ACTRIS
CCRES

Payerne station
status; DCR experiences and activities

Team: University of Bern and *MeteoSwiss*

Renaud Matthey, Tobias Riesen, *Anne-Claire Billault-Roux, Maxime Hervo, Christian Felix, Rebecca Gugerli, Martine Collaud-Cohen, Alexander Haefele*, Axel Murk, Gunter Stober

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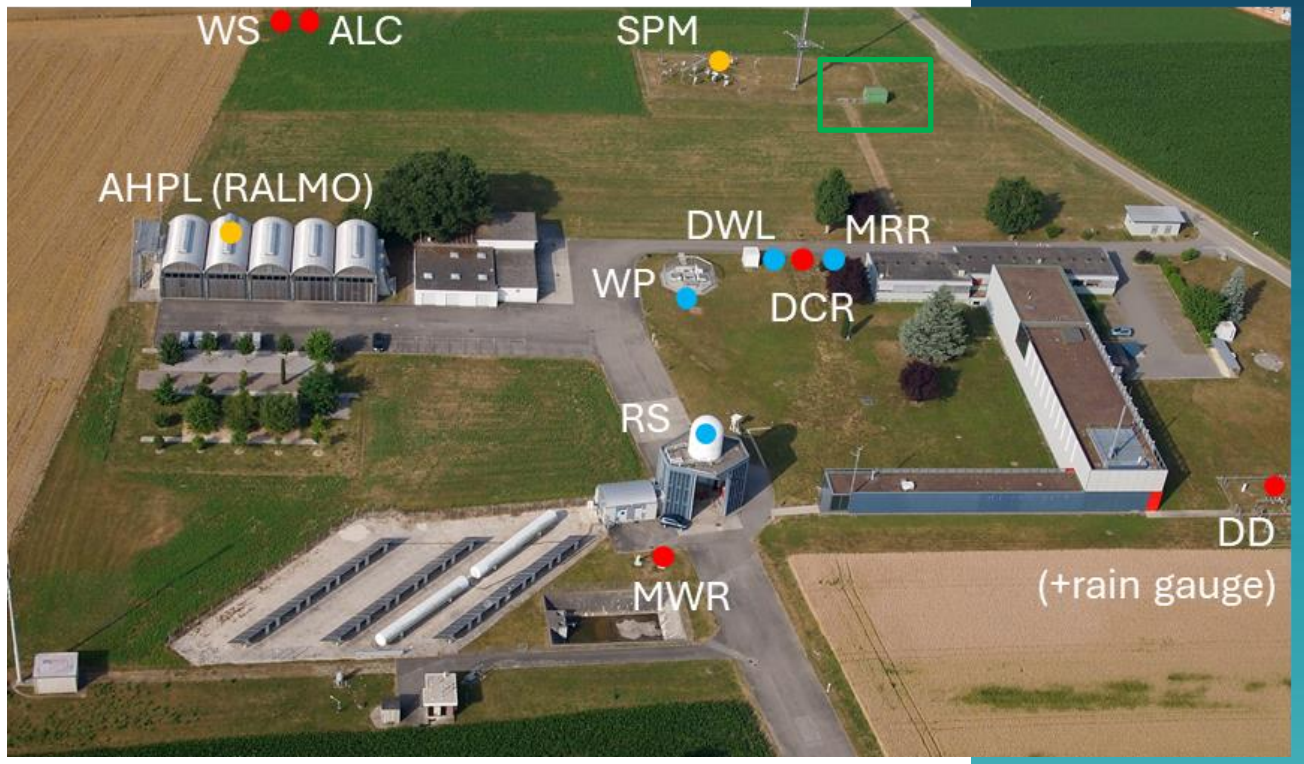
Payerne facility (PAY)

- MeteoSwiss aerological station
- Rural conditions in the Swiss Midlands; 490 m asl

