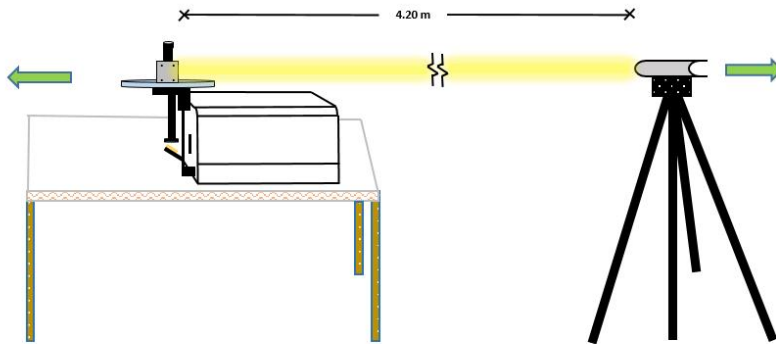


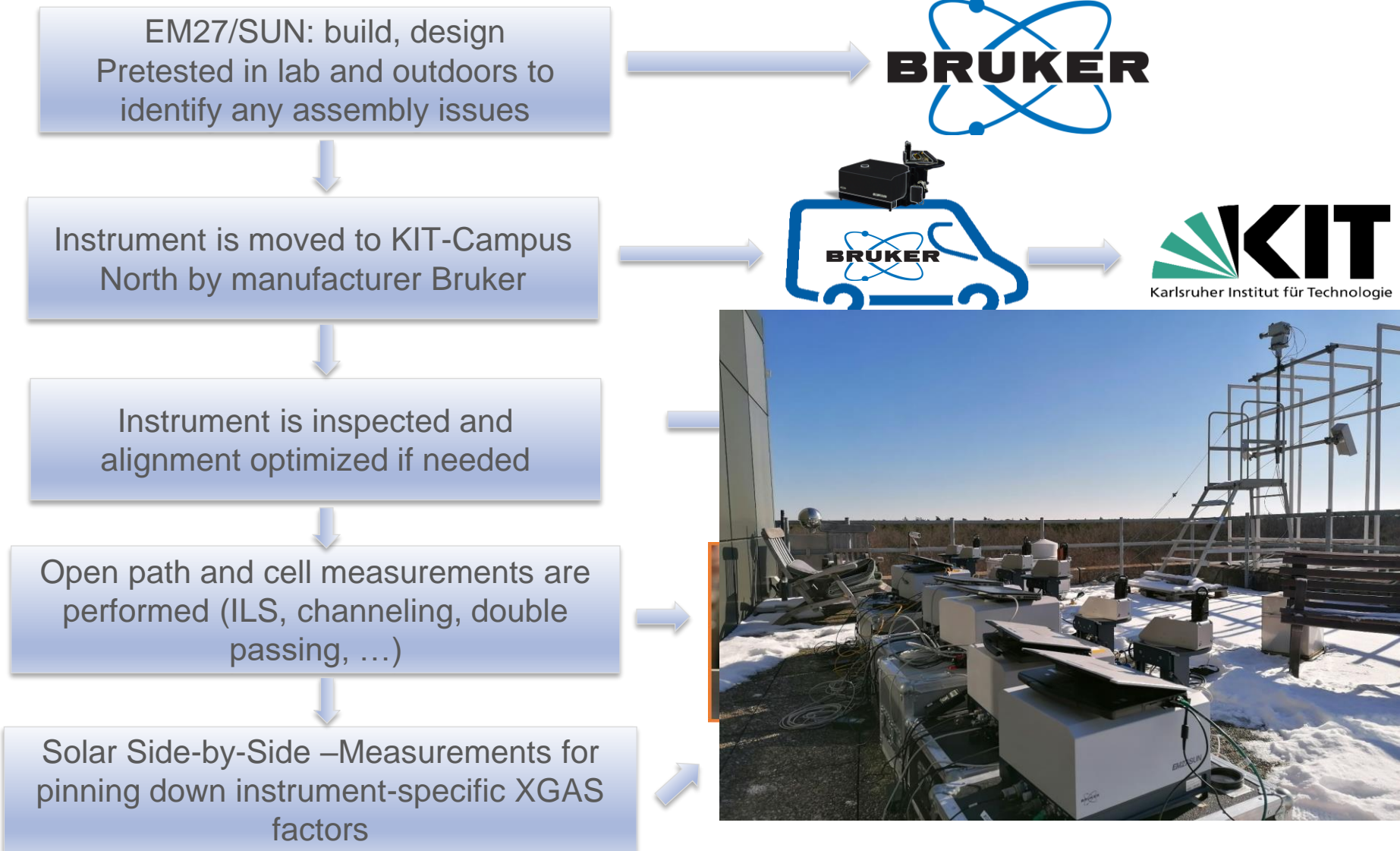
The Central Facility of the COCCON Network: Calibration procedures

