

What's going on above Zagreb

Jadran Jurković

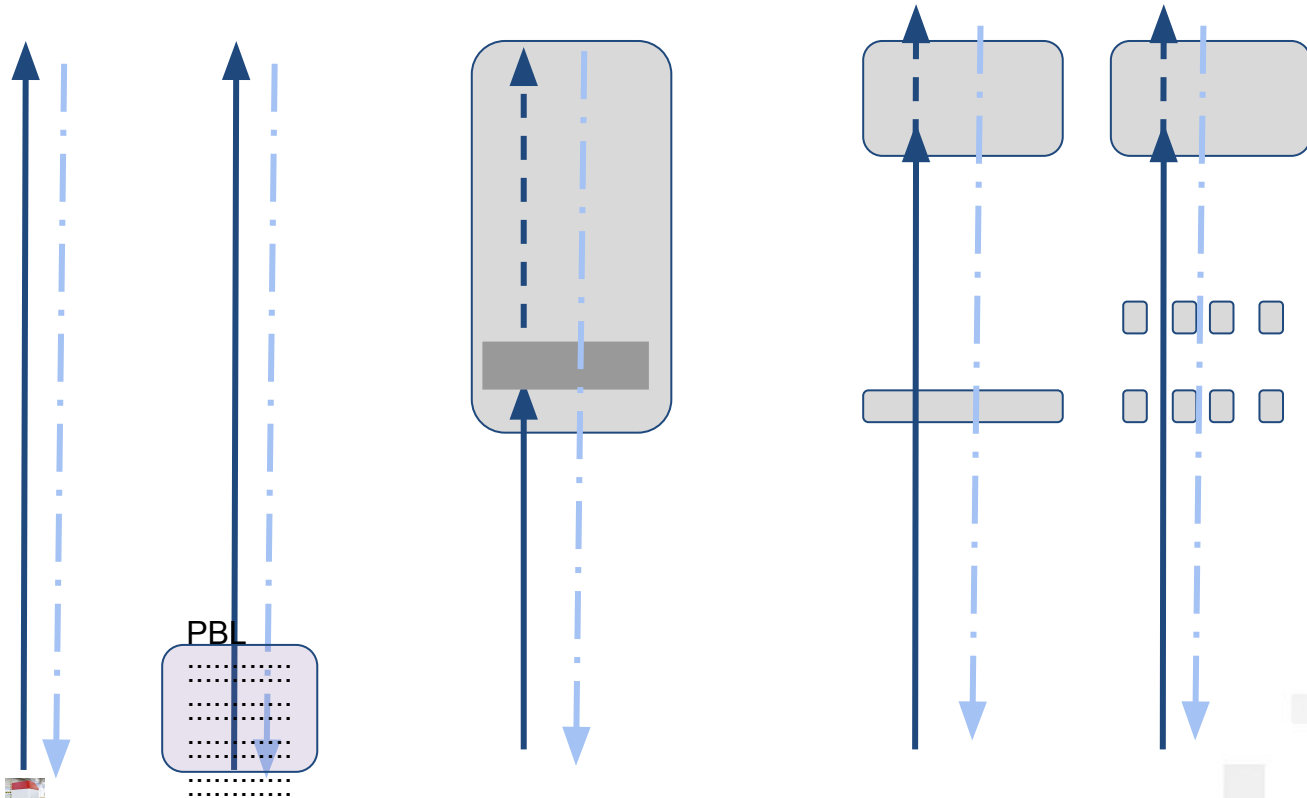
Lufft Ceilometer CHM 15k

- Zagreb Maksimir, 123m AMSL
- detection: aerosol backscatter profile, cloud base height, cloud penetration depth, aerosol layer height, cloud cover, vertical visibility, Sky Condition Index
- “one-wavelength backscatter lidar”
- vertical range 15km
- [manual](#)





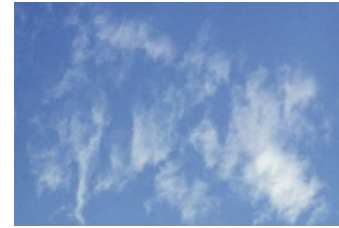
How it works?



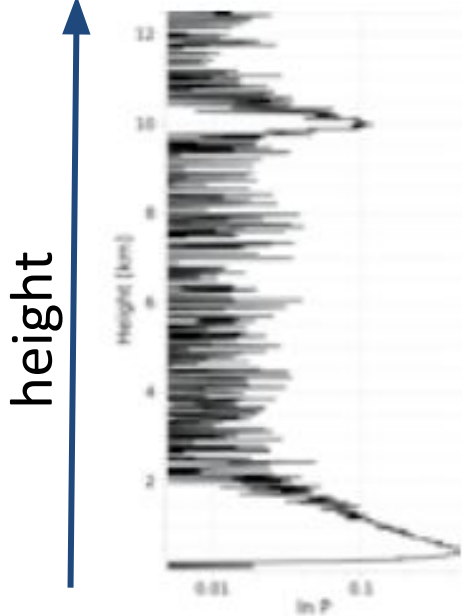
Challenges in meteorology 7
4-5 November 2020., Zagreb



