Comparison between Atmospheric Boundary Layer Height remote sensing-retrievals over a complex topography

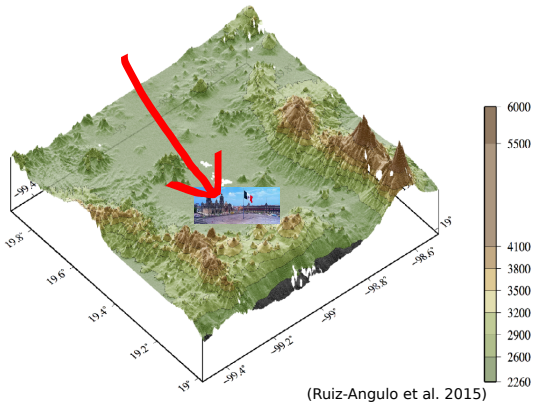
Andrea Burgos Cuevas

A. Magaldi-Hermosillo, D. Adams, J.L. García-Franco, M. Grutter de la Mora, A. Ruiz-Angulo

National University Autonomous of Mexico (UNAM)

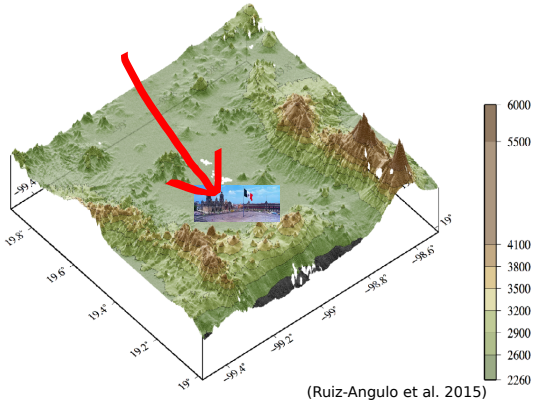
University of Cologne

Mexico City, complex terrain



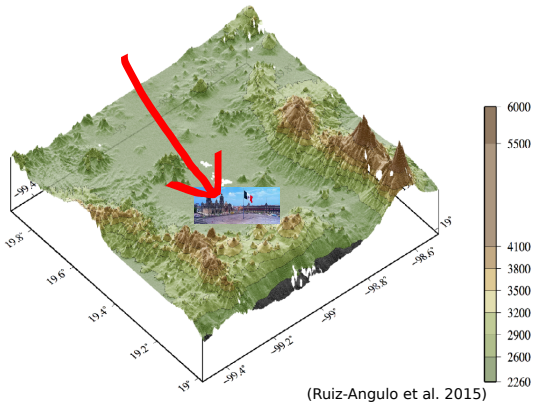
(Ruiz-Angulo et al. 2015)

Mexico City, complex terrain

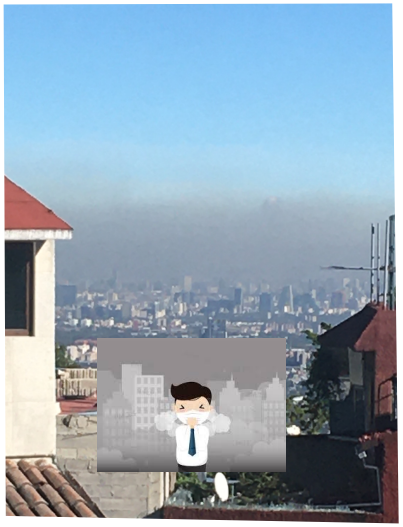


(Ruiz-Angulo et al. 2015)

