

ExOb Seminar

13.12.2021

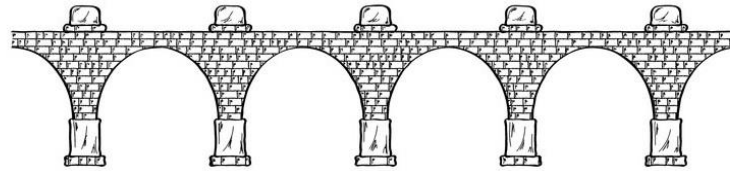
Topics

- Moritz: Cloud detection methods for a stand-alone MWR-gb
- Andrea: Comparison between ABLH retrievals over Mexico
- Other ?

Data acquisition

Ground based remote sensing instruments of the pilot station:

- Doppler-Lidar
- Microwave radiometer
- Cloud radar
- Water vapor DIAL
- Raman Lidar

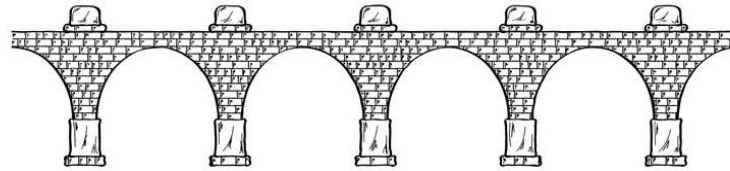


Quality checks and data transmission

- Integrating data in to transmission routines at DWD,
- Monitoring of transmission
- **automatic data quality checks**

Data assimilation and numerical weather prediction

(technical infrastructure - service and repairs)

