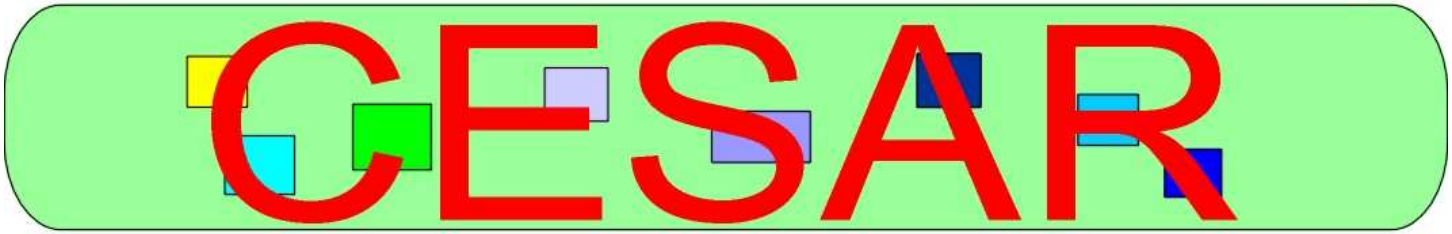

Cabauw Experimental Site for Atmospheric Research

www.cesar-observatory.nl

Herman Russchenberg, Delft University of Technology,
The Netherlands

TU Delft

Objective

To develop an atmospheric observation station for

- Atmospheric process studies
- Land-atmosphere interaction
- Climate monitoring

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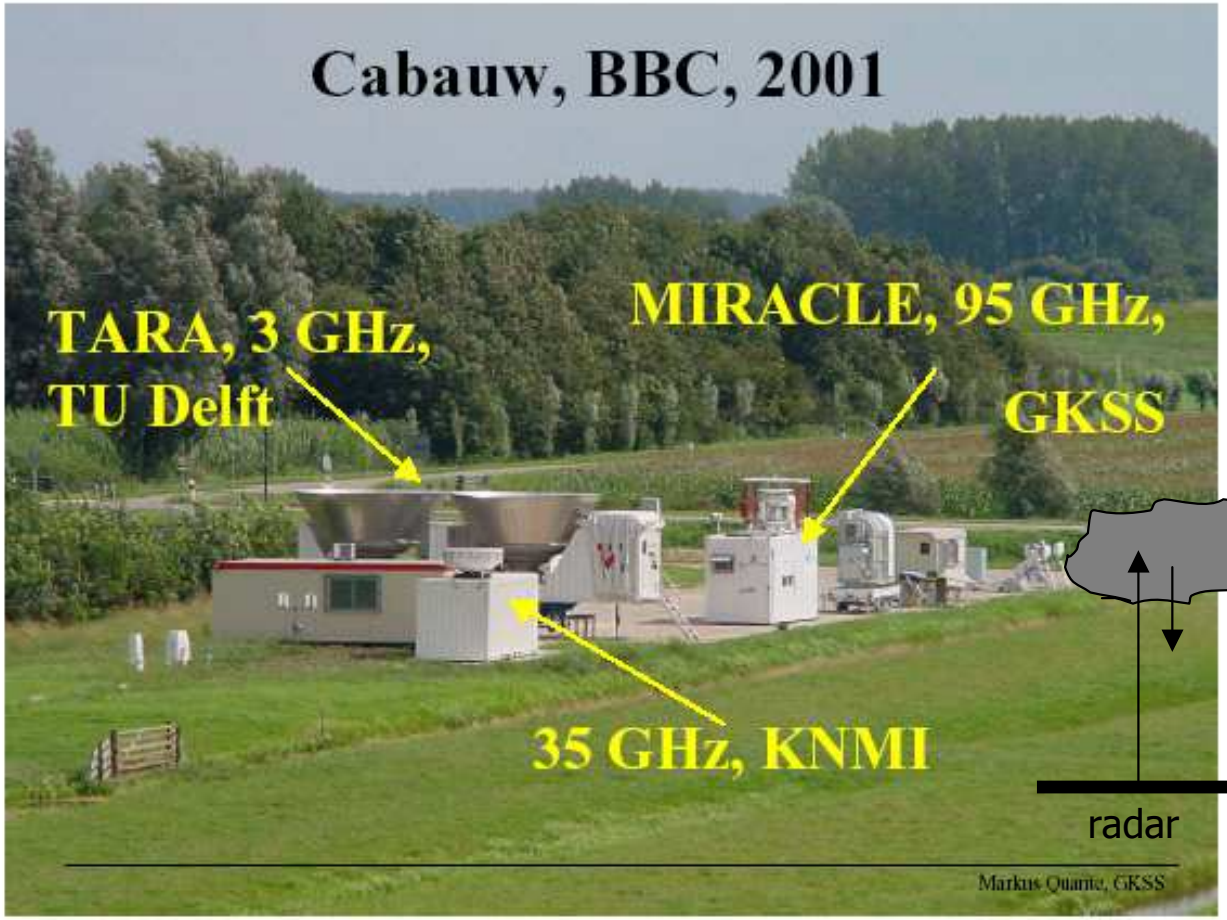
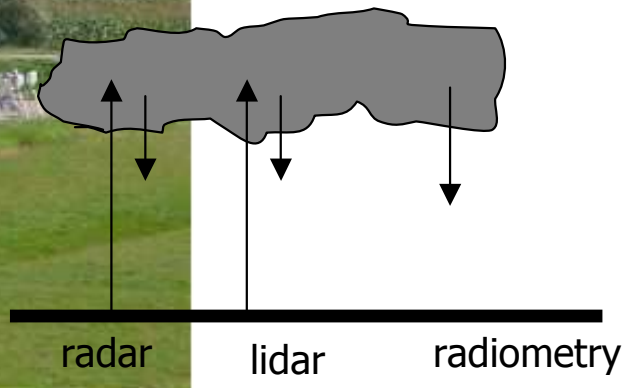