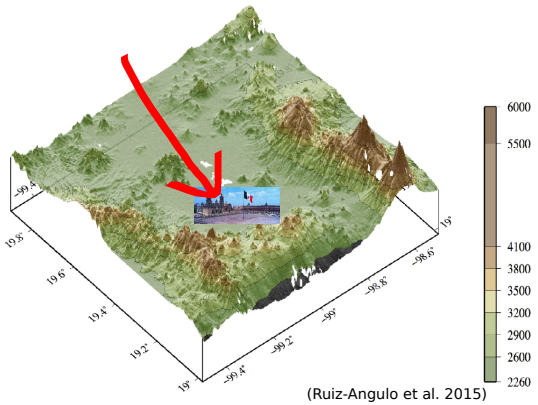
Mexico City, complex terrain



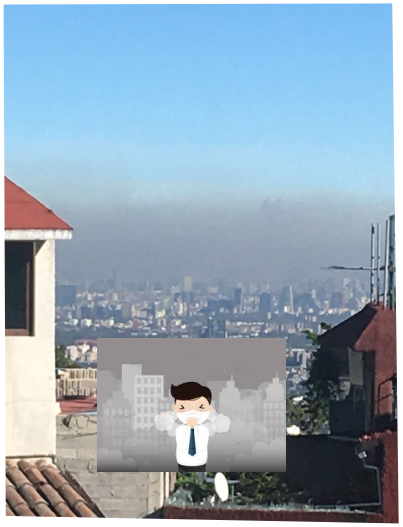
(Ruiz-Angulo et al. 2015)

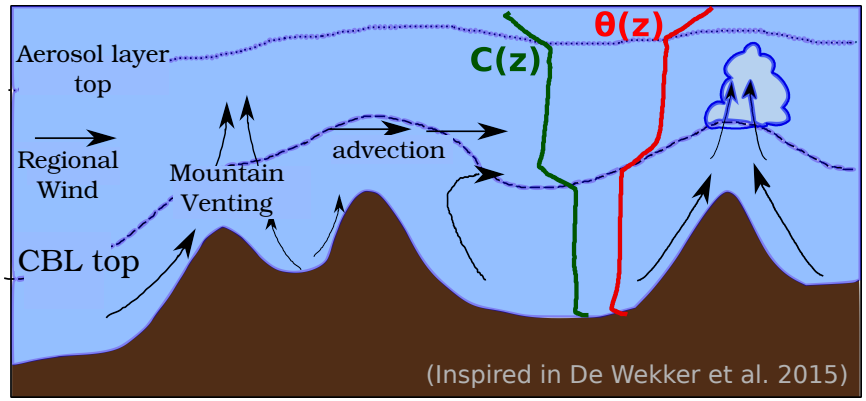


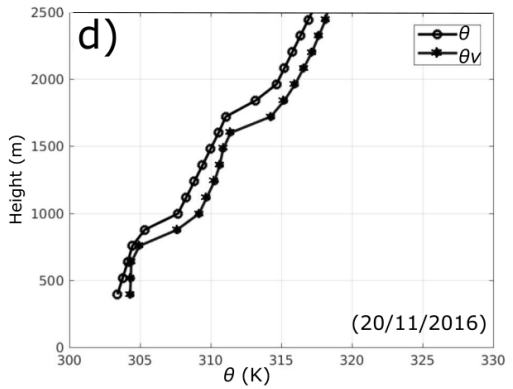
Mexico City, complex terrain



(Ruiz-Angulo et al. 2015)







(Burgos-Cuevas et al. 2021)

Approaching ABLH

One year (Nov 2018- Oct 2019) data from:

Radiosonde stable layers

- Thermally stable layers 250-3000 m a.g.l. at 0600 and 1800 h local time.

Approaching ABLH

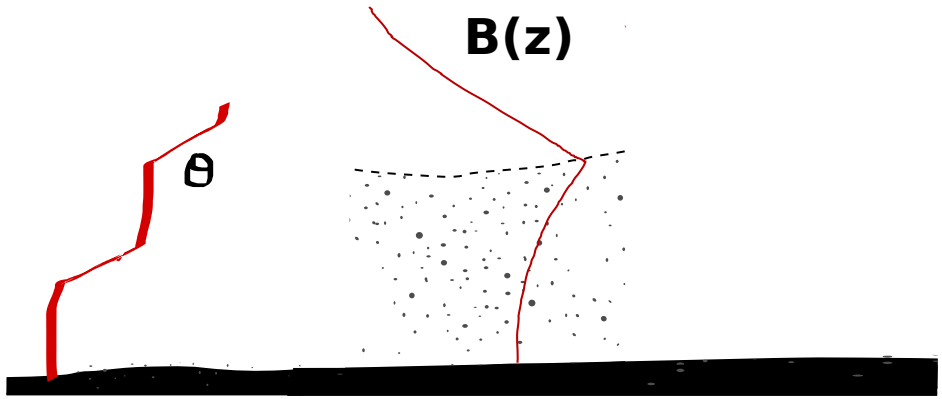
One year (Nov 2018- Oct 2019) data from:

Radiosonde stable layers

- Thermally stable layers 250-3000 m a.g.l. at 0600 and 1800 h local time.