- **3 ACTRIS components**

mandatory optional

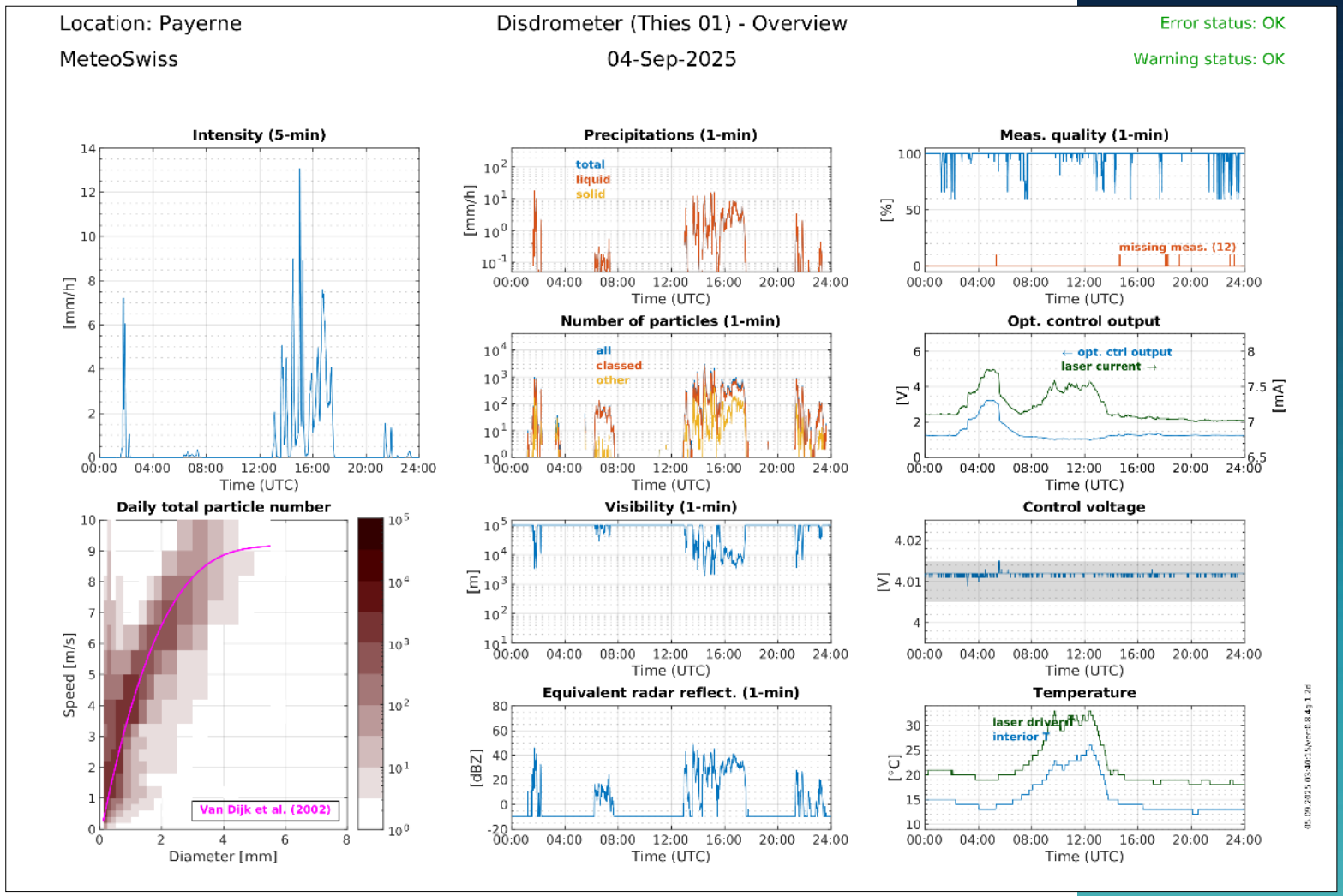
  - **cloud remote sensing** (MeteoSwiss and UniBE)
  - **aerosol remote sensing** (MeteoSwiss and UniBE)
  - **aerosol in situ** (PSI) (+ bioaerosol by MeteoSwiss)
  - [+ partially cloud in situ (ETHZ)]



New instrument for PAY: disdrometer (Thies)

Implementation

- Data collection since Feb. 2024
- Daily quicklook
  - data and HKP
- Daily alert in case of problem