Cabauw, BBC, 2001
TARA, 3 GHz,
TU Delft
MIRACLE, 95 GHz,
GKSS
35 GHz, KNMI
Markus Quante, GKSS


radar
lidar
radiometry

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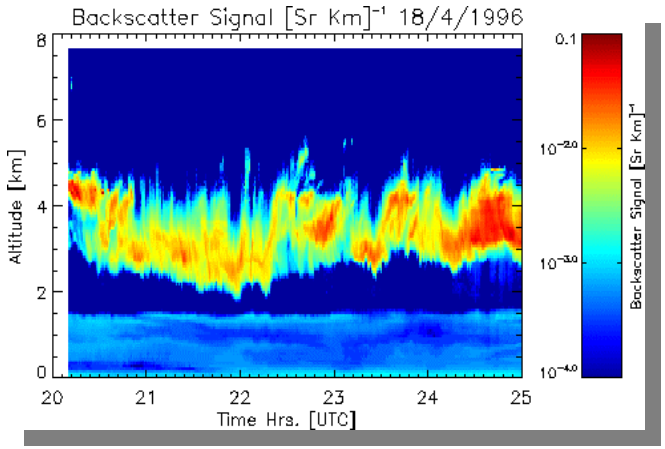
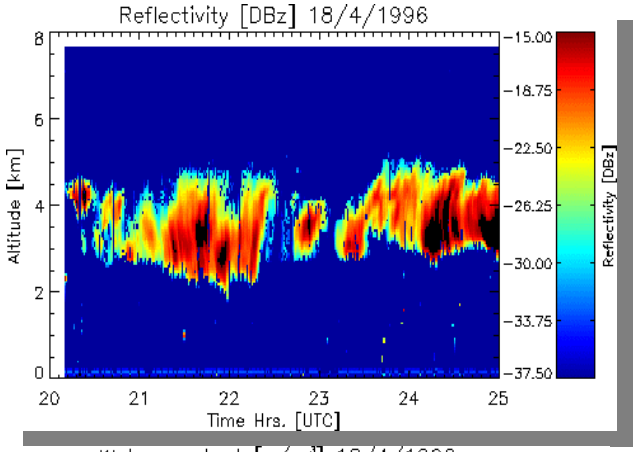
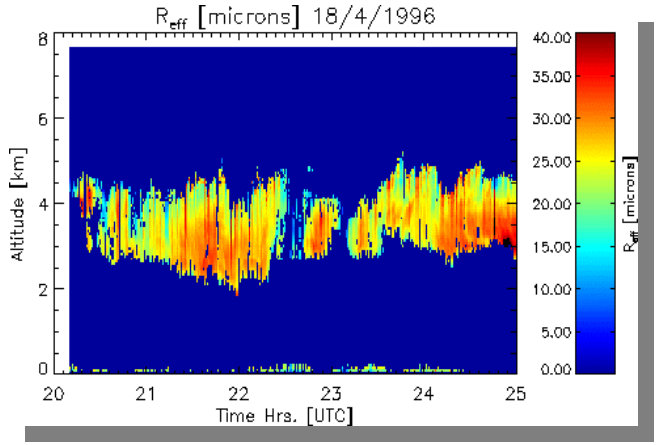
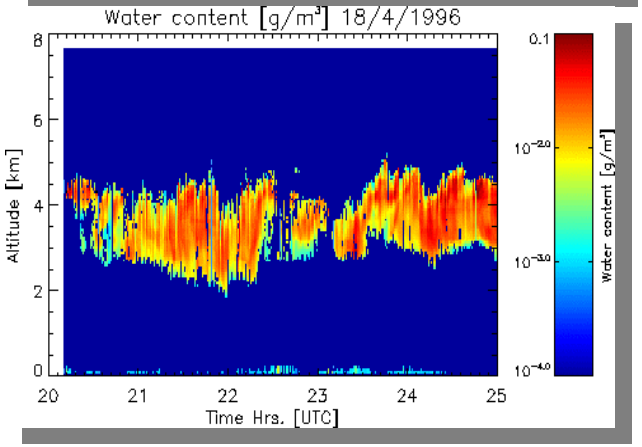
April 18, 1996, CLARA