Ceilometer backscatter

- Gradient and wavelet methods [Garcia-Franco et al. 2018] (every 10 min).



Approaching ABLH

One year (Nov 2018- Oct 2019) data from:

Radiosonde stable layers

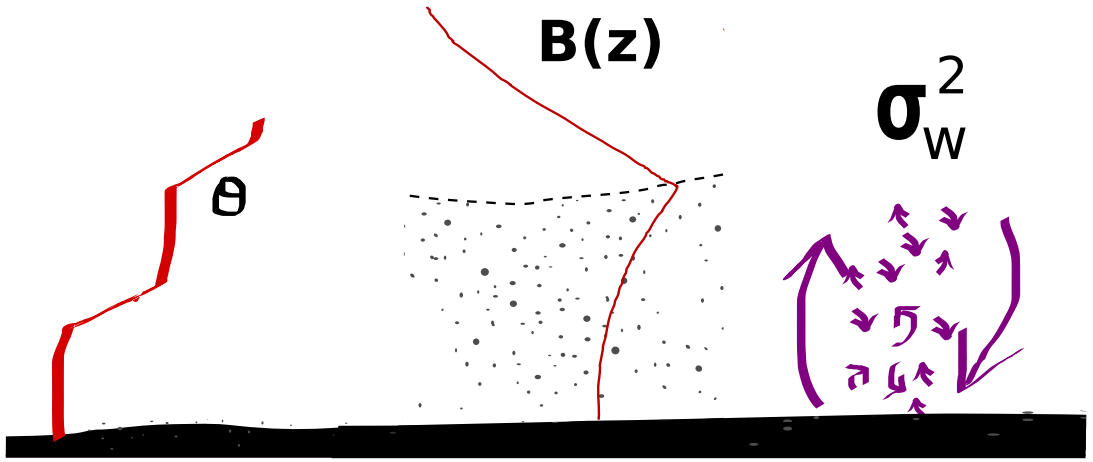
- Thermally stable layers 250-3000 m a.g.l. at 0600 and 1800 h local time.

Ceilometer backscatter

- Gradient and wavelet methods [Garcia-Franco et al. 2018] (every 10 min).

Doppler lidar velocities

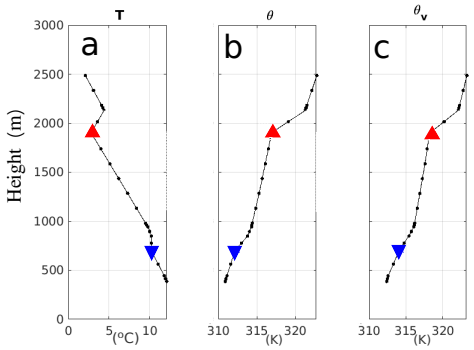
- Turbulence threshold method: $\sigma_w^2 < 0.1 m^2 s^{-2}$, $\sigma_w^2 < 0.2 m^2 s^{-2}$ (Twice-an-hour).



Stability, Backscatter and σ_w^2

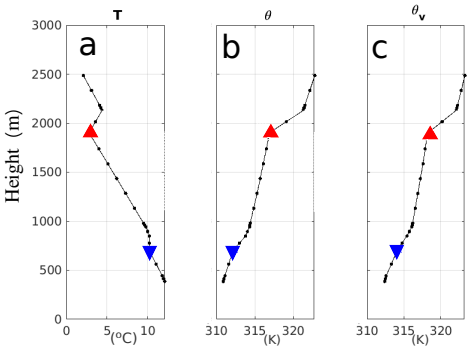
Stable layers (radiosonde)

Backscatter (ceilometer)

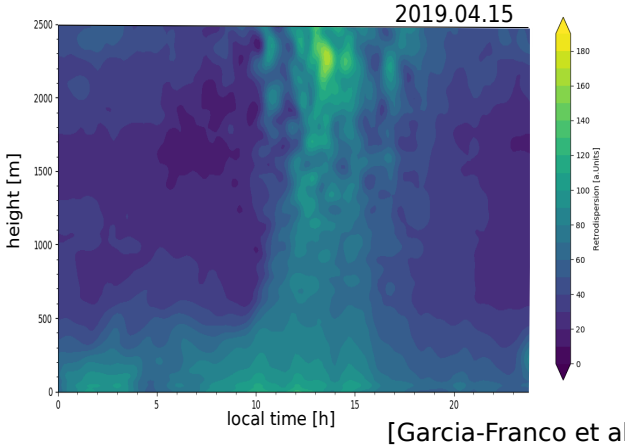


Stability, Backscatter and σ_w^2

Stable layers (radiosonde)



