Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Does changes in the window transmission affect the measurements?

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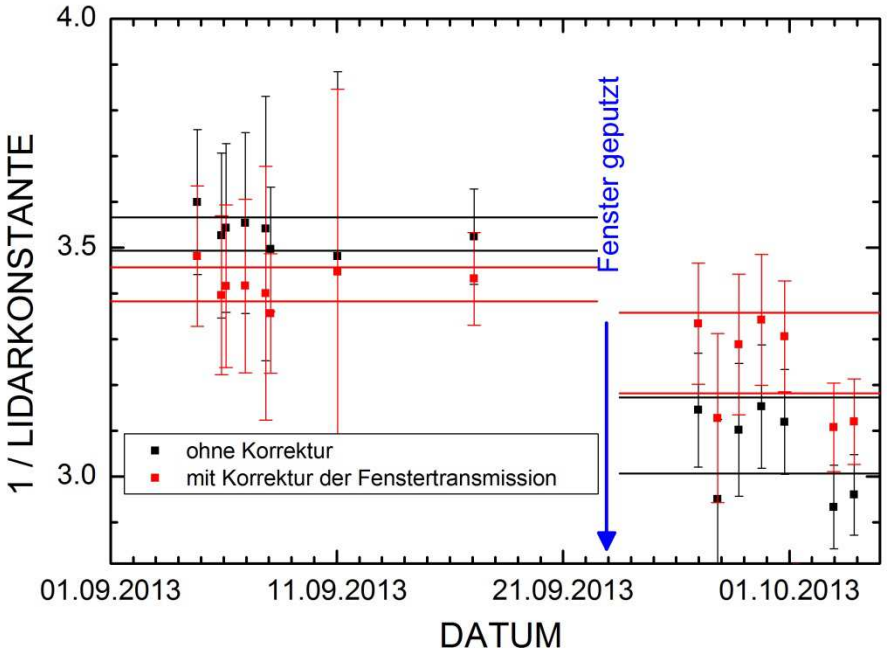
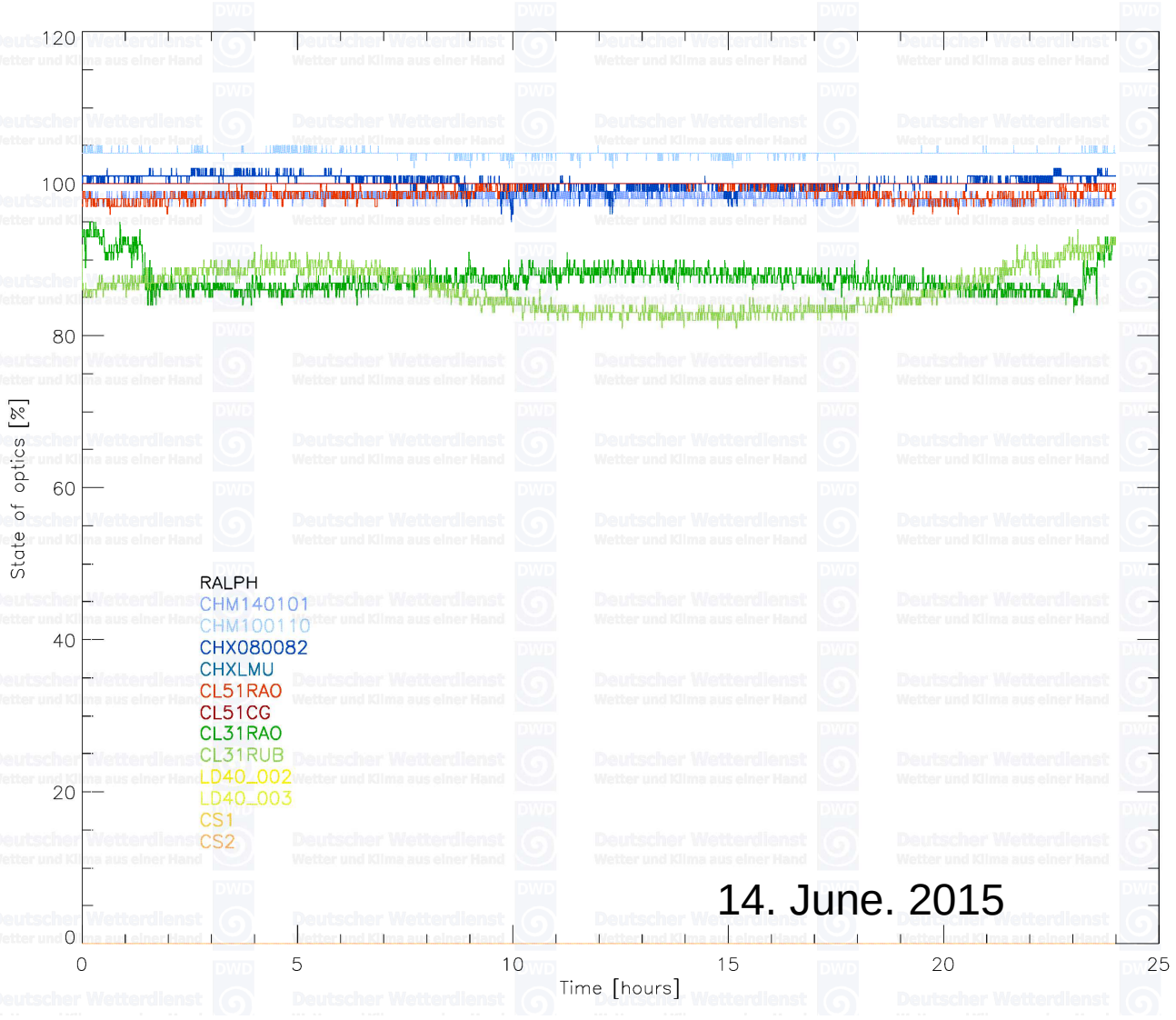
Motivation