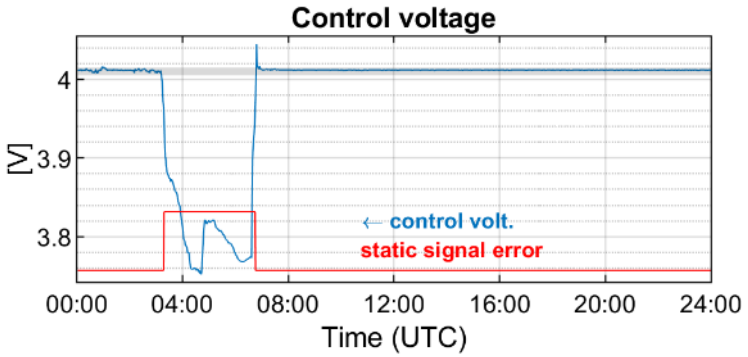
Disdrometer (Thies)

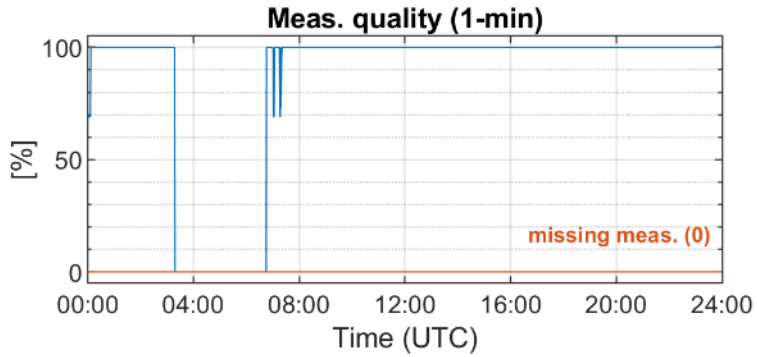
Encountered problems/obstacles

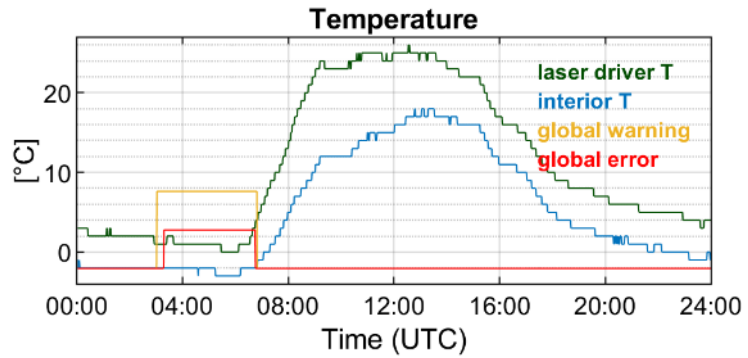
- Internal procedures for data flow
- Instabilities in local data transmission
- Instrument operation
- Logger failure (recently)

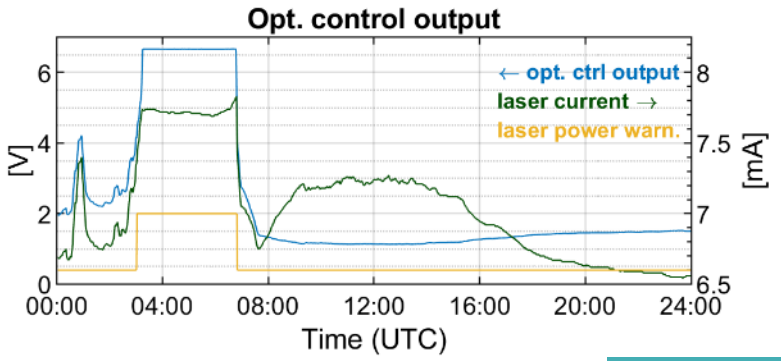
Error status: problem

Warning status: problem









Disdrometer (Thies)

Obstacles : … spider webs

- Potential sources of wrong events
  - probably spiders dislike rain …
- How to avoid them ?
  - silicon (but not good close to optics)
  - …
- Spiders transported by wind on thread

Solution applied so far

- Regular inspection and cleaning
- What about other sites ?