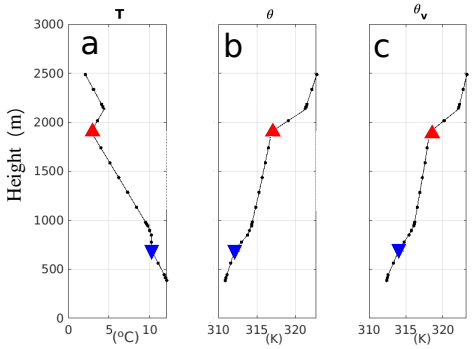
Backscatter (ceilometer)



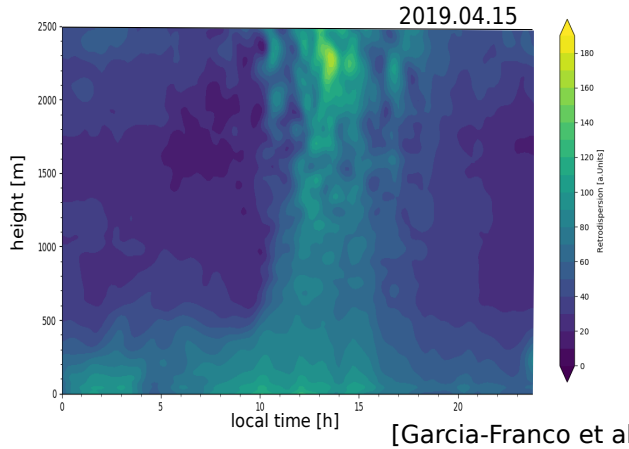
[Garcia-Franco et al. 2018]

Stability, Backscatter and σ_w^2

Stable layers (radiosonde)

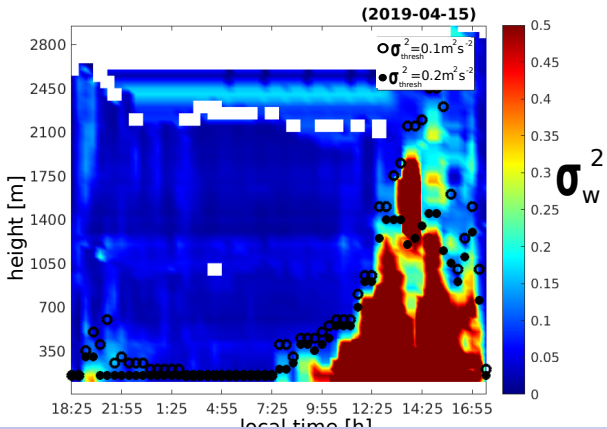


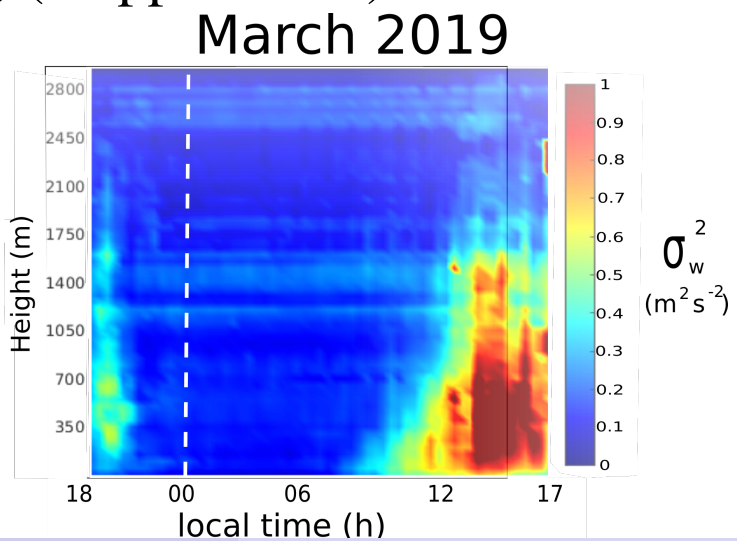
Backscatter (ceilometer)