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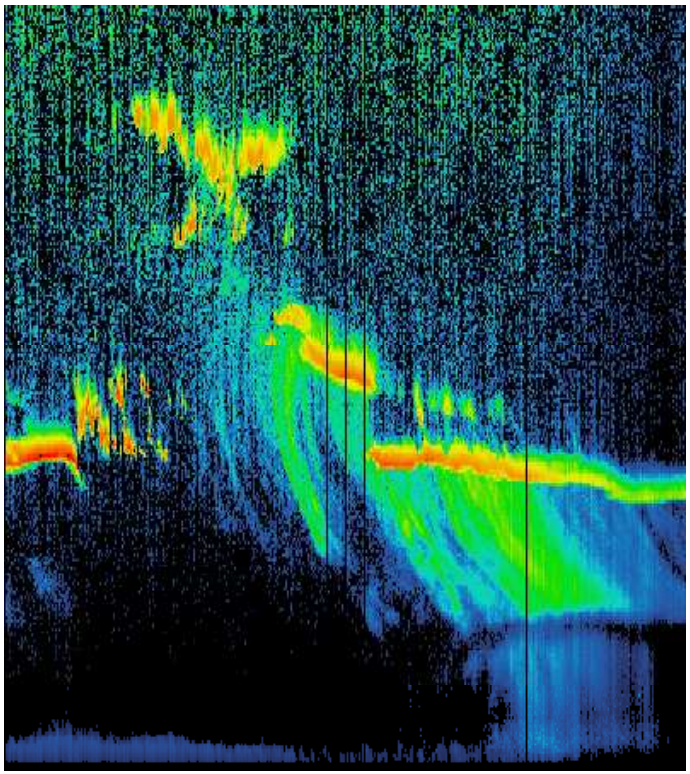
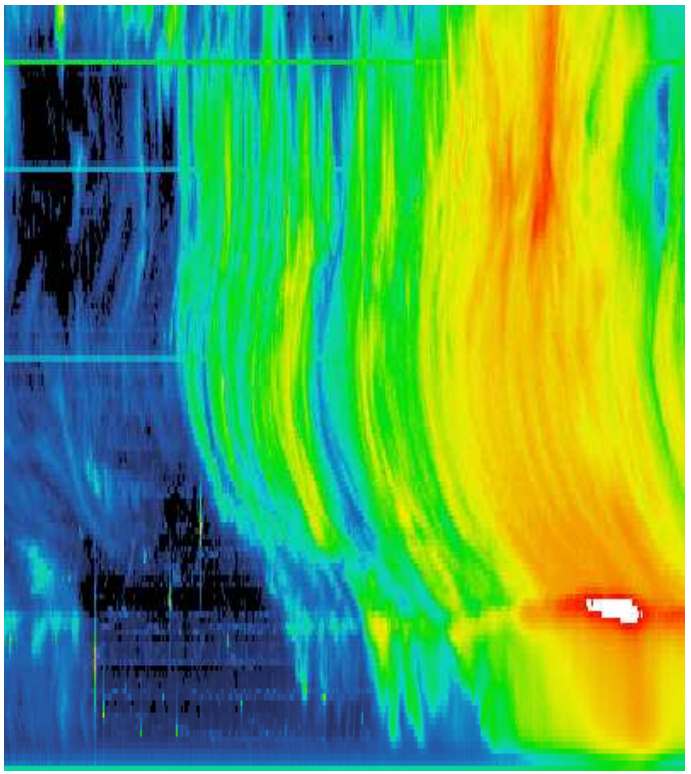
Observation of light rain with lidar and radar