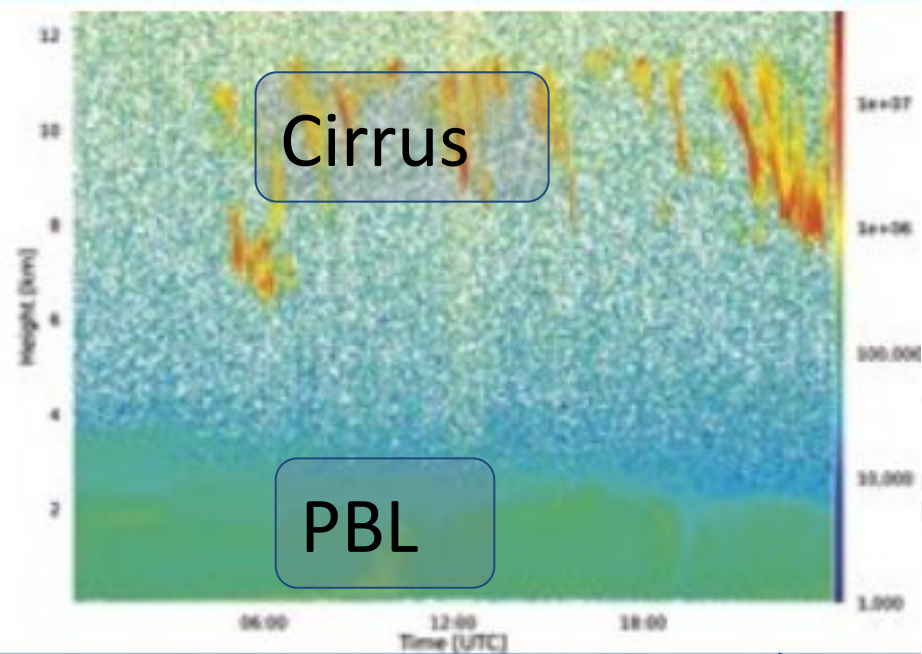
Example *Lufft manual*



1 profile



n-profiles





Ceilometer data

DHMZ

Introduce new data

Programming & visualization 

Monitoring weather and new data

Prepared cases for forecasters

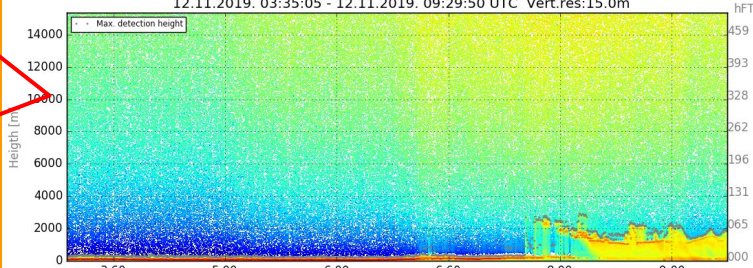


Current view

"raw data" normalized profile

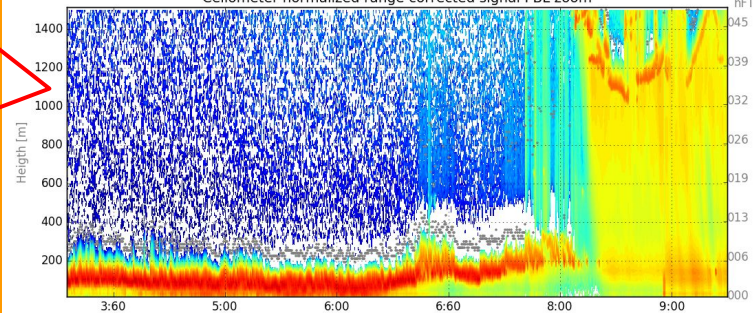
Zagreb-Maksimir 14240 Ceilometer view

Ceilometer normalized range corrected signal TROPOSPHERE
12.11.2019. 03:35:05 - 12.11.2019. 09:29:50 UTC Vert.res:15.0m



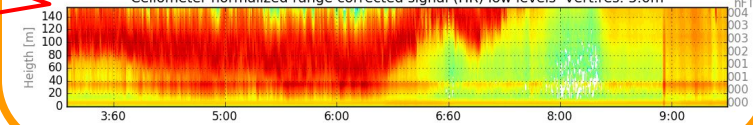
15km (dz~15m)
T: 6h (dt~5min)

Ceilometer normalized range corrected signal PBL zoom



PBL ZOOM
1.5km (dz~15m)
T: 6h (dt~5min)

Ceilometer normalized range corrected signal (HR) low levels Vert.res: 5.0m



155m (dz~5m)
T: 6h (dt~5min)

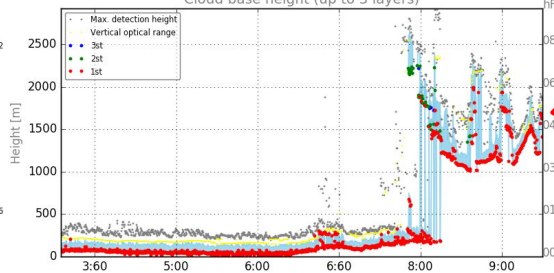


Last derived cloud layers :
3rd: base top
2nd:
1st: 047 hFT 1411 m 058 hFT 1739 m
total cl.cover : 8/8
base cl.cover : 8/8

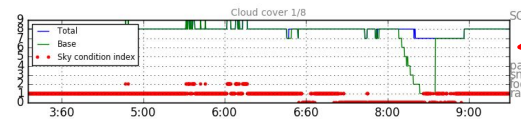
Zagreb Maksimir 2019 Act: 123m
Ceilometer CHM 15k Laser wavelength: 1064nm
Vert.res HR low: 4.99m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=18.0°C T_int=20.0°C T_det=25.0°C T_low=34.8°C
Last file: 20191112_zgmaksimir_CHM170118_1125_000.nc

Current cloud layers (derived from Lufft 15k algorithms)

Cloud base height (up to 3 layers)