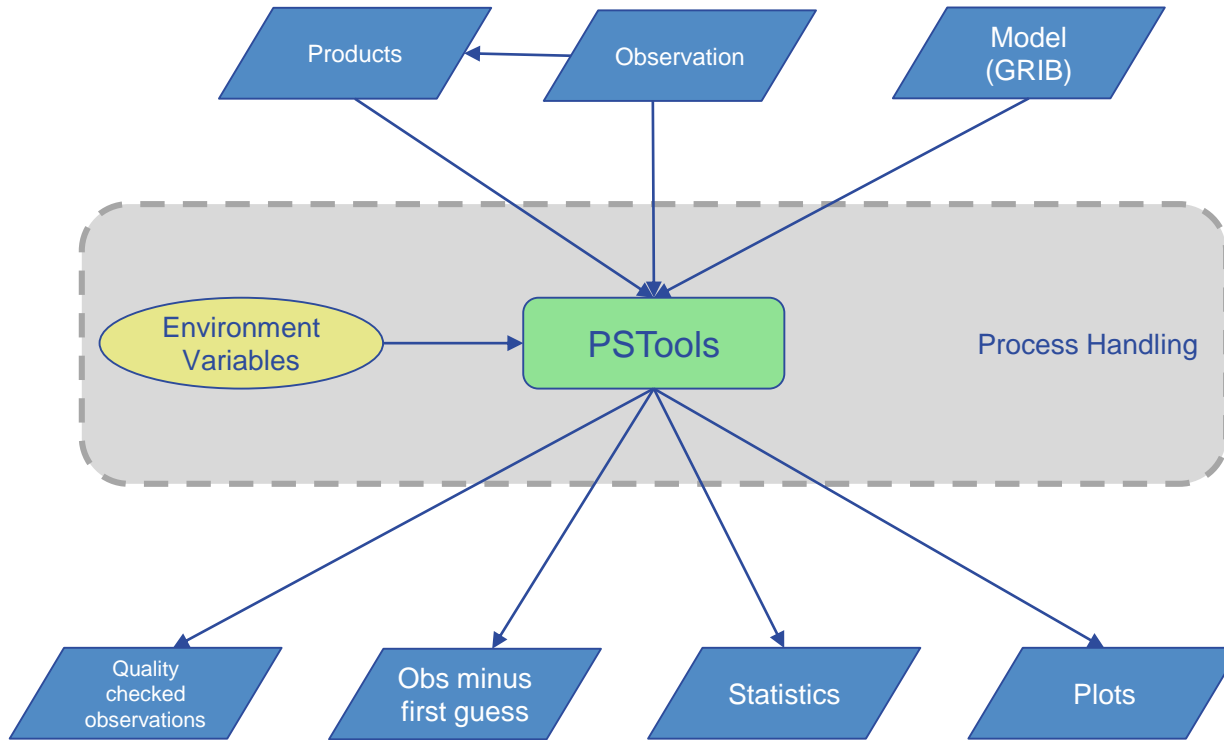


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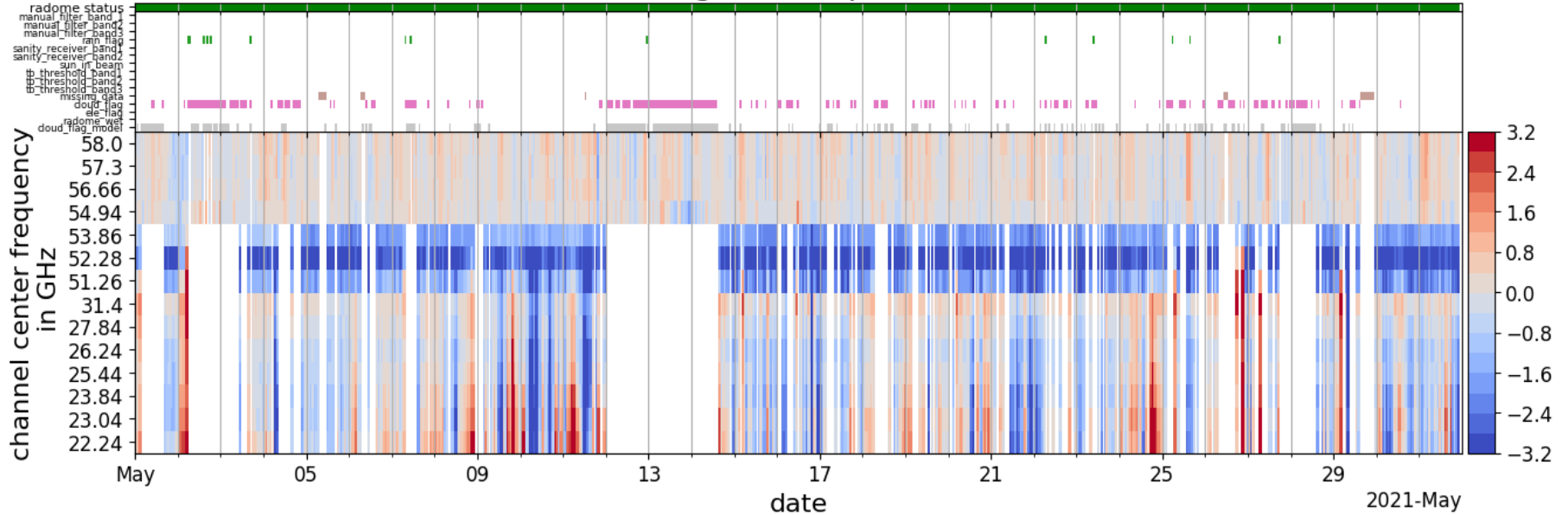
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Monitoring overview MWR

Obs. minus first guess HatproG5 LG - ICON-D2



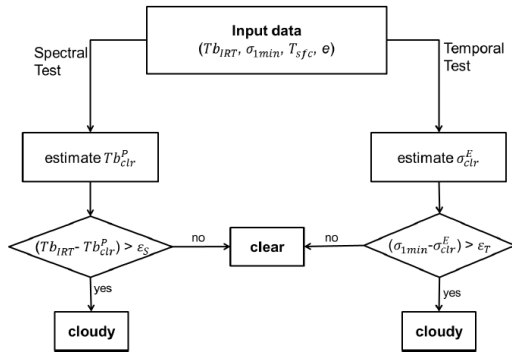
Cloud detection methods for a stand-alone ground based microwave radiometer