lidar



radar



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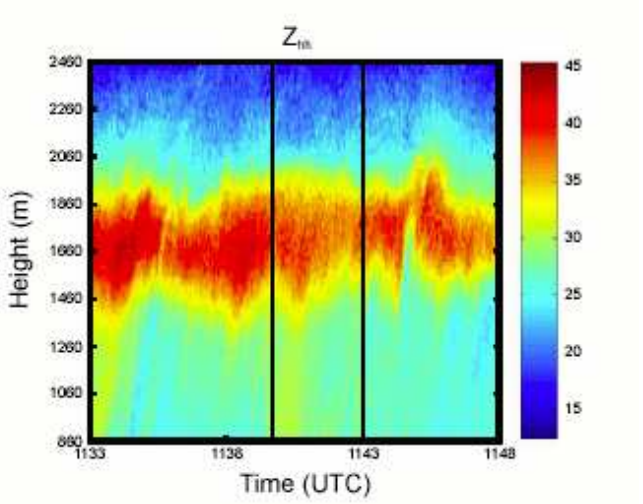
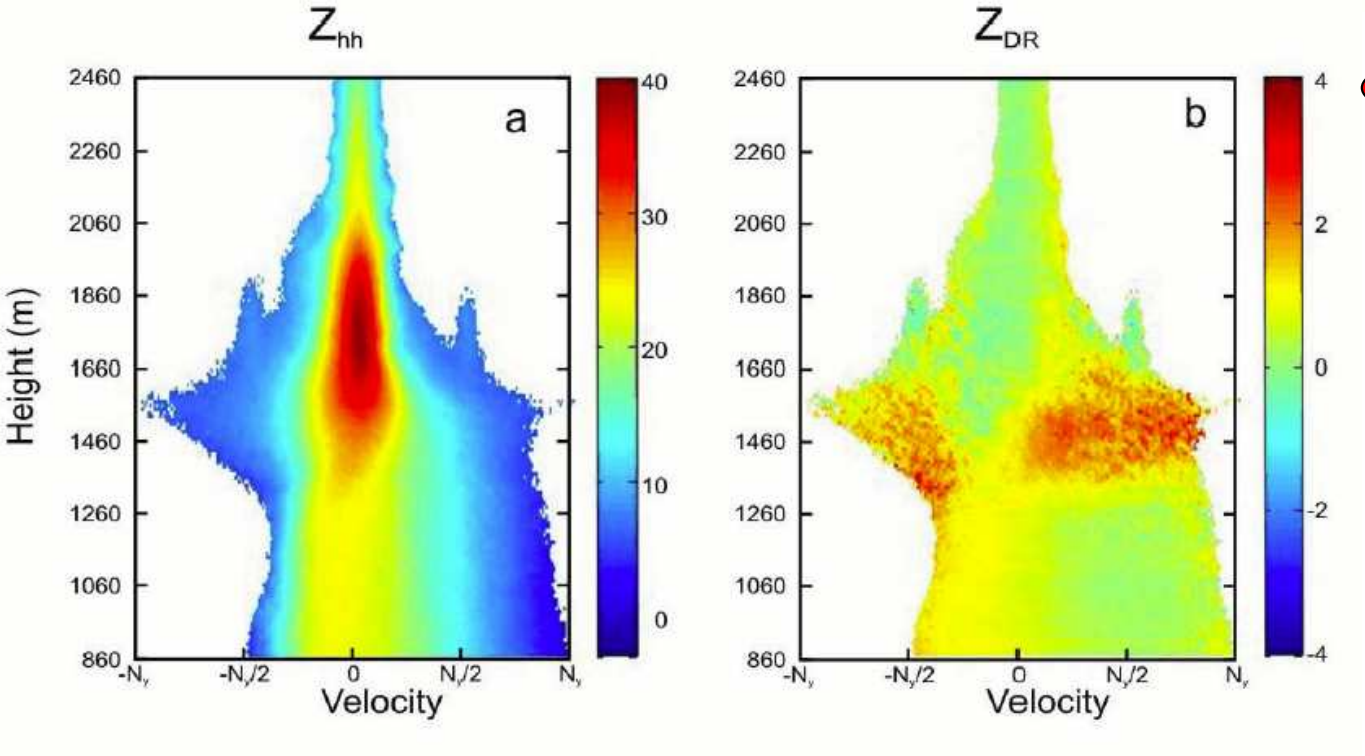
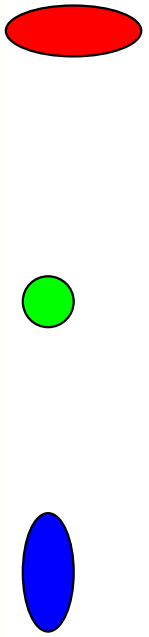
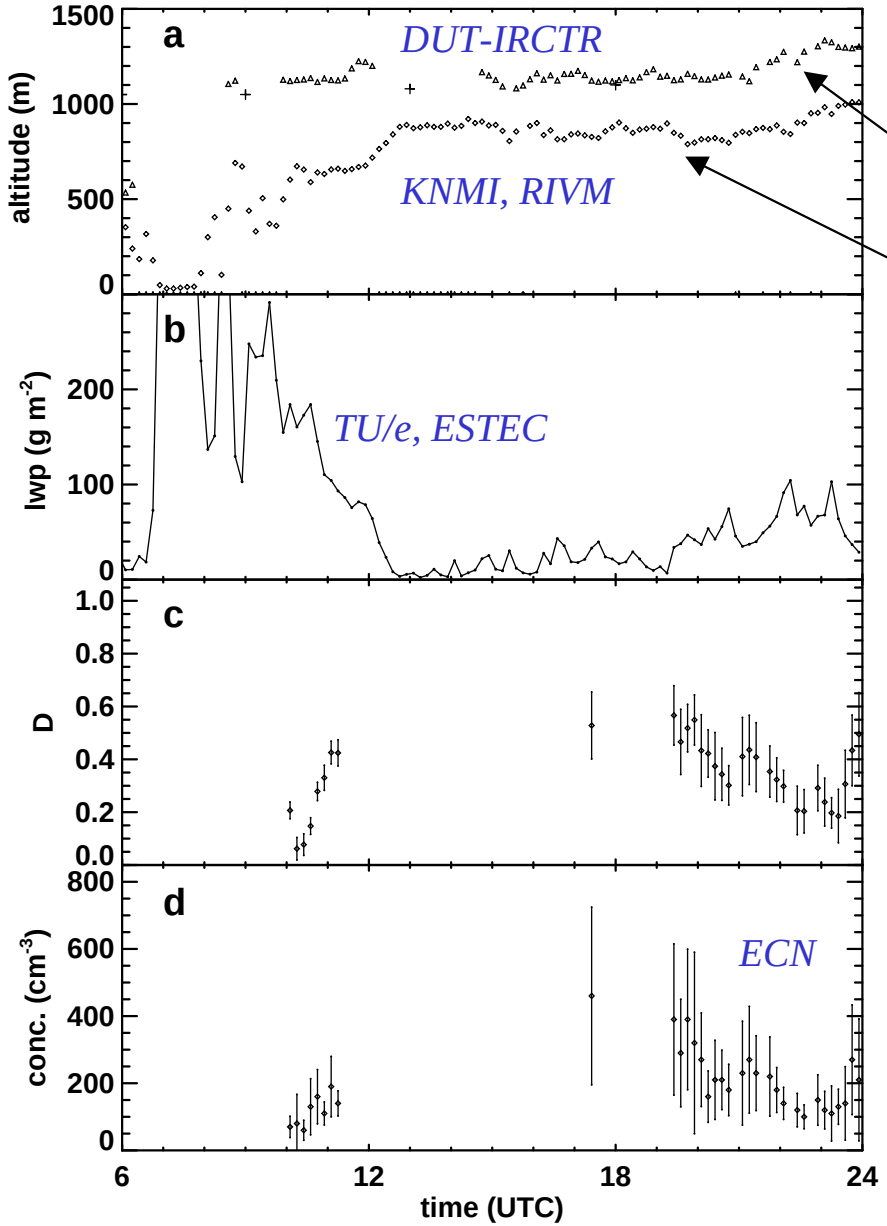
Radar doppler-polarimetry