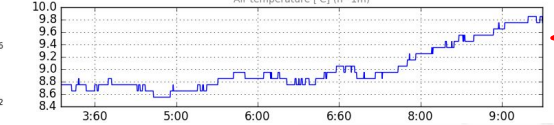


Cloud layers in the last 6 hours



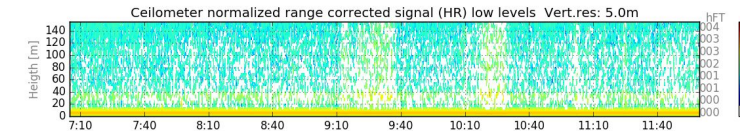
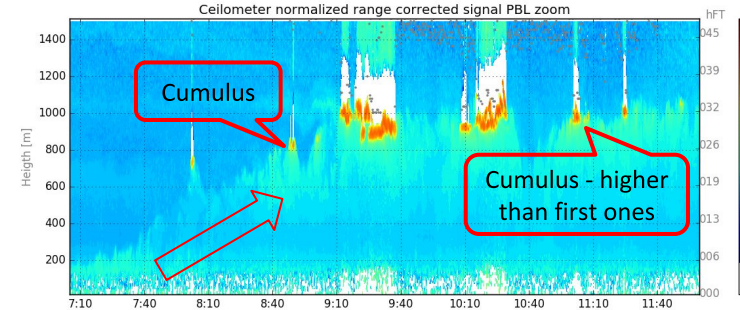
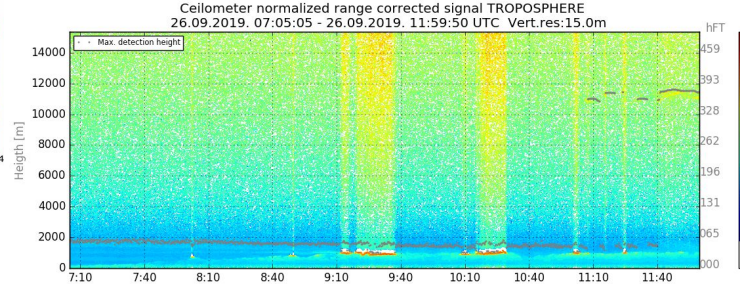
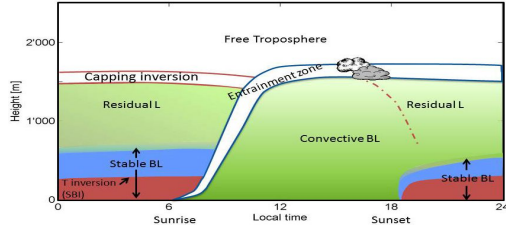
Present weather detector

Air temperature [°C] (h-1m)



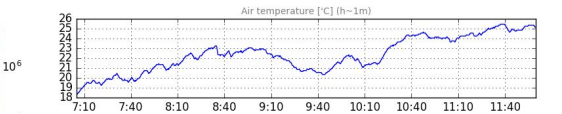
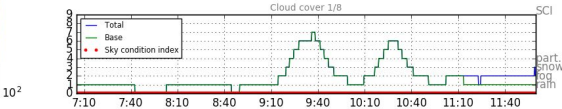
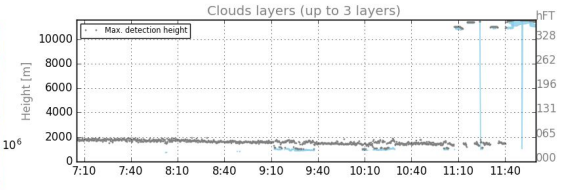
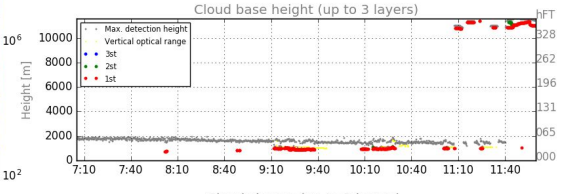
T[°C] 1m

Ex.1 Deepening of convective BL

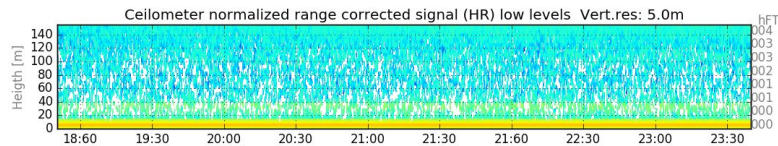
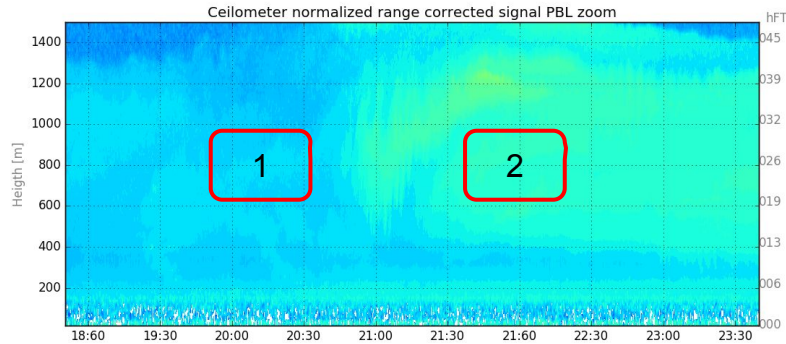
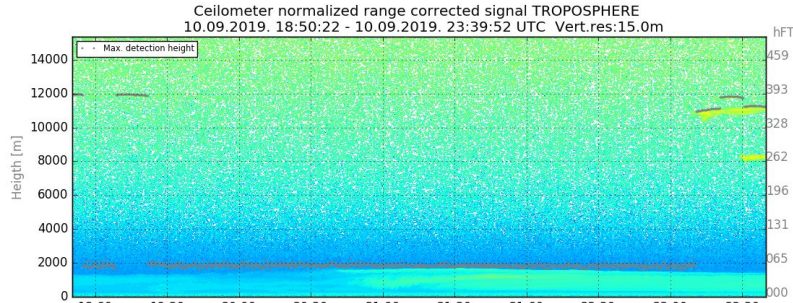