- Existing cloud detection methods and new ideas
- Evaluation/Verification

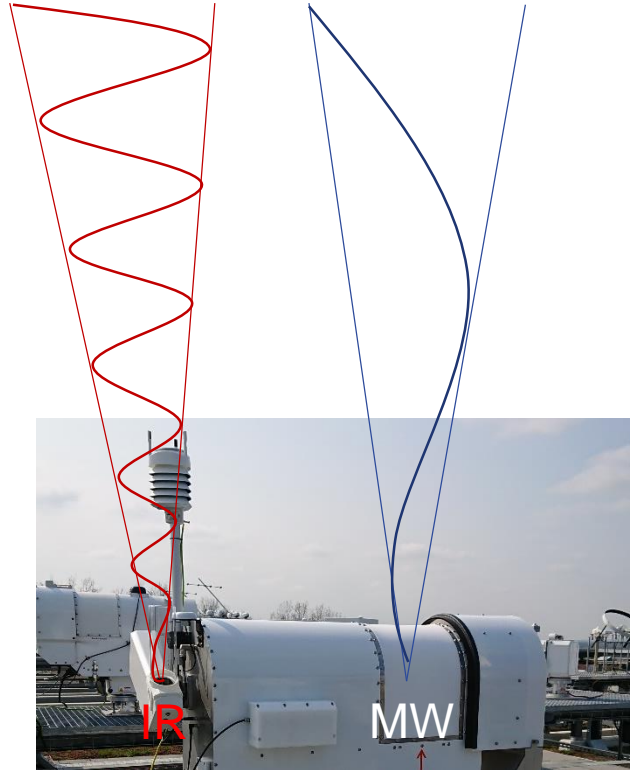
- Numerous clear-sky/cloudy algorithms are available
- A systematic comparison with respect to the performance of these is currently missing
- Multiple existing algorithms mainly aim to confidently identify clear-sky situations e.g. for
 - Calibrations
 - comparison with model or other reference
- Current assimilation efforts rely on cloudy/clear-sky differentiation due to
 - Different biases for cloudy and clear-sky cases
 - Lacking representativeness of observation due cloud mismatch
- Clear-sky/cloud algorithms are mostly designed for vertical measurements and may face issues at lower elevation angles

Cloud detection methods - vertical

$Tb_{IR} > -30^\circ\text{C}$ (e.g. Martinez et al. 2015)



Ice & liquid water clouds (Ahn et al. 2015)



$\text{Std}(Tb_{MW} @ 31 \text{ GHz}) > 0.5\text{K}$
 $1\text{h} < \Delta T < 30 \text{ min}$ ($\Delta T \Rightarrow 2 \text{ min}$ possible?)
(e.g. Turner et al. 2007, De Angelis et al. 2017)

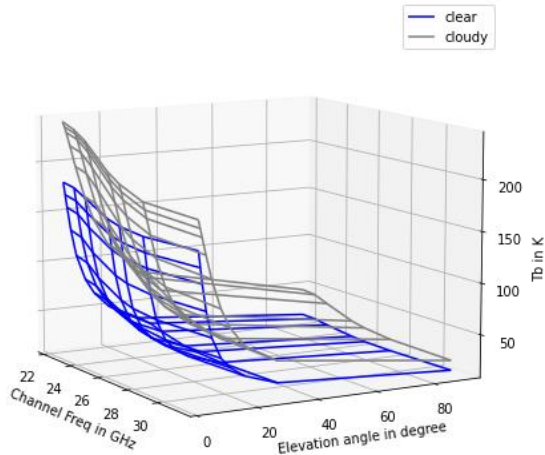
\Rightarrow LWP,
LWP > 3 x Noise (Hocke et al. 2016)
 $\text{Std}(\text{LWP}) > 1.5\text{g/m}^2$ (Ebell et al. 2016)
 $\Delta T \sim 6 \text{ min}$

Neural Network (NN) Algorithm

Training

- CloudNet
- Observation (Tb_{MW} , met. station)
- Covariance(Tb_{MW} , Tb_{IR})