New instrument of PAY: cloud radar (RPG 94 GHz)

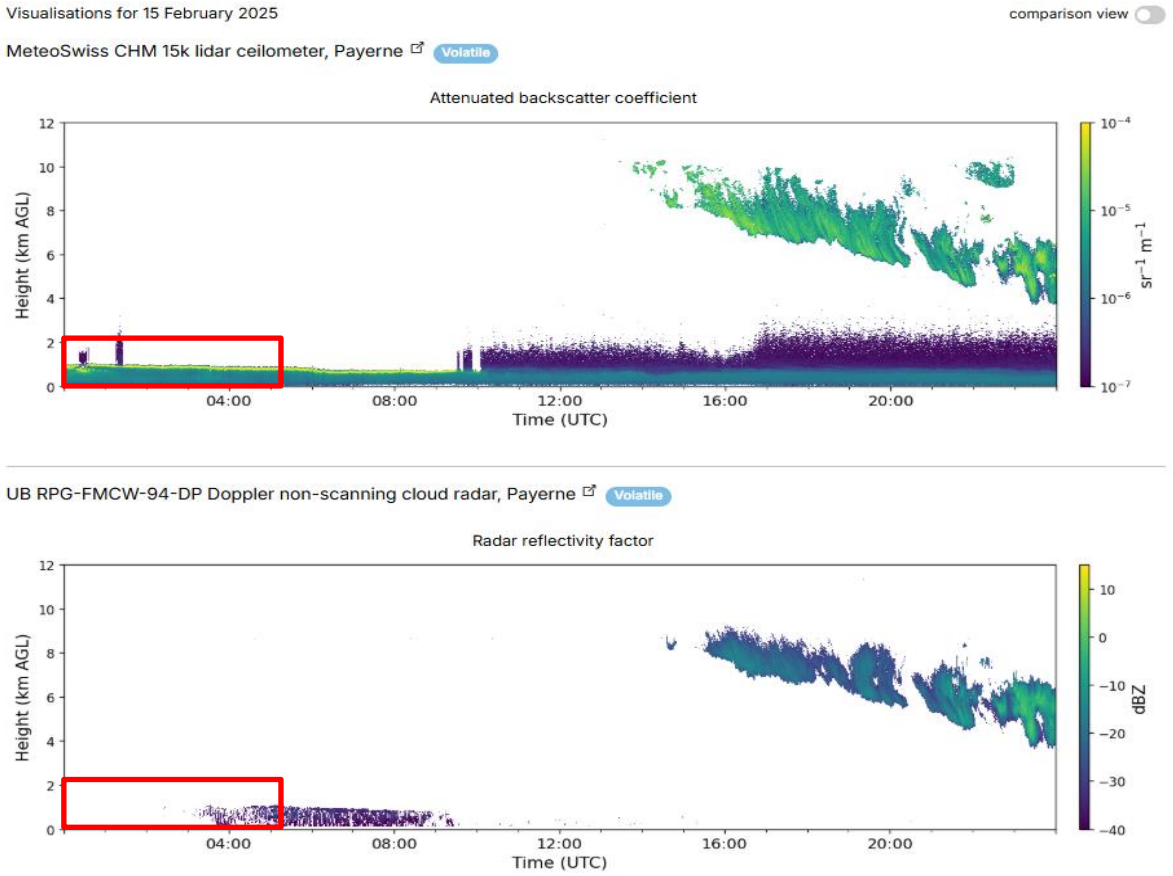
Operation

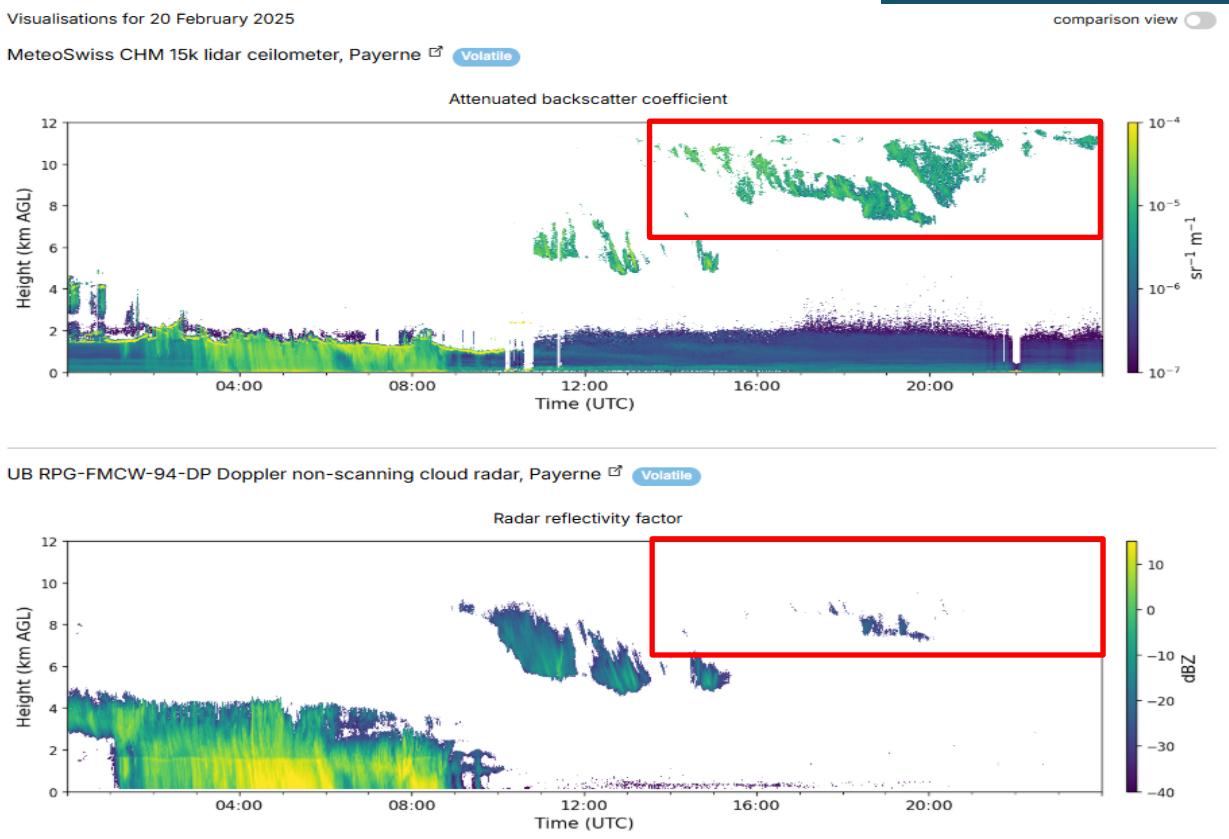
- Data collection since November 2024
- No instrument failure
- However: fuse on the power supply line blew several times since this summer
  - loss of data over several days
- Regular and stable data transmission to CLU

Cloud detection

Some clouds detected by ceilometer, not by cloud radar

- Stratus (~ expected, low Ze)
- Cirrus (less expected, likely too low sensitivity)