Zagreb Maksimir DHMZ Alt: 123m
Lufft Ceilometer CHM 15k Laser wavelength: 1064nm
Vert.res : 14.98m Max.Height: 15345.0m
Vert.res HR low: 4.99m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=25.0°C T_int=31.0°C T_det=25.0°C T_lom=34.0°C
Last file: 20190926_zgmaksimir_CHM170118_1255_000.nc

Last derived cloud layers :
3rd: base top
2nd: 366 hFT 10999 m 373 hFT 11289 m
1st: total cl.cover : 2/8
base cl.cover : 1/8

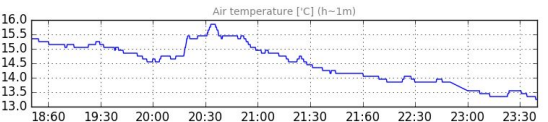
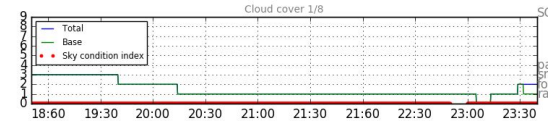
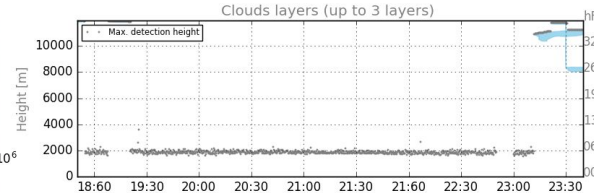
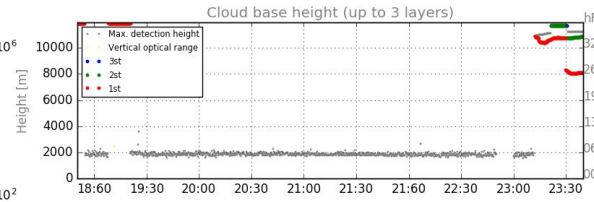


Ex.2 Advection of air with different features



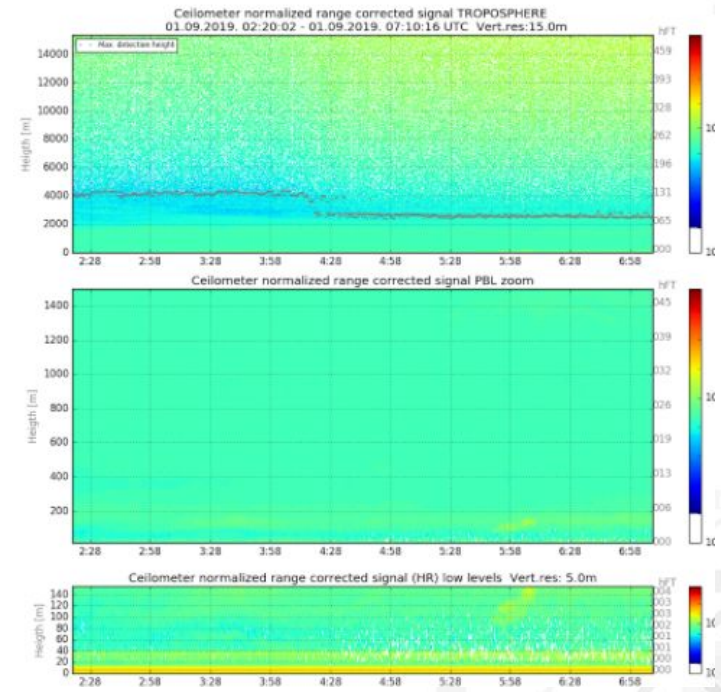
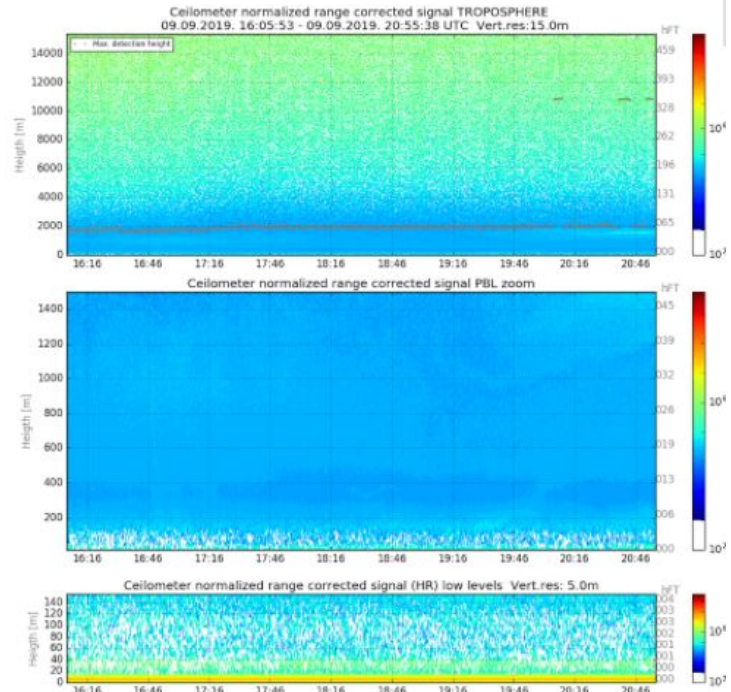
Zagreb Maksimir DHMZ Alt: 123m
Lufft Ceilometer CHM 15K Laser wavelength: 1064nm
Vert.res: 14.98m Max.Height: 15345.0m
Vert.res HR Low: 4.99m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=13.0°C T_int=24.0°C T_det=25.0°C T_Lom=35.0°C
Last file: 20190911_zgmaksimir_CHM170110_0035_000.nc