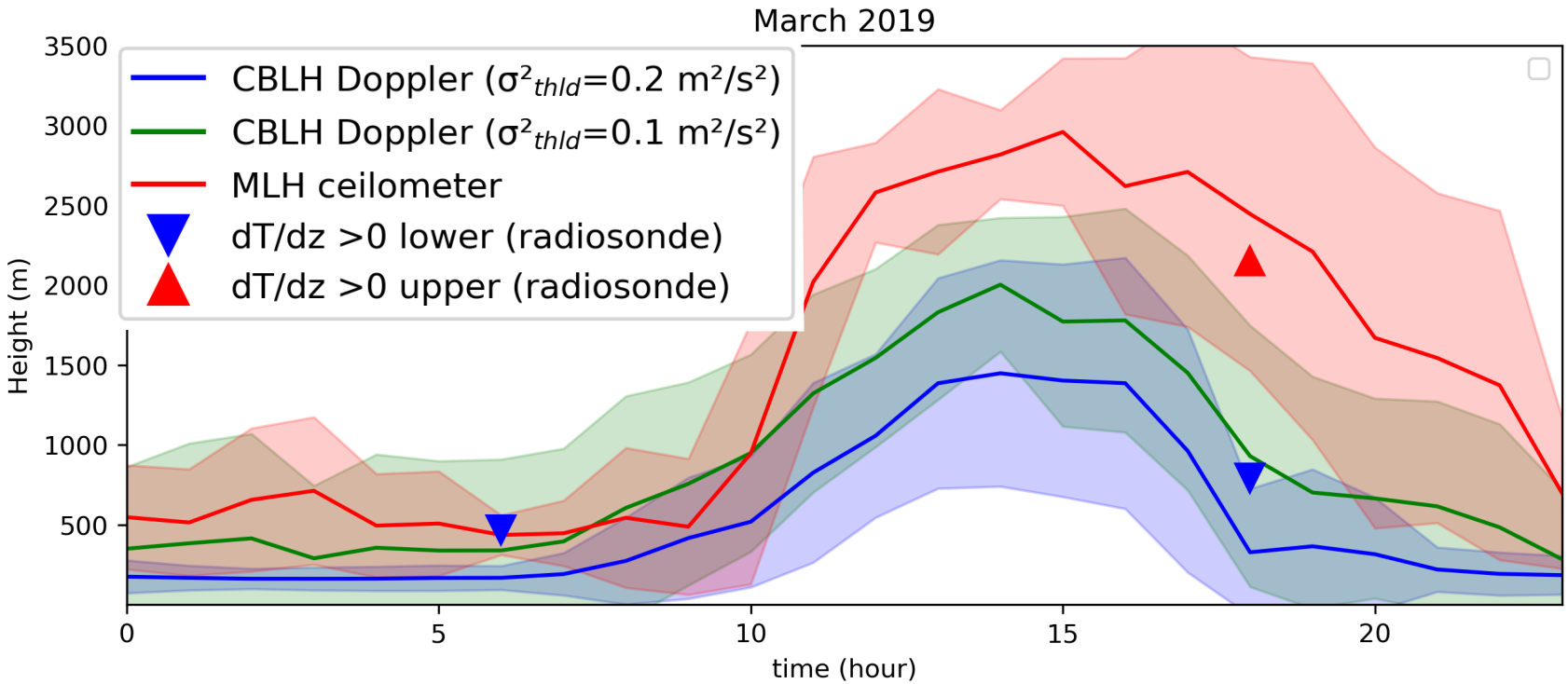
[Garcia-Franco et al. 2018]

Variance of vertical velocity, σ_w^2, (Doprler lidar)