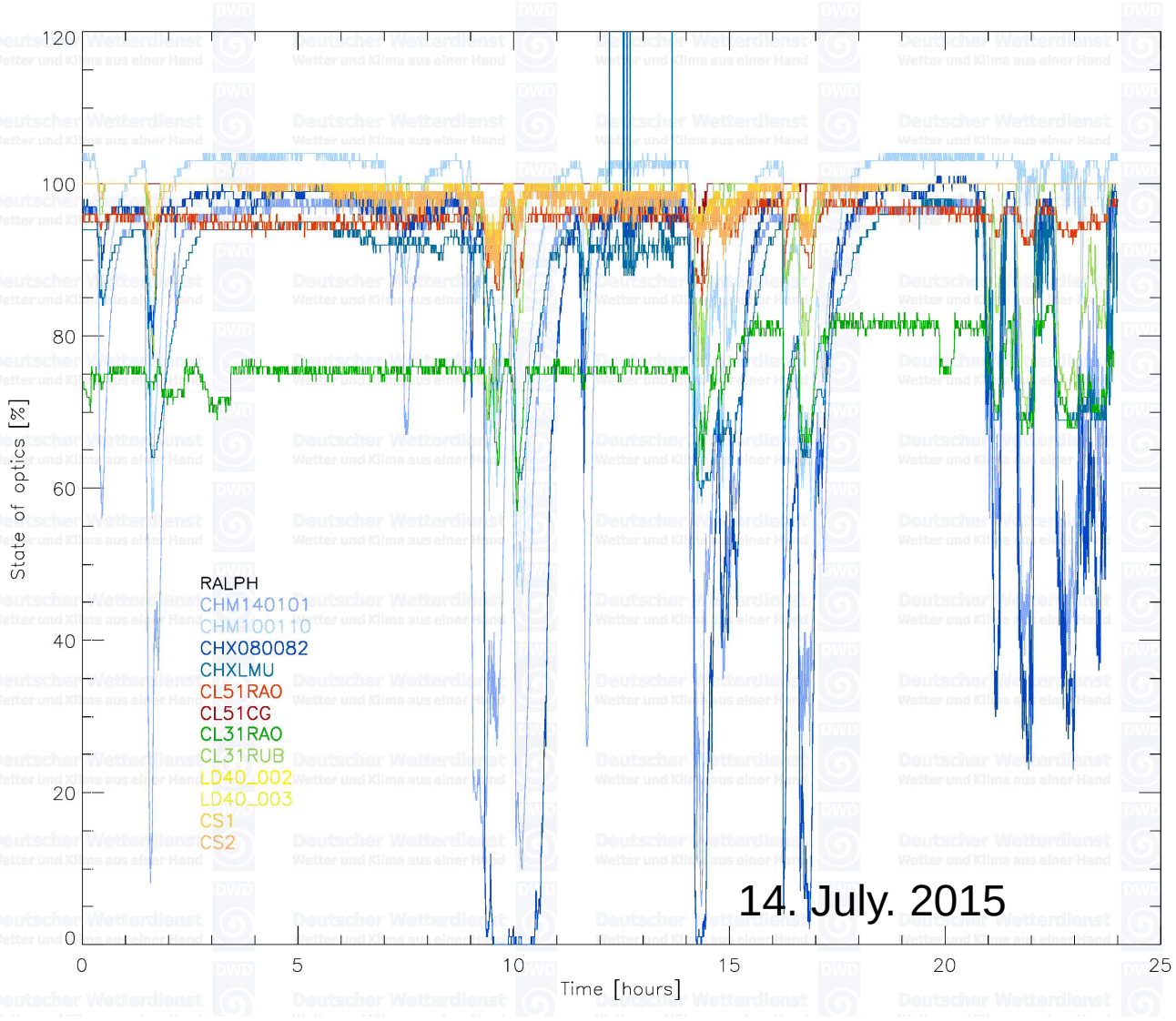
Leipzig, CHM vs Polly
8km distance

Window transmission: housekeeping data



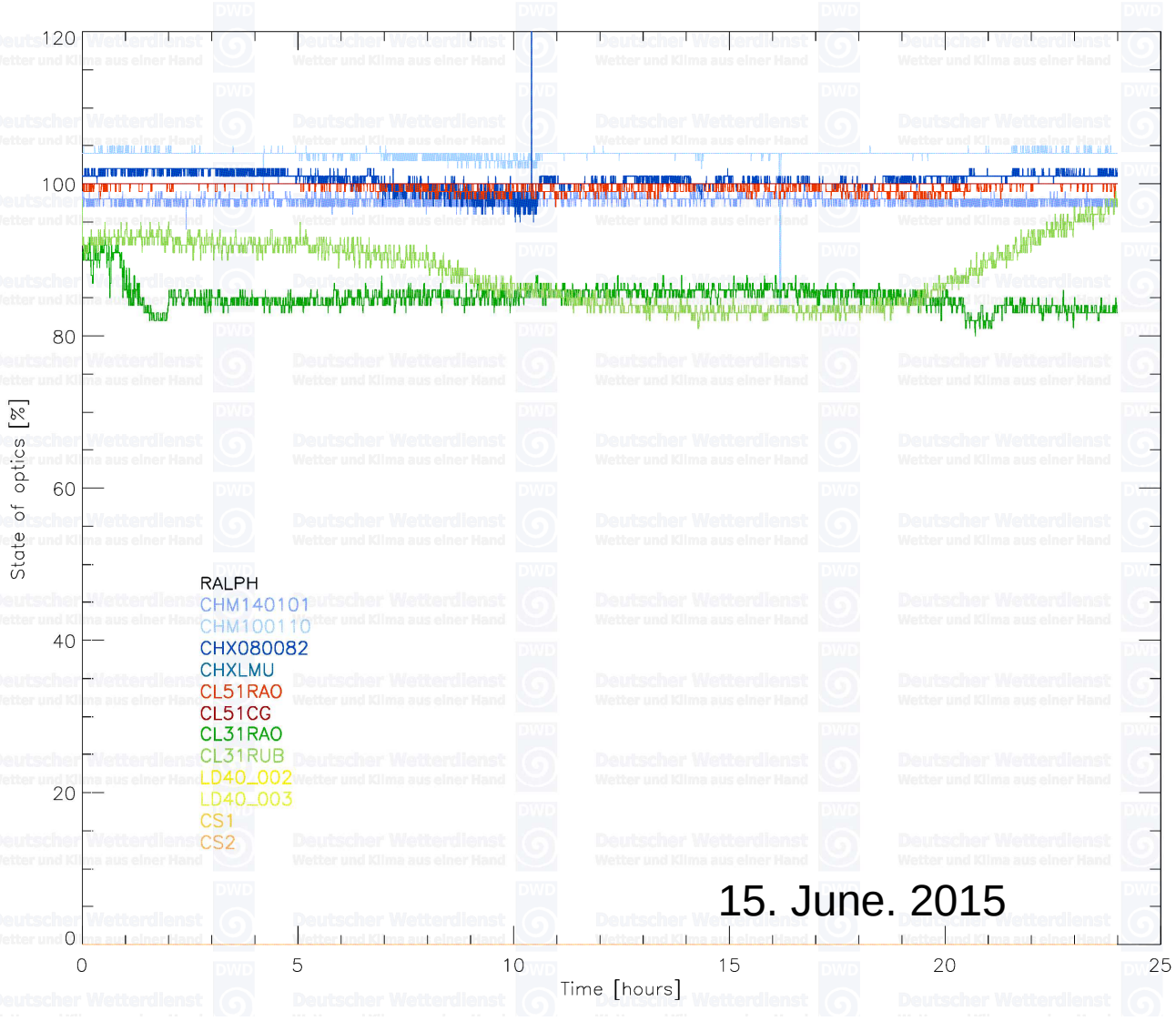
- Mostly around 100% (optimal)
- Some of them has values over 100% → problem of initialization
- CL31s tend to decrease WT
- All ceilometers get lover WTs: deposition
- Effect on measurements?