Last derived cloud layers :
base top
3rd: 362 hFT 10877 m 372 hFT 11179 m
2nd: 269 hFT 8092 m 278 hFT 8364 m
1st: 269 hFT 8092 m 278 hFT 8364 m
VV :
total cl.cover : 2/8
base cl.cover : 1/8



Ex.3 Clean air

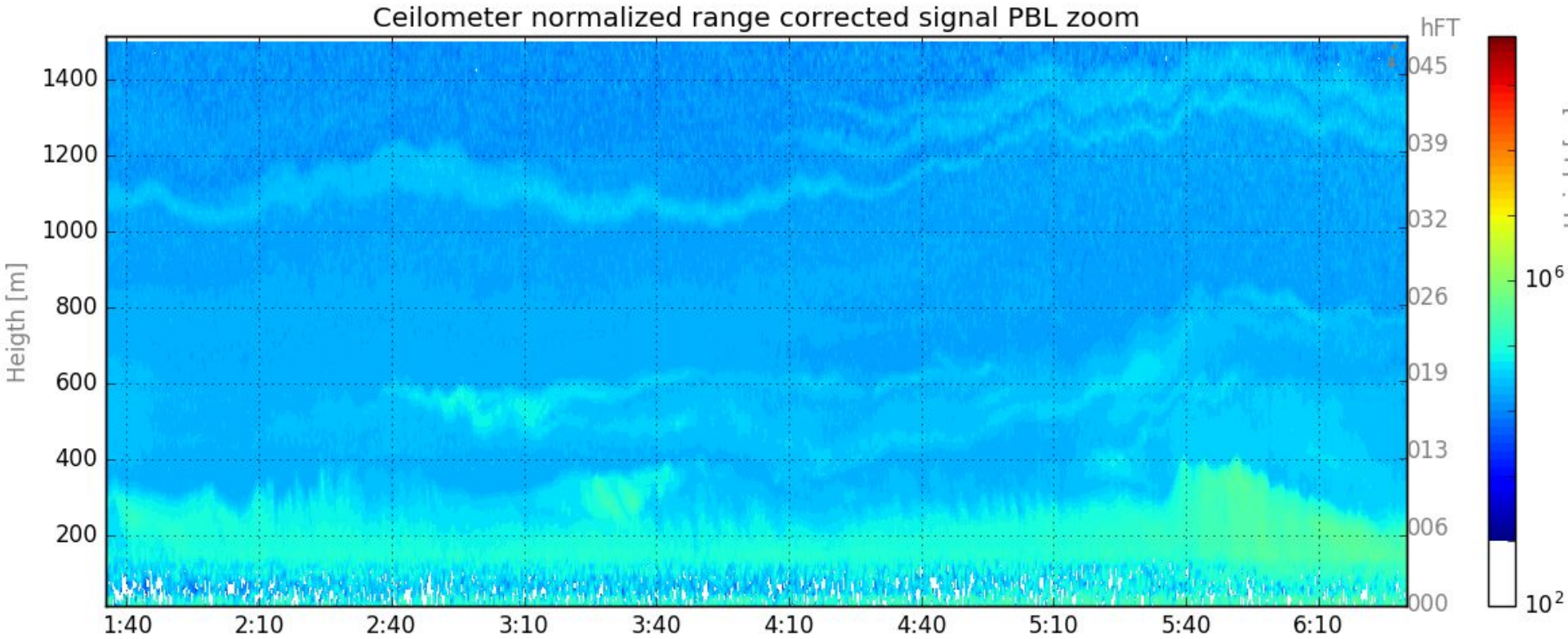
v.s. air with particles



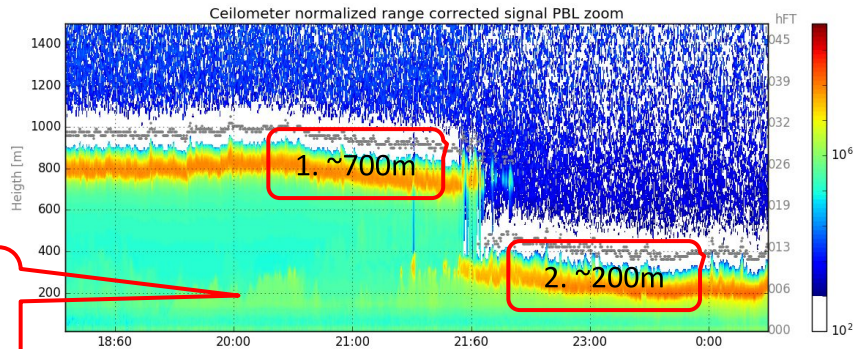
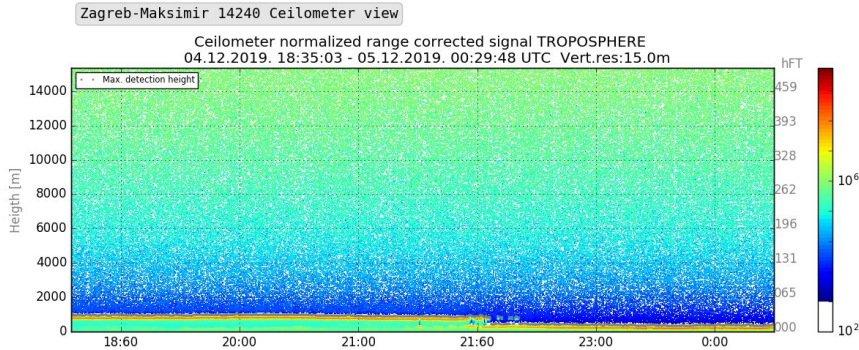
sky clear N=0, visibility 40km
after cold front