Melting layer:
pilot for mixed clouds









Sensor synergy for the retrieval of cloud parameters

Radar cloud top
Lidar cloud base

Liquid water path
from microwave radiometer

Retrieved adiabicity parameter

Retrieved number concentration

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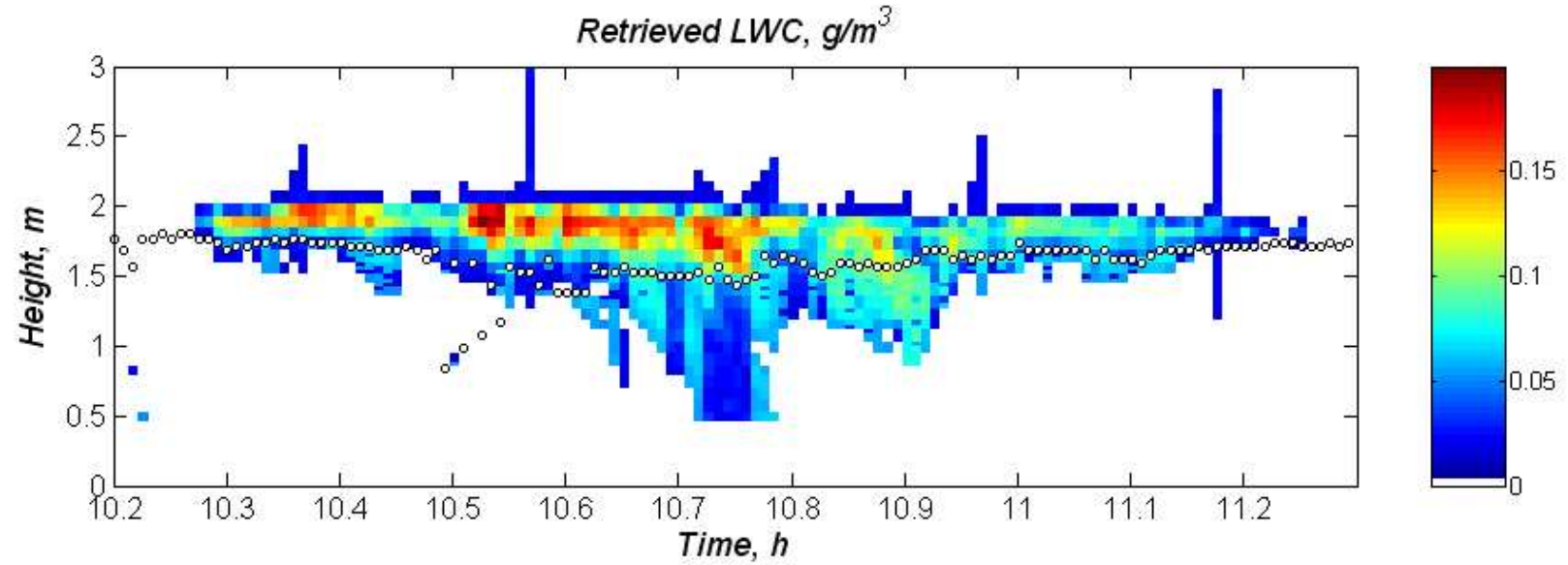
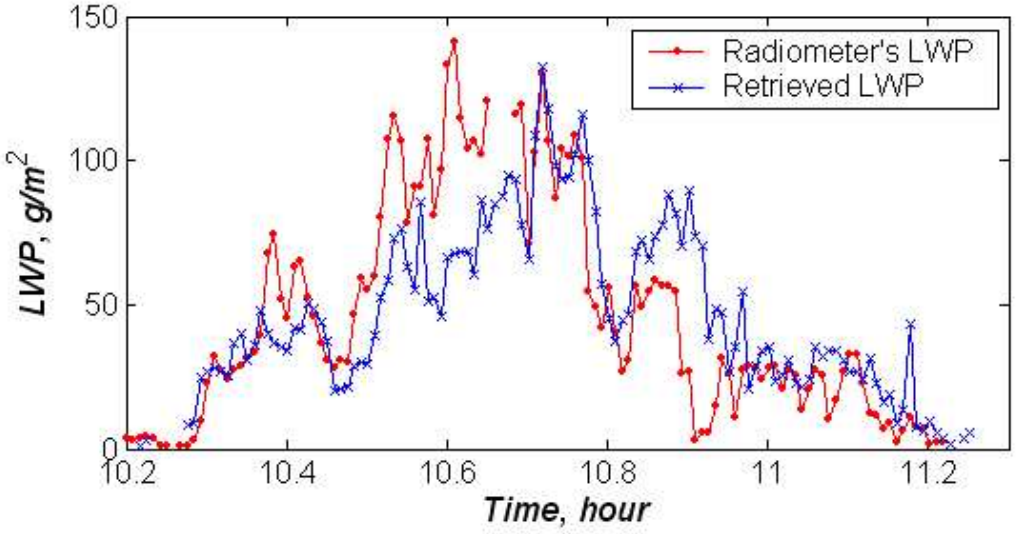
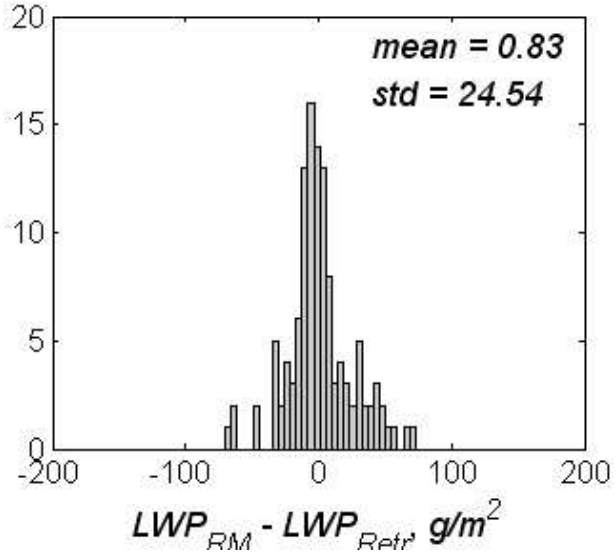