Changing WT: Rain



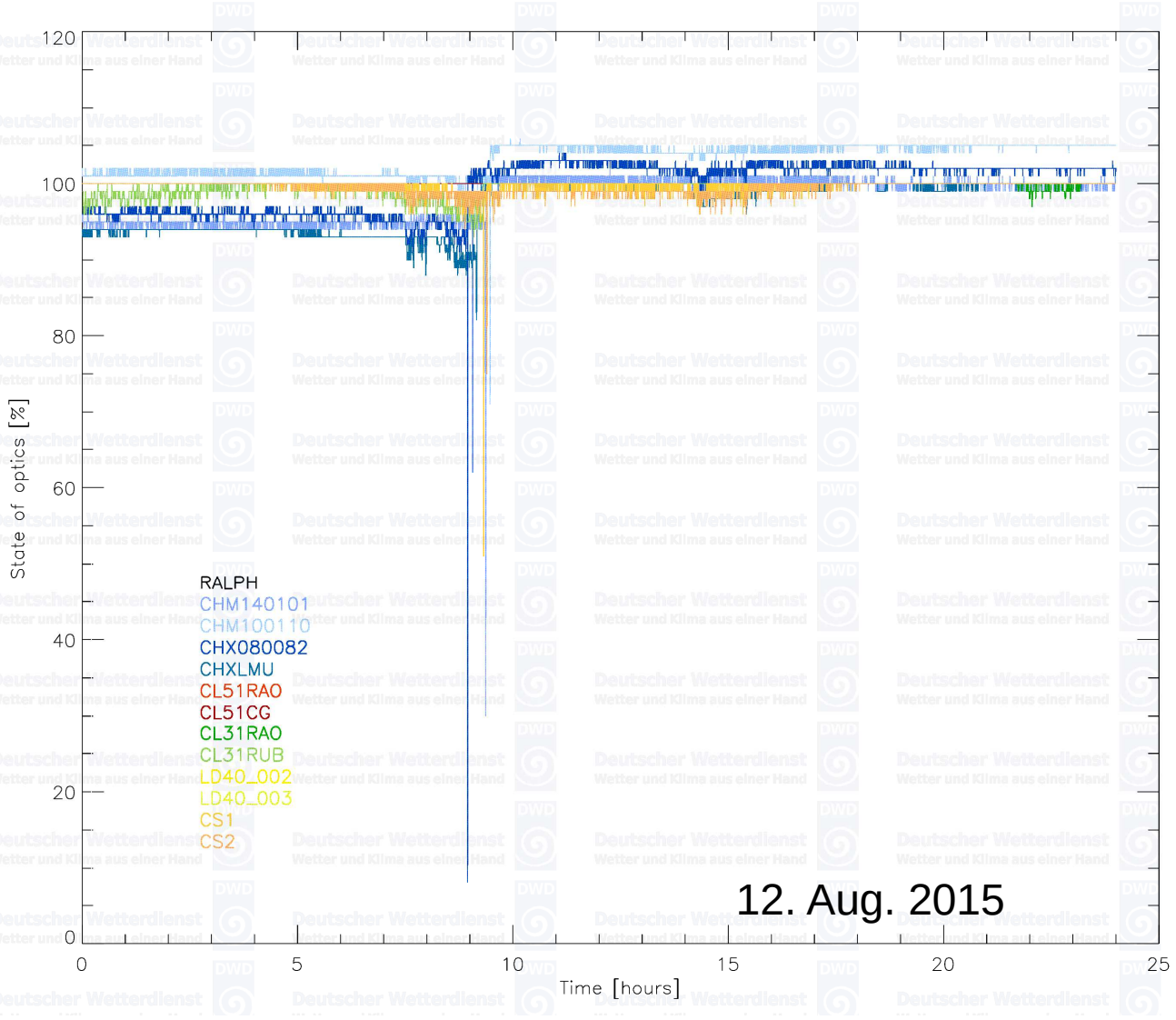
- Drop of WT at all instruments
- Major changes at Lufft instruments
- Other instruments: smaller drop in WT
- After rain: sometimes different level of WT than before (i.e. CL31RAO).

Changing WT: reason??