sky clear N=0, visibility 15km
old anticyclone

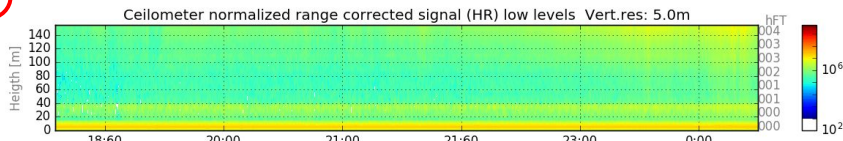
Ex.4 different stable layers



Ex.5 Two stratus layers



Nearly saturated
(not yet cloud)



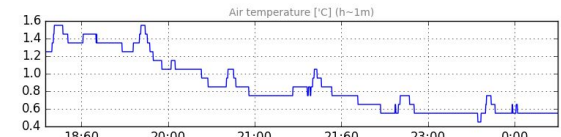
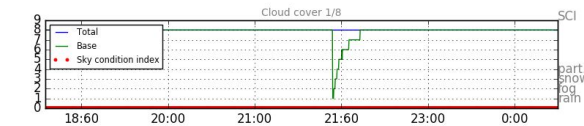
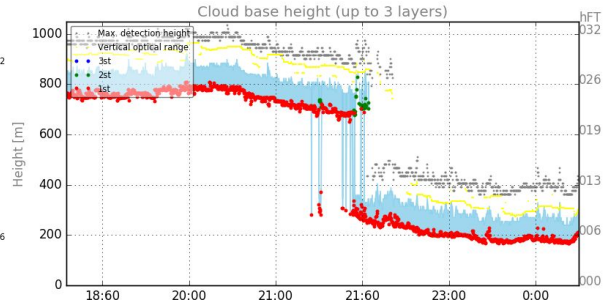
LDZA - webcam

Sljeme jug - webcam

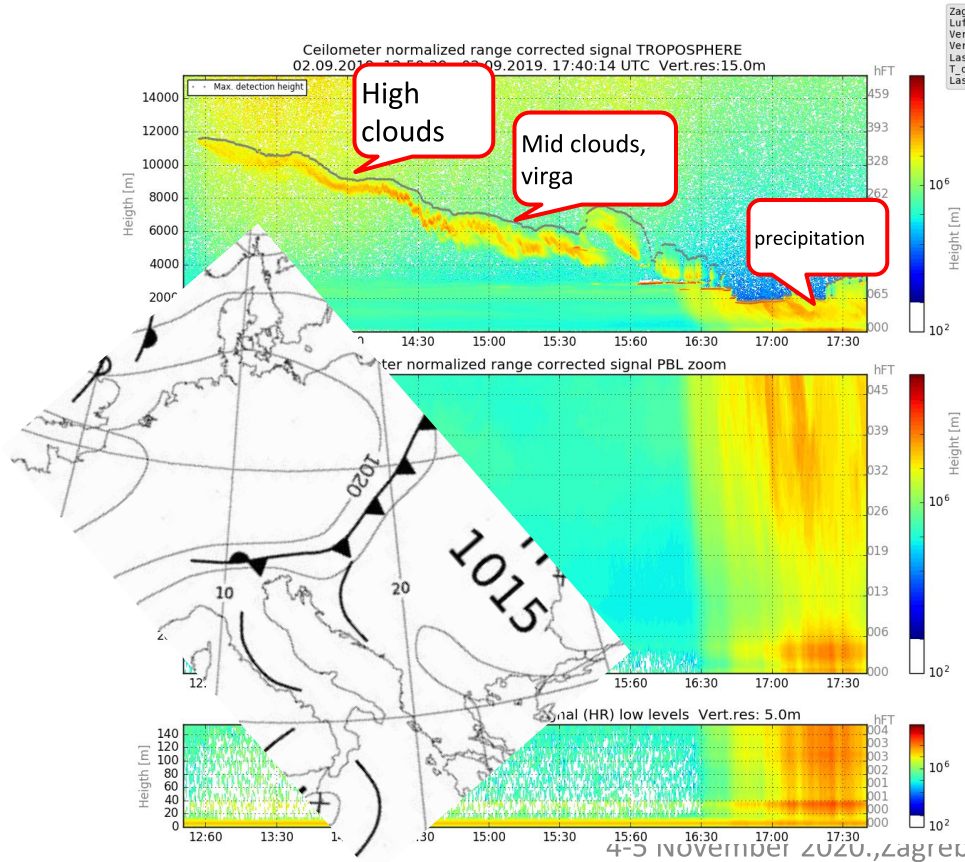


Last derived cloud layers :
base top
3rd: : 14.98m Max.Height: 15345.0m
2nd: : 007 hFT 0200 m 010 hFT 0300 m
1st: 007 hFT 0200 m 010 hFT 0300 m
VV : T_int=16.0°C T_det=25.0°C T_low=36.0°C
total cl.cover : 8/8
base cl.cover : 8/8

Zagreb Maksimir DHMZ Alt: 123m
Lufft Ceilometer CHM 15k Laser wavelength: 1064nm
Vert.res : 14.98m Max.Height: 15345.0m
Vert.res HR low: 4.99m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=1.0°C T_int=16.0°C T_det=25.0°C T_low=36.0°C
Last file: 20191205_zgmaksimir_CHM170118_0125_000.nc

