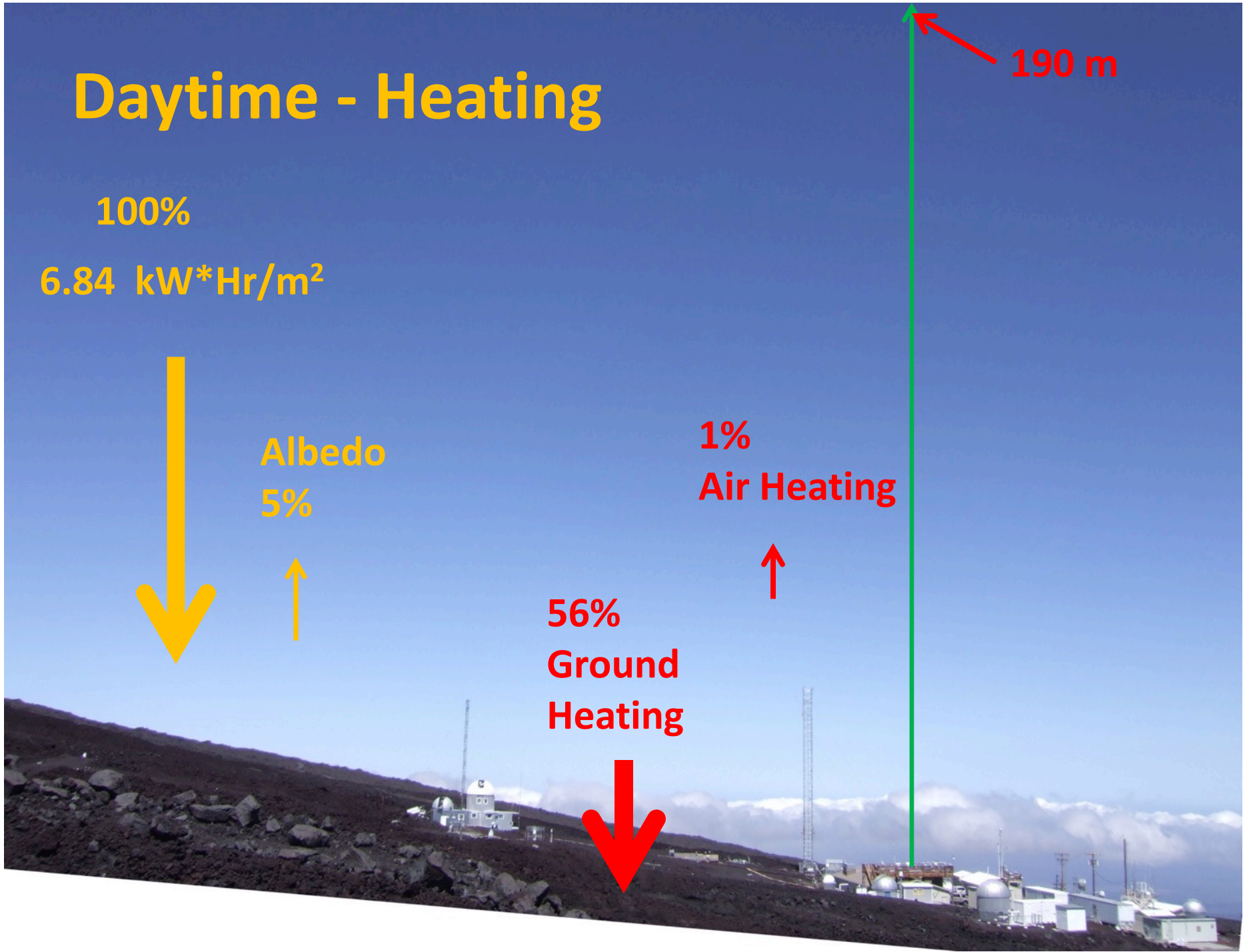

Altitude Above Ground (m)
0
20
40
60
80
100
120
140
160
180
0
1
2
3
4
5
Aerosol Extinction (Mm-1)
----+Std Dev
Avg
----Std Dev
~30% more
Aerosol at 40 m
than at 10 m
24
~30%
more
Aerosol
10 m
Aerosol
Intake