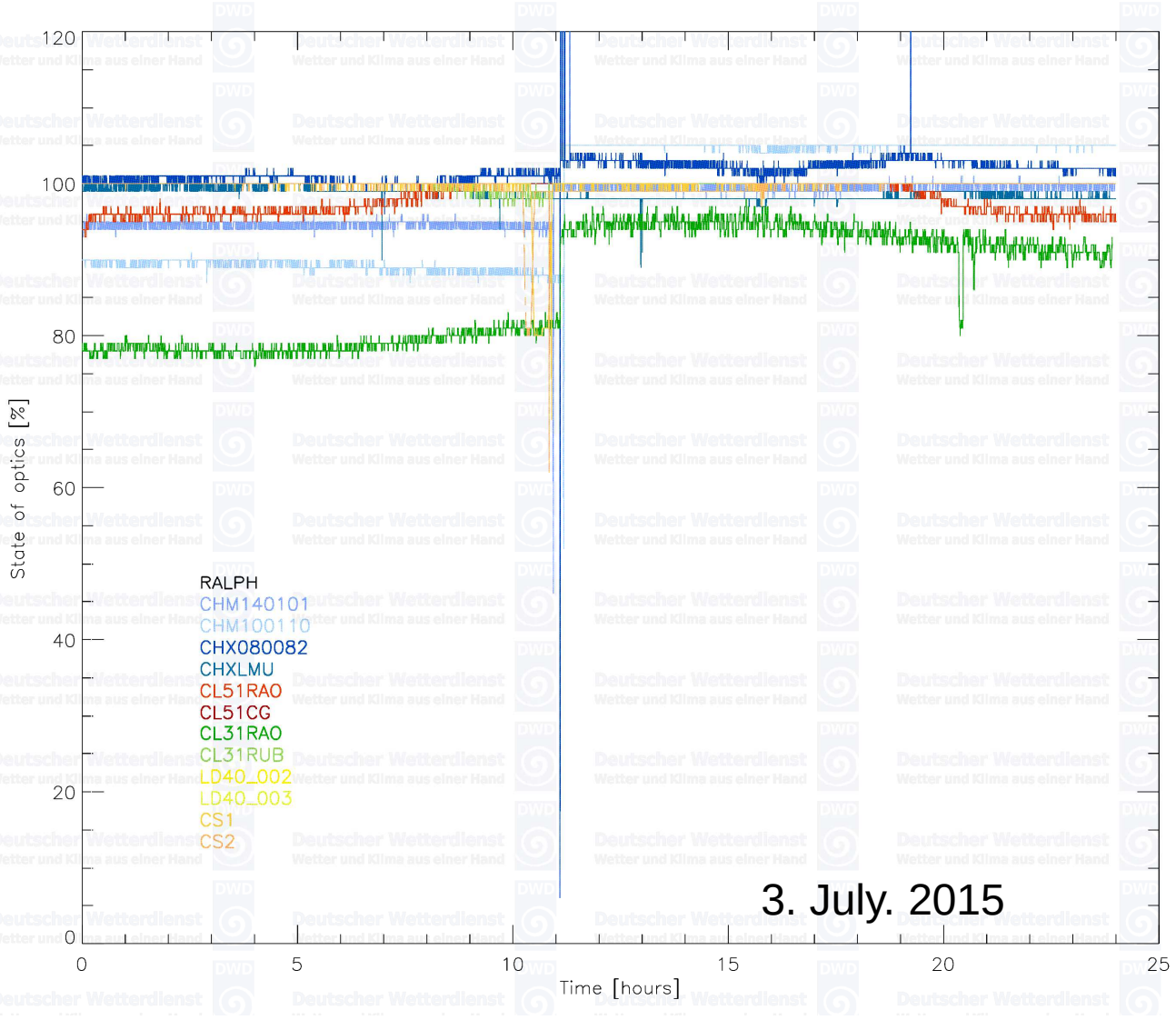
- Abrupt change at CHX080082
- “Fast” change of CL31RAO
- Slow change of CL31RUB >10%
- Causes uncertainty in the calibration

Window cleaning



- Abrupt changes in the window transmission
- Some of them has values over 100% → problem of initialization
- All ceilometers cleaned at the same time
- Effect on measurements?