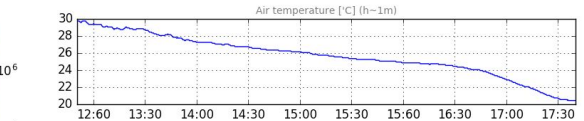
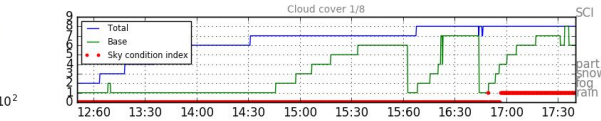
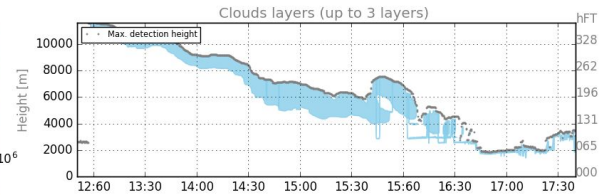
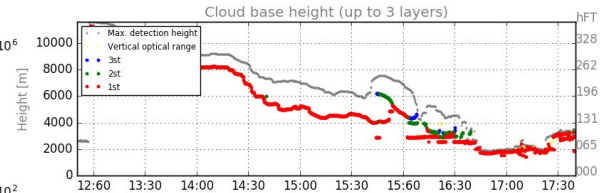


Ex.6 Cold front quick passage



Zagreb Maksimir DHMZ Alt: 123m
Lufft Ceilometer CHM 15k Laser wavelength: 1064nm
Vert.res : 14.90m Max.Height: 15345.0m
Vert.res HR low: 4.99m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=20.0°C T_int=28.0°C T_det=25.0°C T_low=34.0°C
Last file: 20190902_zgmaksimir_CHM170119_1635_090.nc

Last derived cloud layers :
3rd: base top
2nd:
1st: 061 hFT 1837 m 099 hFT 2983 m
VV :
total cl.cover : 8/8
base cl.cover : 6/8

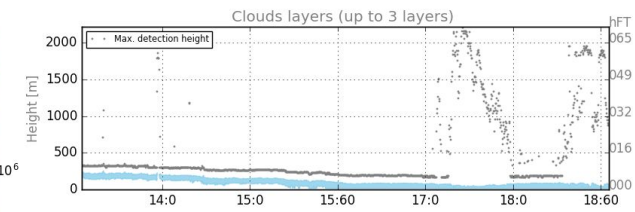
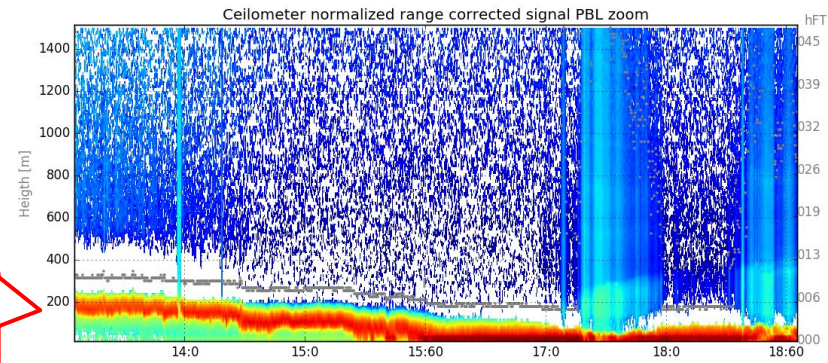
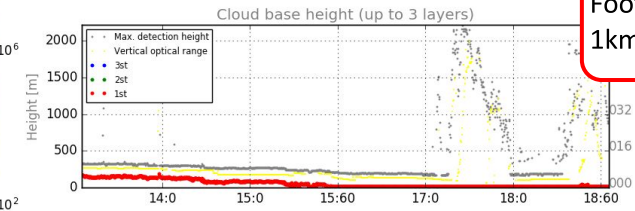
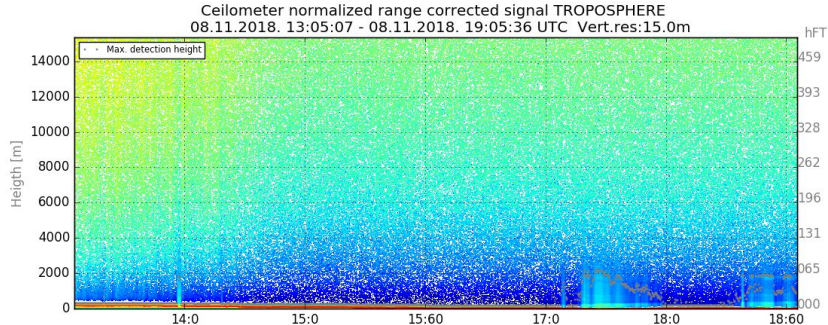


Ex.7 Very dense fog

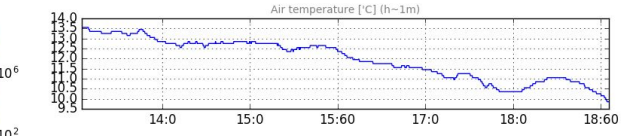
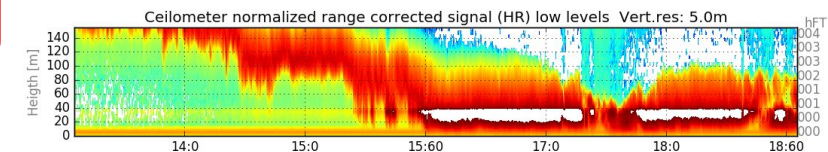
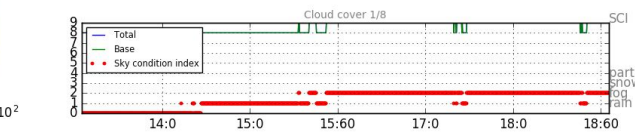