Improving DCR sensitivity

Tests with different instrument settings

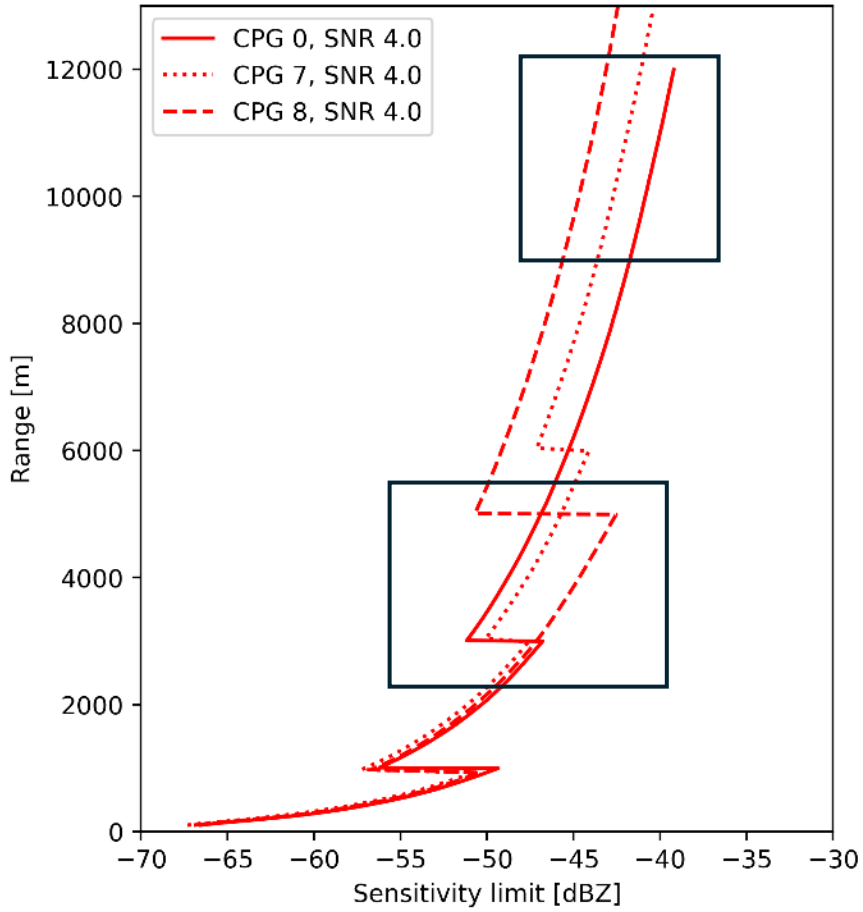
- **Chirp tables**
  - trade-off to be found: chirps' altitude ranges, range resolution, max. unambiguous velocity; integration time, resulting sensitivity, …

  → 2 tables with 3 chirps, 1 table with 4 chirps

- **Noise threshold for spectral compression**
  - trade-off between need to suppress noise (data volume) vs. good sensitivity
  - loss of data is an issue (also for averaging)

  → SNR threshold (*noise filter*): 2 to 6

- **Evaluation procedure**
  - MBFs based on various combinations of table and SNR threshold; 30 min. each (MDFs)
  - Sensitivity limit (mean value)



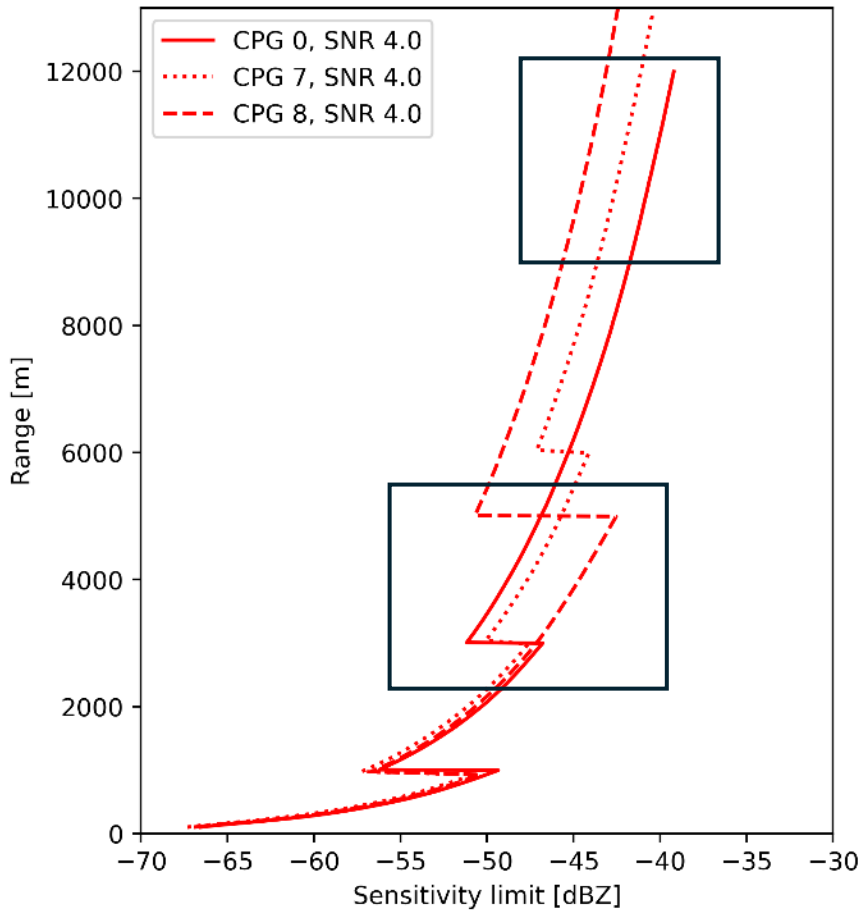
- **Table with 4 chirps => seems better trade-off**