Window cleaning



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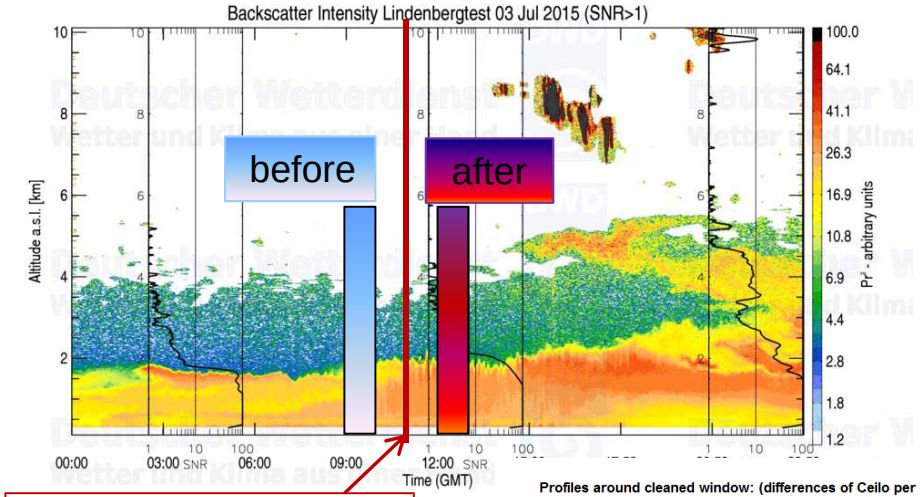
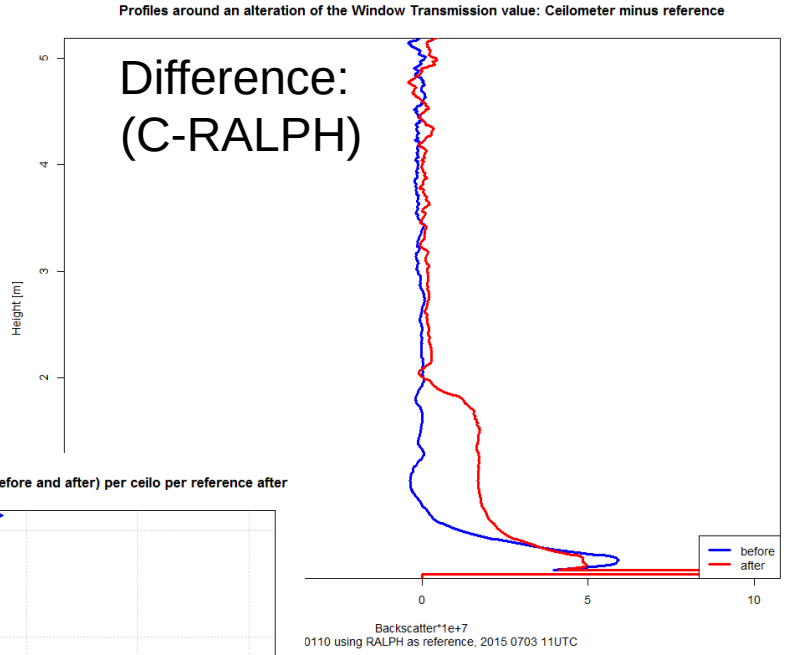
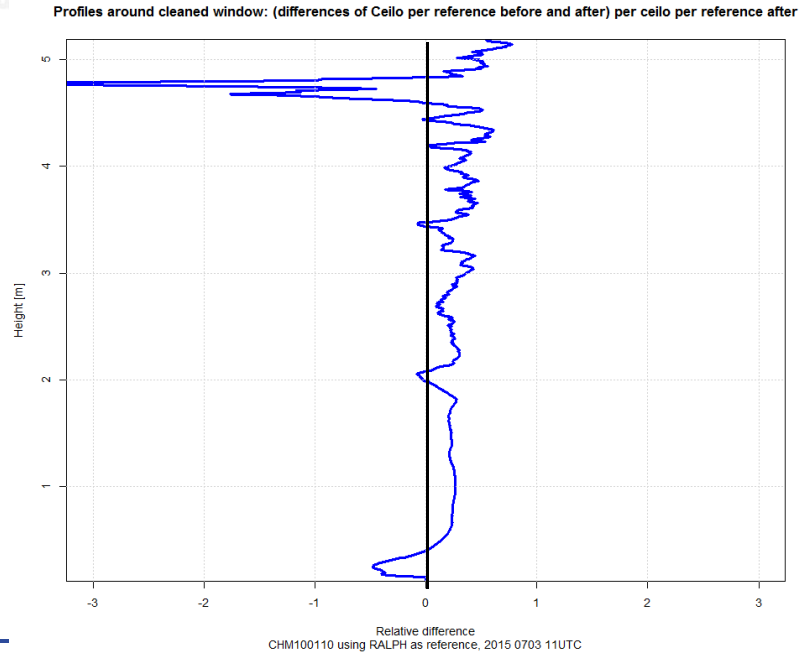