Altitudes of peak in downslope (nighttime) aerosols



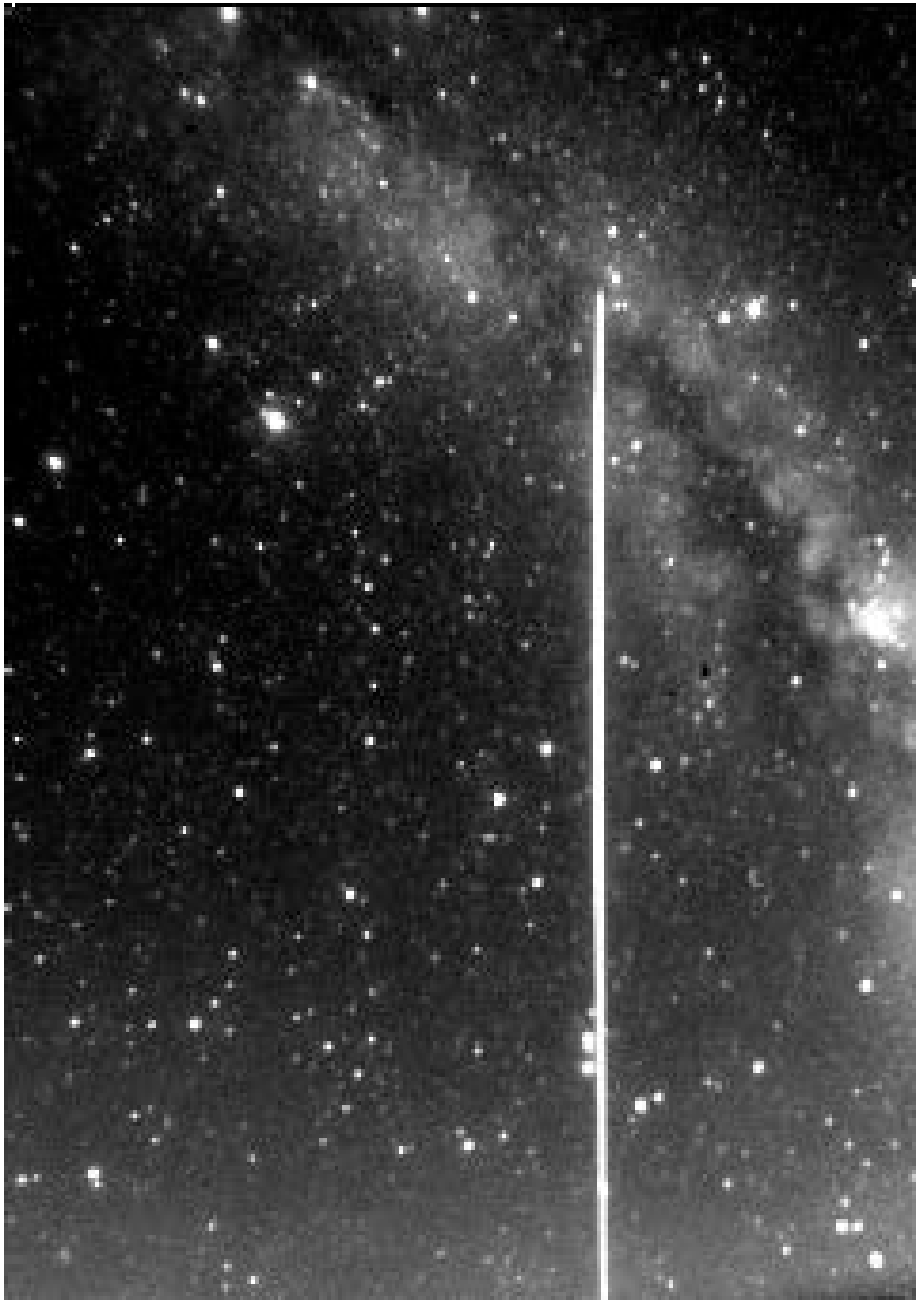

MLO Wind Speed vs Radiosonde (m/s)
MLO Wind Speed (m/s)
0
1
2
3
4
5
6
Off-Island Wind Speed (m/s)
Day/Upslope
Day Avg
Night/Downslope
Night Avg
Linear (Day/Upslope)
Linear (Day Avg)


190 m
Daily Delta T (C)
4
6
8
18
3
Temperature (C)
25
20
15
10
5
0
38 m
10 m
2 m
-0.05 m
-0.4 m
0
0.25
0.5
0.75
1
Time of Day (Local)