(work in progress; to be consolidated)

Improving DCR sensitivity

Noise threshold impact

Noise thresh. (SNR thresh.)	2	3	4	6
Sensitivity gain (vs Noise thr. 6)	4 dB	3 dB	2 dB	-
Visual inspection	Noise backgr. visible ++	Some noise pixels	No backgr. noise	No backgr. noise
File size 1h (rough,MB)	200-1500	20-400	2-200	1-200



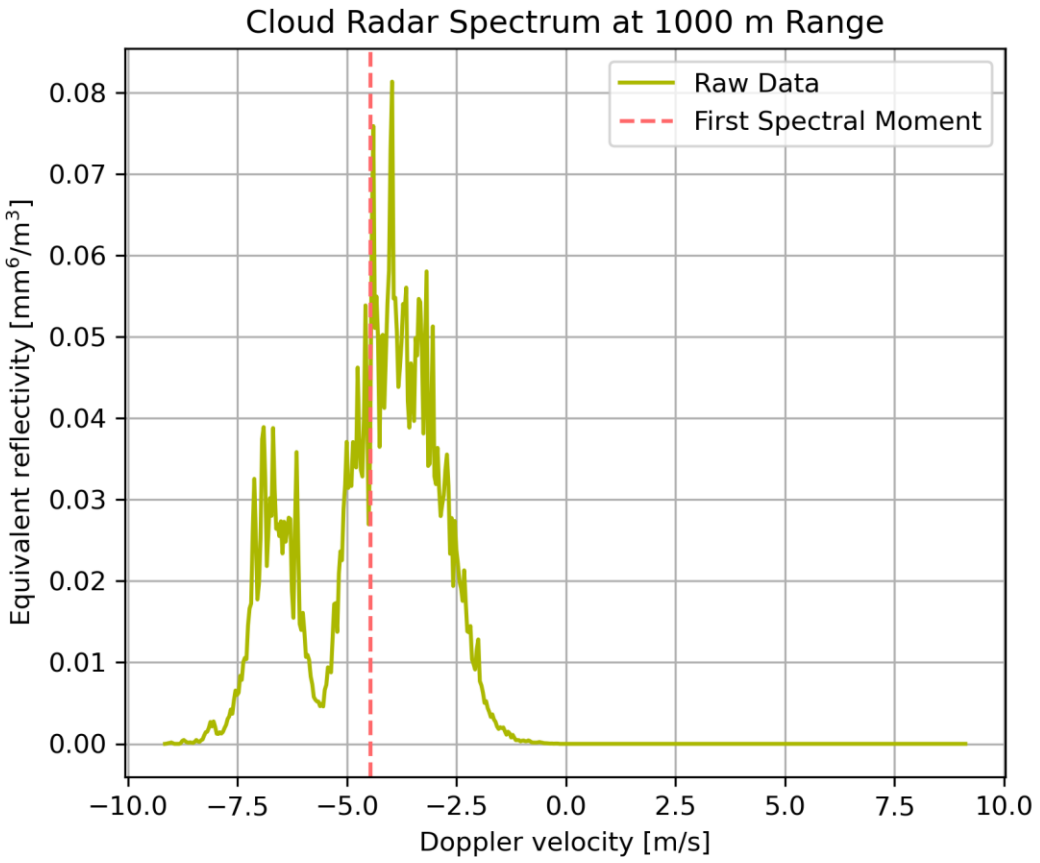
- **Best trade-off: noise threshold ~ 3**