Window cleaning



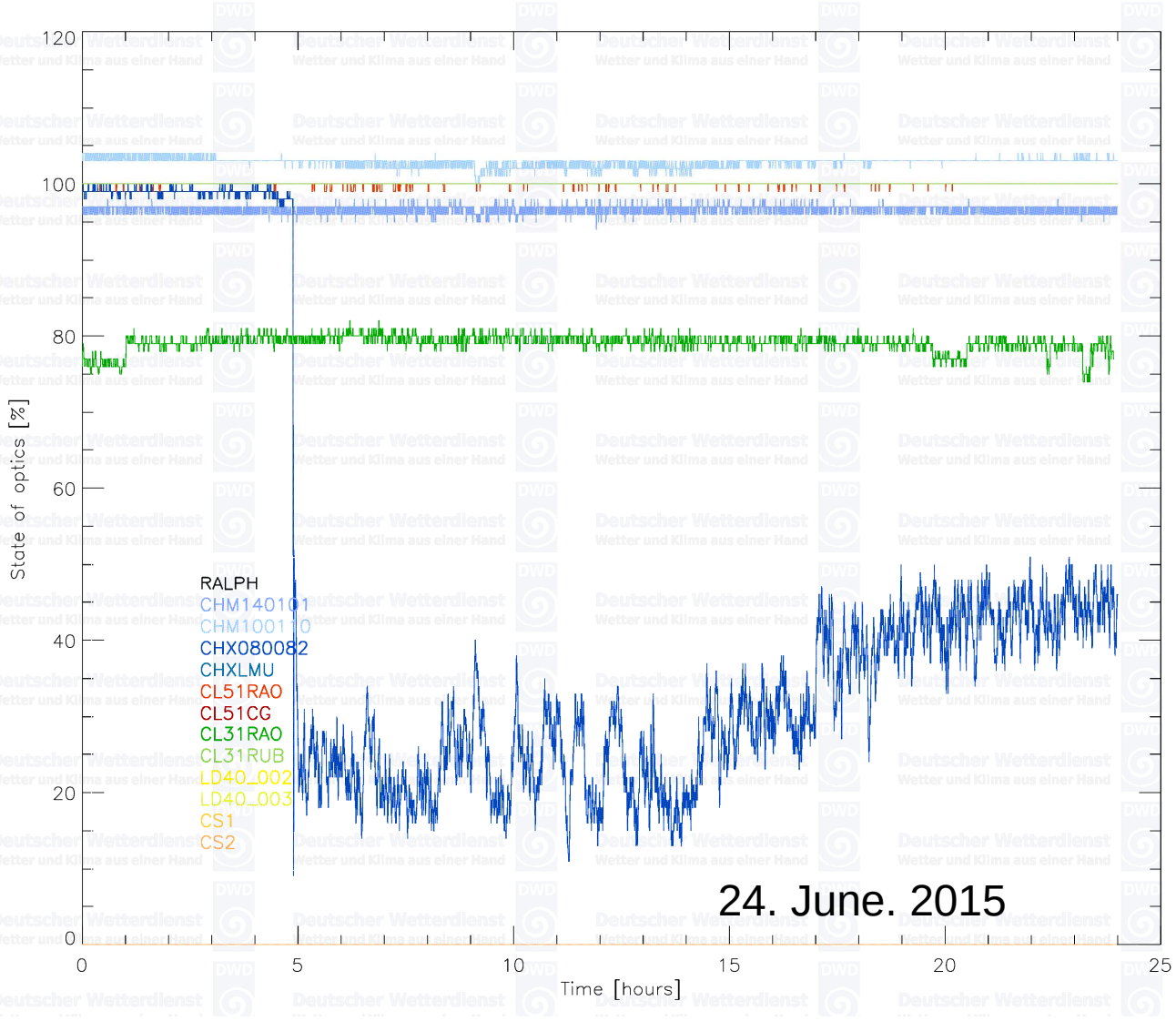


Calibrated difference:

$$\frac{C_a/R_a - C_b/R_b}{C_a/R_a}$$

C: Ceilometer
R: reference (RALPH)
a: after
b: before

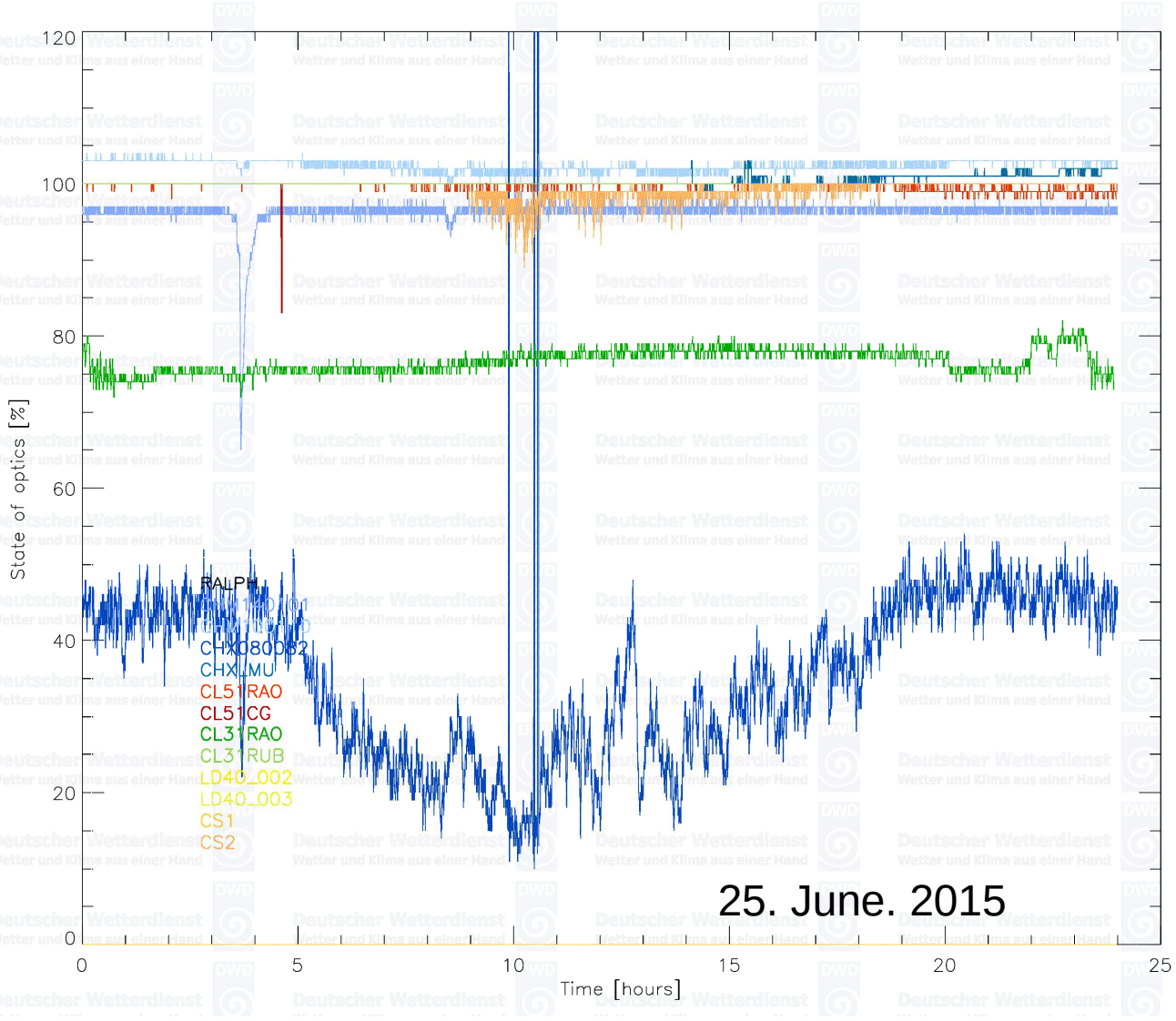
Changing WT: reason??