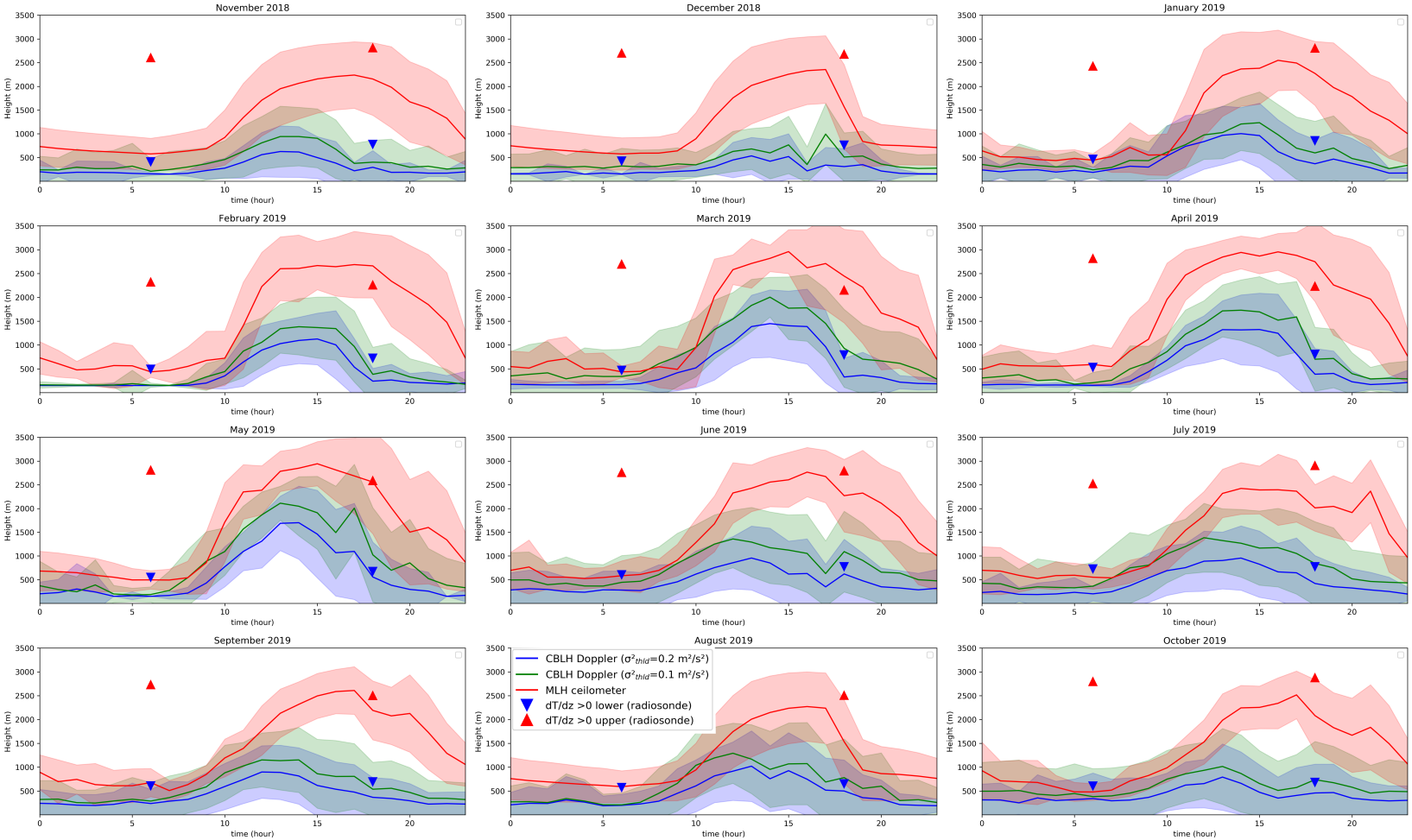




ABL heights retrieved by all methods (diurnal cycle)



Monthly-mean diurnal cycle (Nov 2018-Oct 2019)



Conclusions

- ABLHs estimated via thresholding (with Doppler lidar data) and via backscatter (with ceilometer data) both reproduce a physically realistic diurnal cycle.
- However, the daytime thresholding-estimated heights are always lower than the ceilometer-retrieved ones.
- The difference between both remote sensing estimations suggests that aerosols may be able to disperse upper in the atmosphere than where the current convective turbulence is reached.

Conclusions

- ABLHs estimated via thresholding (with Doppler lidar data) and via backscatter (with ceilometer data) both reproduce a physically realistic diurnal cycle.
- However, the daytime thresholding-estimated heights are always lower than the ceilometer-retrieved ones.
- The difference between both remote sensing estimations suggests that aerosols may be able to disperse upper in the atmosphere than where the current convective turbulence is reached.

Thanks for your attention!