Retrieved LWC, g/m3
Height, m
Time, h
0
0.5
1
1.5
2
2.5
3
10.2
10.3
10.4
10.5
10.6
10.7
10.8
10.9
11
11.1
11.2
0.15
0.1
0.05
0


LWP, g/m2
Time, hour
Radiometer's LWP
Retrieved LWP
0
50
100
150
10.2
10.4
10.6
10.8
11
11.2


mean = 0.83
std = 24.54
LWP_RM - LWP_Retr, g/m2
0
5
10
15
20
-200
-100
0
100
200

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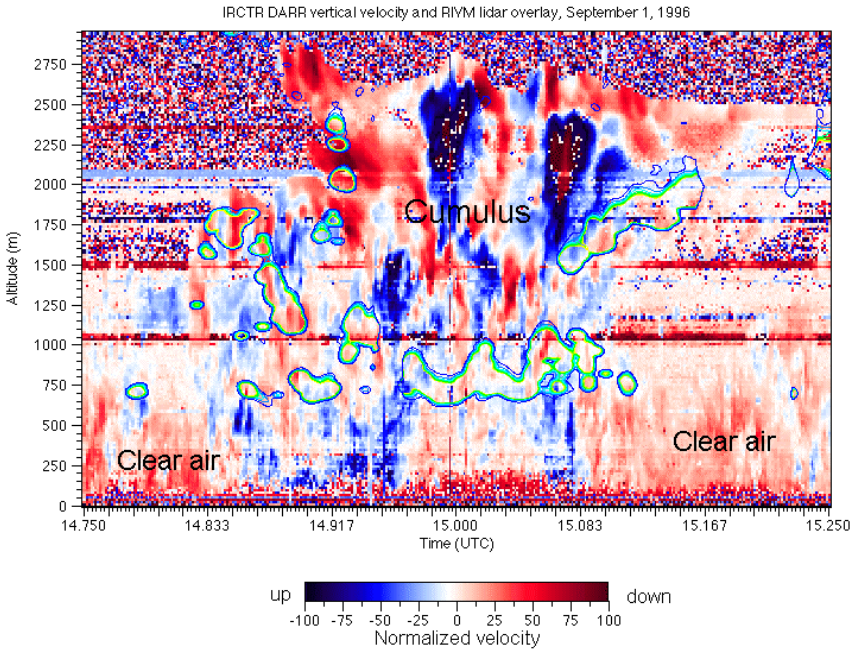