- CHX080082: Abrupt change
- Large variation in the WT value
- Slow and smooth change

WT dropped from 100% to 15-50%

Changing WT: some partial coverage



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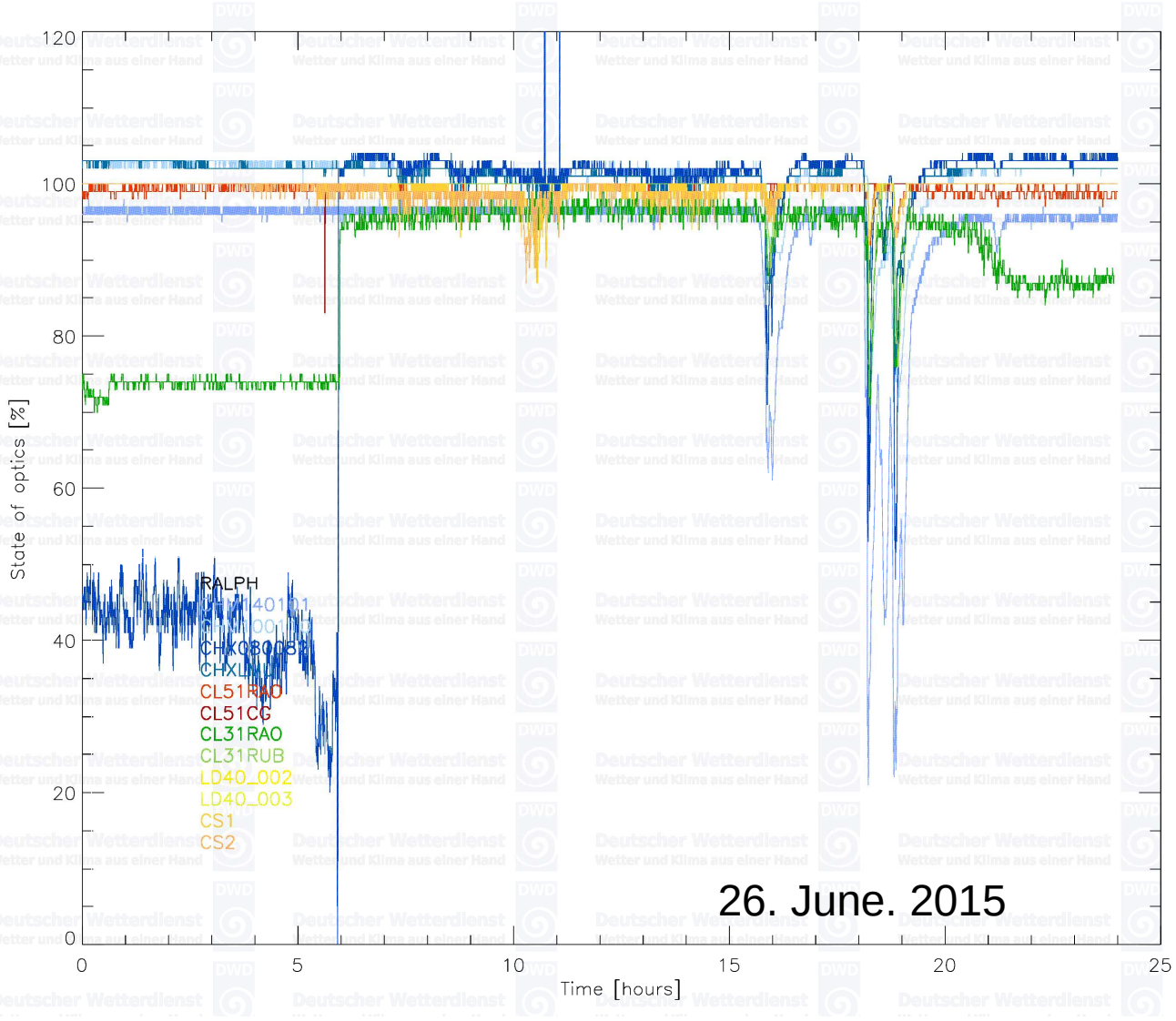
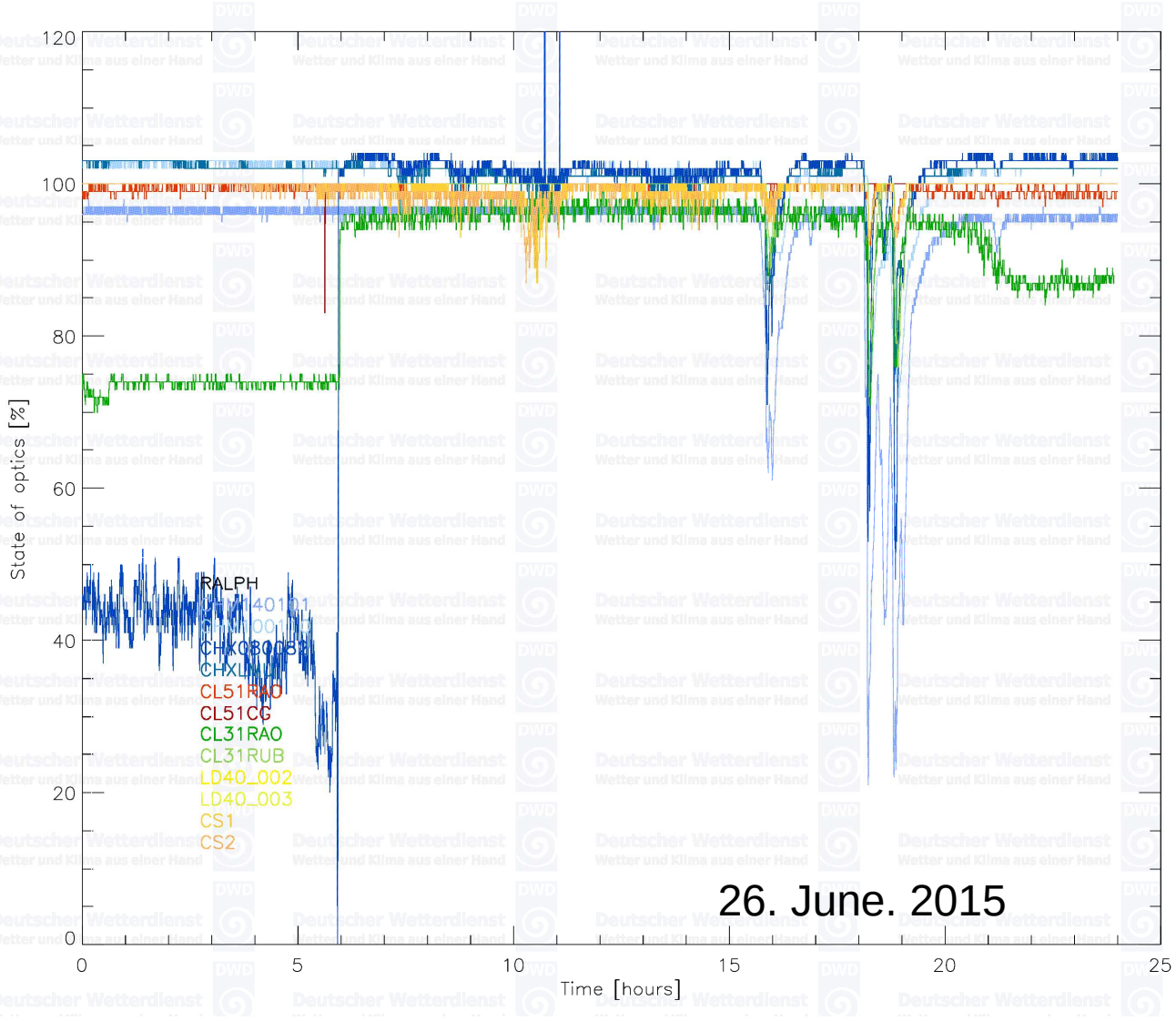