Football match
1km away

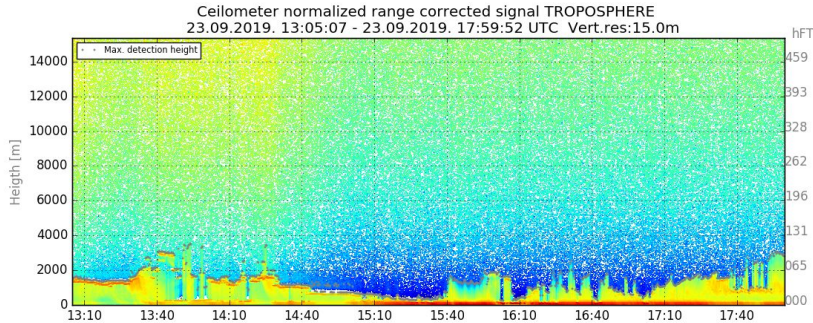
Zagreb Maksimir DHMZ Alt: 123m
Lufft Ceilometer CHM 15k Laser wavelength: 1064nm
Vert.res : 14.90m Max.Height: 15345.0m
Vert.res HR low: 4.90m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=10.0°C T_int=21.0°C T_det=25.0°C T_om=35.0°C
Last file: 20181108_zgmaksimir_CHM170118_2100_000.f



Fog onset -
lowering
stratus

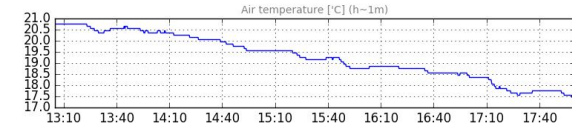
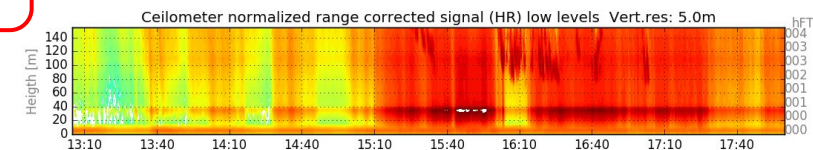
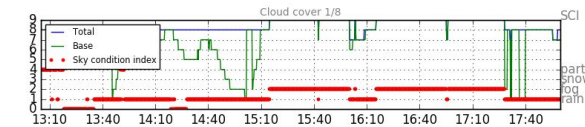
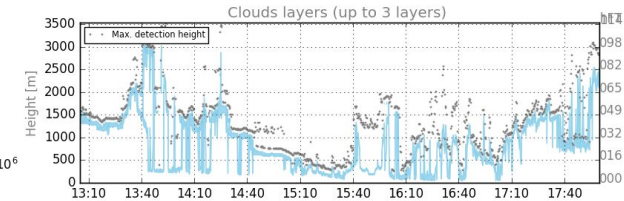
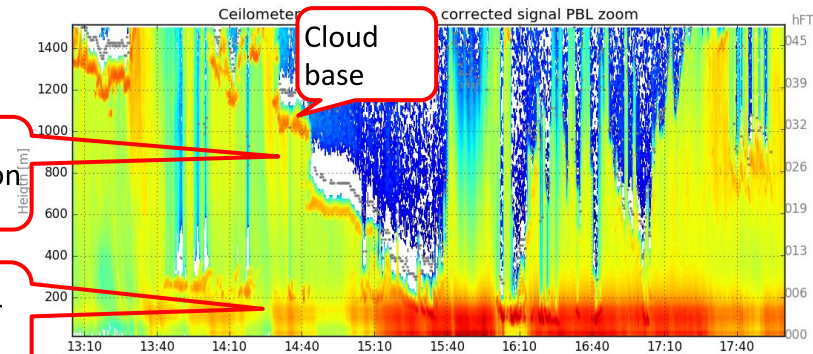
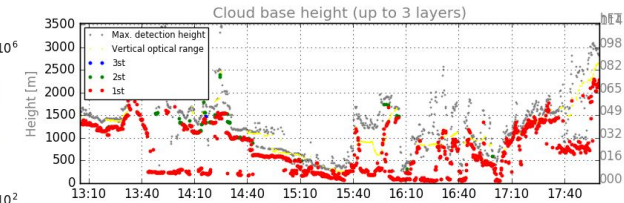


Ex.8 Thunderstorm with heavy shower rain



Zagreb Maksimir DHMZ Alt: 123m
Lufft Ceilometer CHM 15k Laser wavelength: 1064nm
Vert.res : 14.98m Max.Height: 15345.0m
Vert.res HR low: 4.99m Max.Height: 155.0m
Laser quality index: min=100.0 max=100.0
T_out=17.0°C T_int=26.0°C T_det=25.0°C T_Lom=35.0°C
Last file: 20190923_zgmaksimir_CHM170118_1855_000.nc

Last derived cloud layers :
base top
3rd: 076 hFT 2279 m 084 hFT 2532 m
2nd:
1st: 076 hFT 2279 m 084 hFT 2532 m
VV :
total cl.cover : 8/8
base cl.cover : 7/8



What's going on above Zagreb

meteorological

- nothing extraordinary, but *Full of life*
- visualized ceilometer data help forecaster to:
 - monitor the weather
 - diagnose ongoing physical processes
 - detect clouds and their recent developments
 - see nearly saturated layer and falling precipitation
 - easily connect theoretical background and reality