- More analyses on-going; comparison of cloud detection, DCR wrt. CHM15K

Doppler spectrum

Cloud Radar Measurements

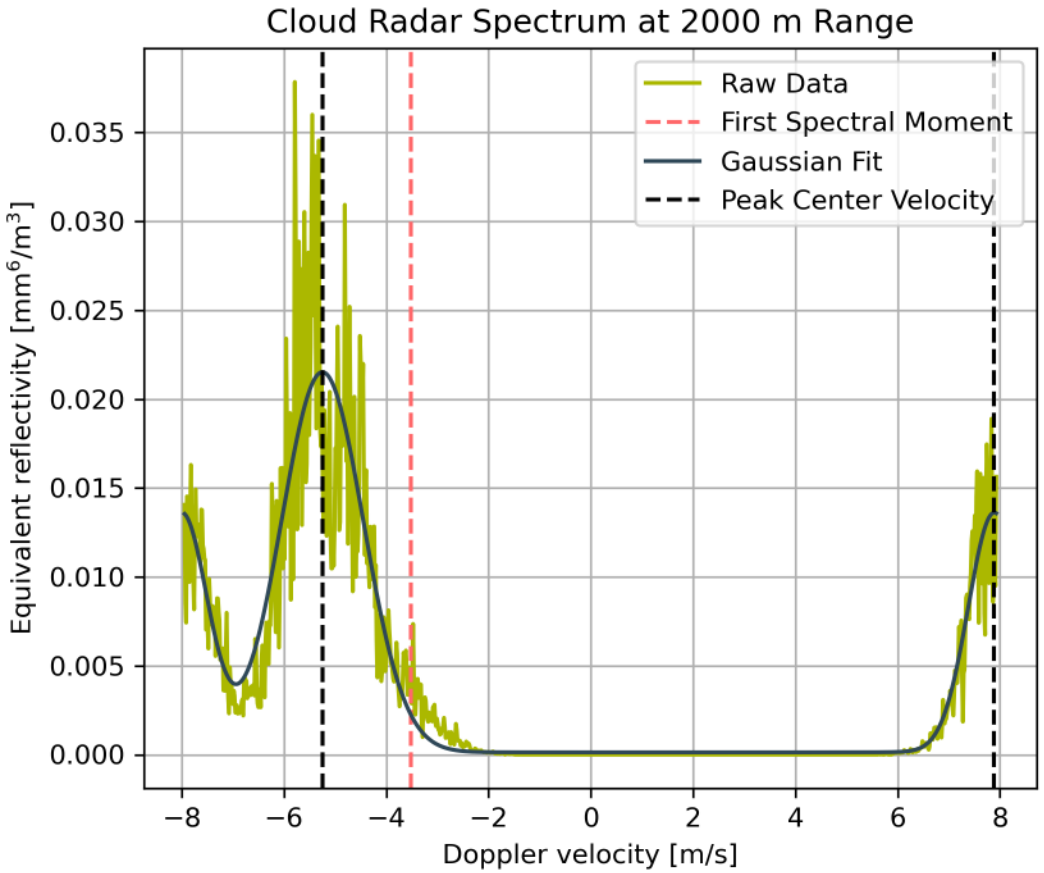
- Cloud radars produce a spectrum for each measurement time and each range (altitude)
- Spectra have different Nyquist velocities and different resolutions
- Mean velocity computed as first spectral moment
- First spectral moment can have difficulties at multiple peaks
- → Spectral fit performs better in this scenario
- Parts of the spectrum above and below the Nyquist velocity are aliased and reappear in different places of the spectrum



Doppler spectrum

Truncated Gaussian fit

- A DFT is applied to a Gaussian function, and the parameters are tuned to match the data (noise, signal amplitude, velocity, spectral width)
- Works also for peaks around Nyquist velocity
- Produces the covariance matrix of the parameters and therefore also the statistical uncertainty
- Resilient against aliasing concerning the statistical uncertainties of the derived parameters



Other instruments

Doppler wind lidar (WindCube WLS200S)

- Condensation on the scanner output window
- Problem solved:
  - installation of external window heater
  - solution by the manufacturer

ALC

- Activities though E-Profile
- CL61 purchased (UniBE)

MRR (micro rain radar)

- MRR-PRO purchased (UniBE)
- Installation by the end of the year

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Thank you !