Daytime - Heating
100%
6.84 kW*Hr/m²
Albedo
5%
1%
Air Heating
56%
Ground
Heating
190 m

Possible future work:

Wind profiler
Better Lava temperature measurements



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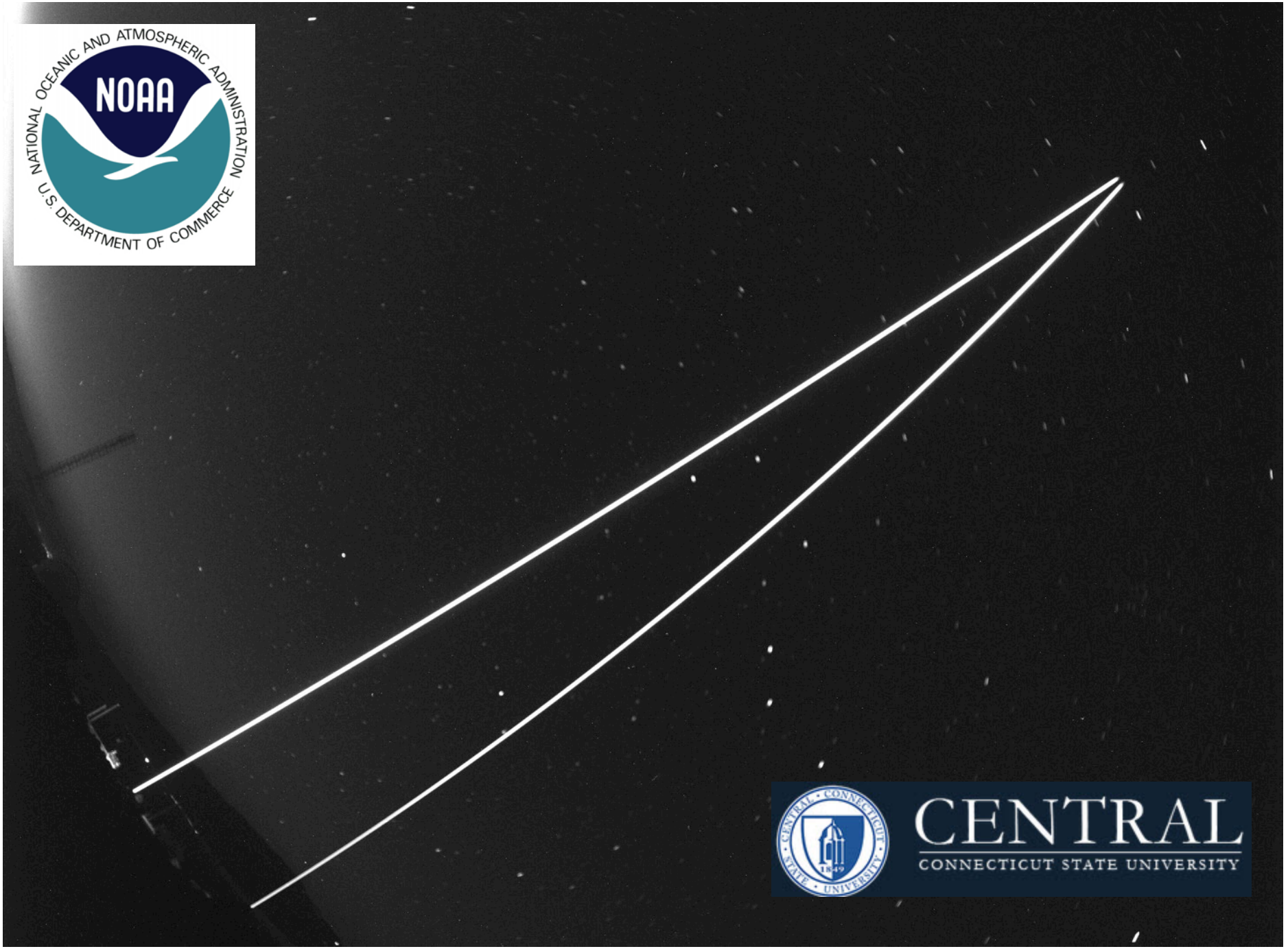
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NASA/CALIOP Space Lidar, Aerosol Phase Functions