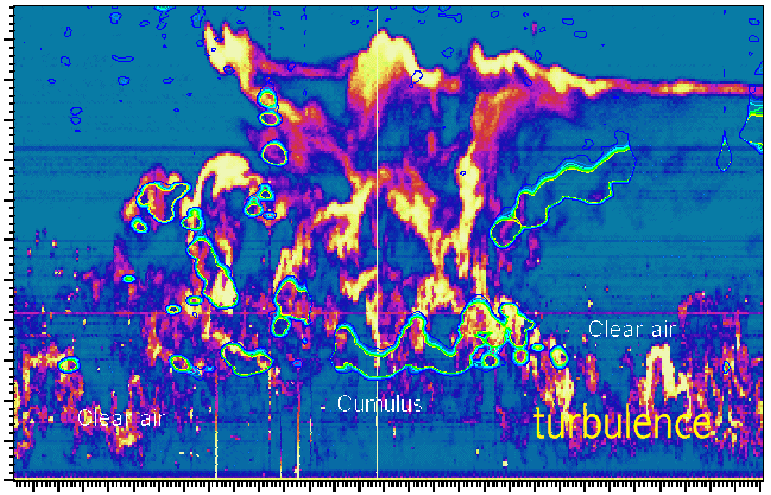

Combined radar-lidar observation of convection

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	Instrument	**Responsible institute**							
			P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**
Remote Sensing Instruments	Wind/RASS profiler	KNMI						X	
	3 GHz radar	IRCTR		X	X			X	X
	10 GHz surveillance rain radar **(P8)**	IRCTR				X		X	X
	35 GHz radar	KNMI		X	X	X			
	Ceilometer	KNMI		X	X	X	X		
	GPS-receiver	DUT-AE						X	
	Ir-radiometers	KNMI	X						
	µWave radiometer	ESA-ESTEC			X	X		X	
	Raman lidar **(P9)**	RIVM	X	X	X	X	X	X	
	Pyranometers	KNMI	X						
	Sun photometer	TNO-FEL	X				X		
	Dual-frequency radiolink	WUR							X
In-situ instruments (in meteo tower)	Aethalometer	RIVM	X				X		
	CCN counter	ECN					X		
	Nephelometer	TNO-FEL	X				X		
	Particle counter	TNO-FEL					X		
	SJAC	ECN					X		
	Sonic anemometer	KNMI						X	
	H2O/CO2 turbulence	KNMI						X	
In-situ instruments (ground-based)	Video disdrometer	WUR							X
	Rain gauges	WUR,KNMI							X
	TDR	WUR							X
	Discharge meters	WUR							X
	Ground water	WUR							X
	Soil heat flux plates	KNMI						X	
	Soil thermometers	KNMI						X	
	Ground water sensors	WUR/KNMI						X	X

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Products

Down ward short and long wave radiation- global, direct, diffuse
Upward short and long wave radiation
Size distributions of aerosols
Aerosol volatility spectra
In situ optical properties of aerosols
Climatology of the concentration of black carbon
Climatology of the number concentration of cloud condensation nuclei
Vertical profiles of aerosol optical properties
Cloud base and top
Cloud overlap
Cloud microstructures: drop sizes, concentration, ice/water content
Drizzle rates
Horizontal distribution and vertical water vapour profiles
Surface energy fluxes and vertical temperature profiles
Rainfall parameters: intensity, microstructure and cell geometry
Hydrological budget
3D wind fields
Momentum flux and vertical profiles of 3D wind
Boundary layer structure and turbulence characteristics

Contribution to COPS

Subset of instruments:
radar(s), lidar, radiometer, disdrometer

Constraints

- should not disturb running observation progam at CESAR
- funding

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