- CHX080082: Large variation in the WT value
- Slow and smooth change
- Abrupt change: window cleaned

Changing WT: Bird excrement



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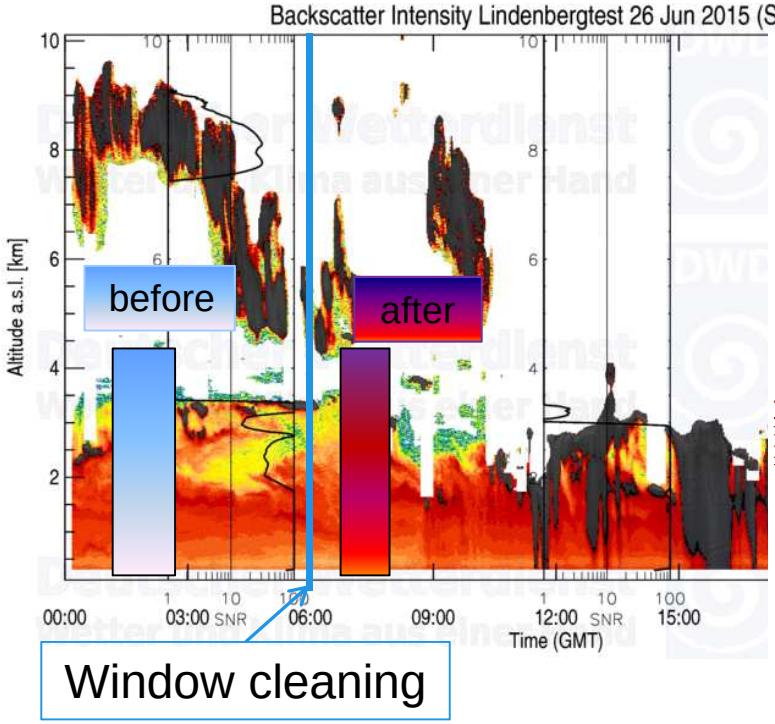

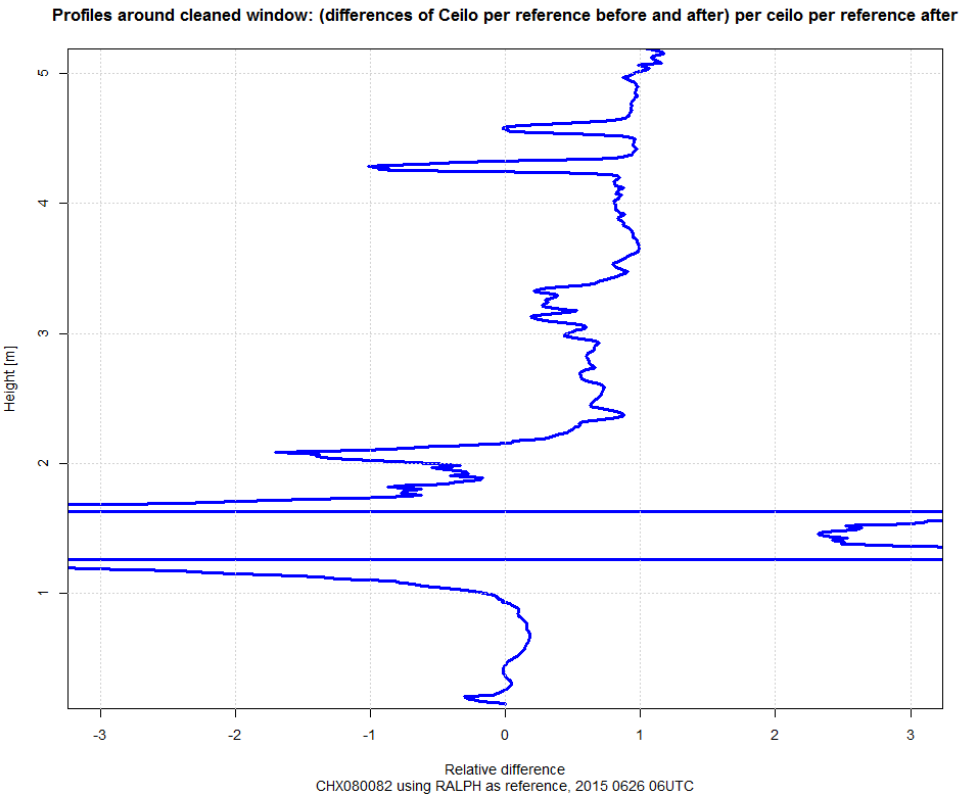

No clear difference:

Probably only a smaller part of the window were covered, and WT sensor was looking exactly there…

Take home message

- Take an eye on housekeeping data like window transmission (WT)!!!
- Slow and smooth changes in WT or abrupt changes are possible
- They may affect the measurements
- Brings uncertainty in the measurements and calibration
- Difference between
  - partial full coverage (bird poop, leaf, etc.) → more random effect
  - Full window, but transparent coverage (dust, mowed lawn) → clearer effect

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