Neural Network (NN) Algorithm



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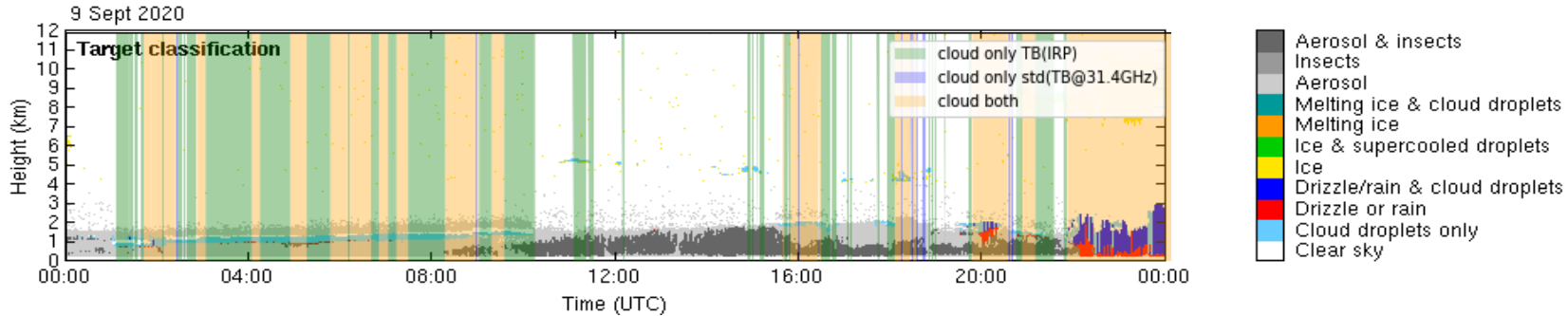
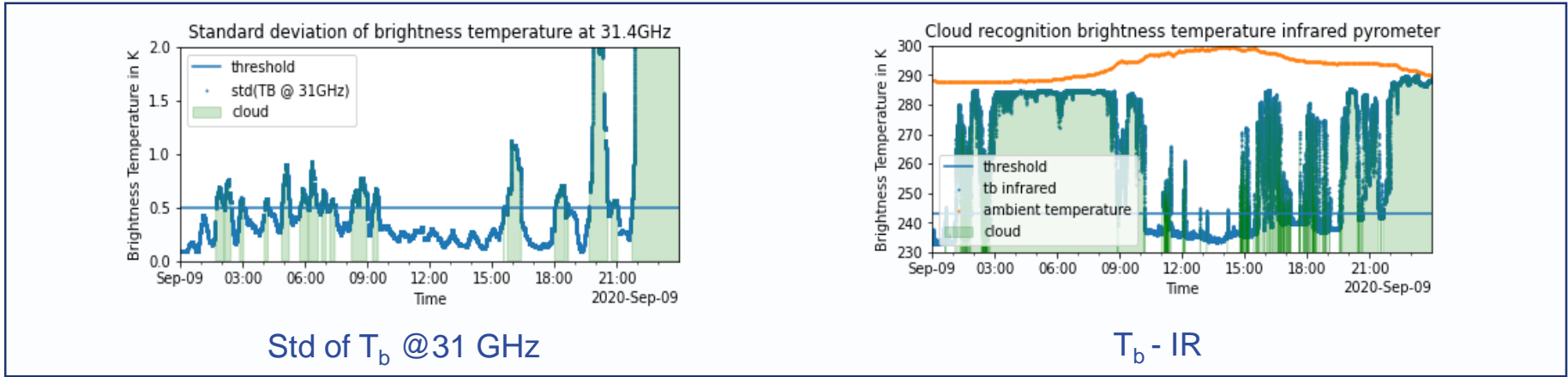
Neural Network (NN) Algorithm

Training

- Reanalysis (ERA5) + RTTOV-gb (\Rightarrow elevations + channels)
- Observation ($T_{b_{MW}}$, met. station)



Cloud detection methods – Evaluation

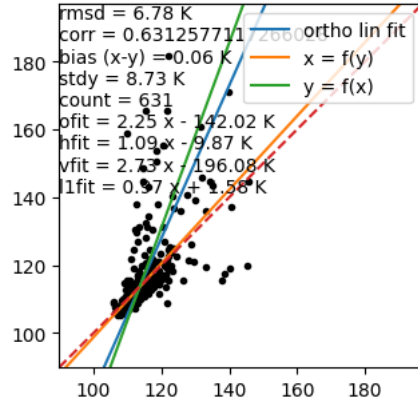


Observation minus first guess

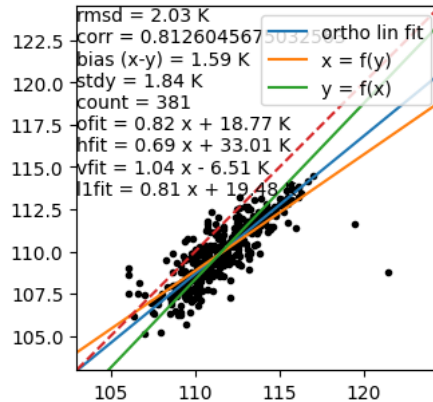
- Statistical evaluation of the agreement between model and observation

=> Possibly an indication for the benefit of using the data?

cloudy - 51 GHz



clear-sky - 51 GHz



Other criteria:

- Timeliness
- Technical requirements (IR-Radiometer?)
- Site requirements (CloudNet, Ceilometer, ...)
- Required measurement sequence (standard or specific)
- Computational requirements
- Geographical portability

Thank you!

Kontakt:

Moritz Löffler

Moritz.loeffler@dwd.de