Carlos Alberti and Frank Hase

Institute for Meteorology and Climate Research, Atmospheric Trace Gases and Remote Sensing (IMK-ASF, KIT)



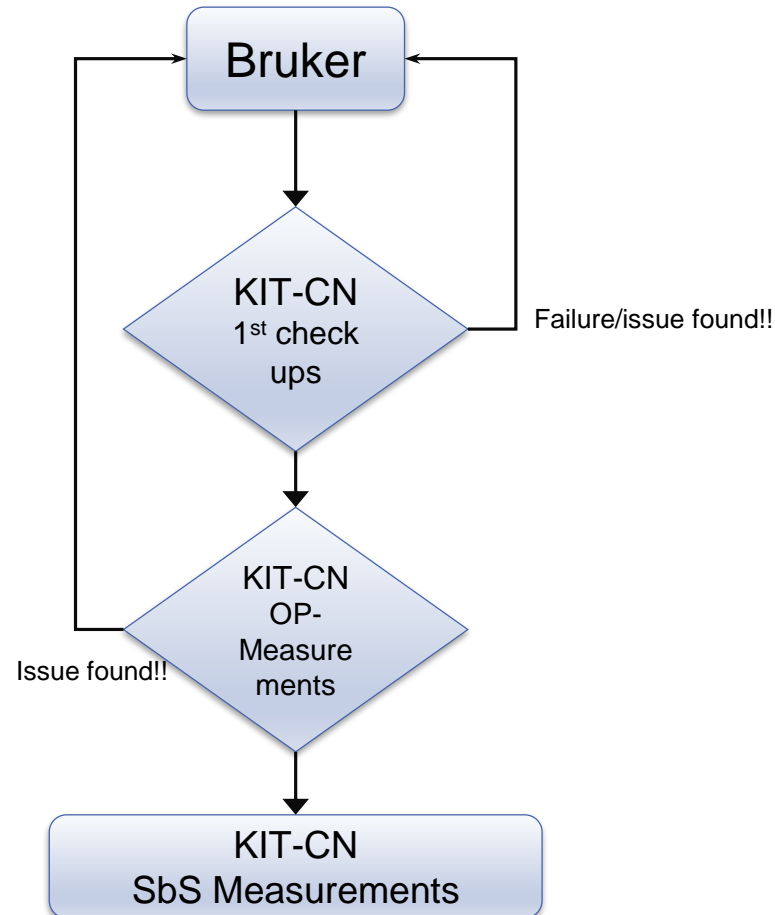
General Flowchart COCCON procedures



COCCON's reference

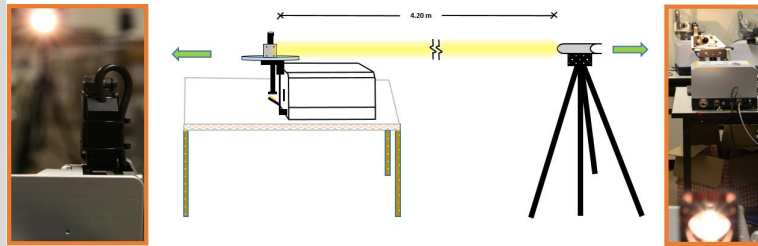


TCCON station KA

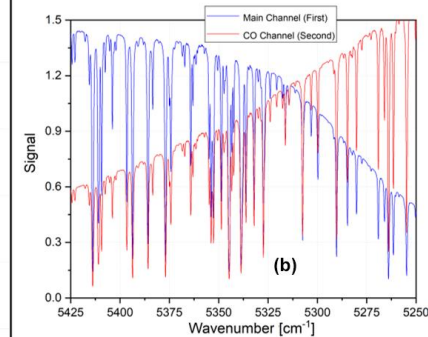
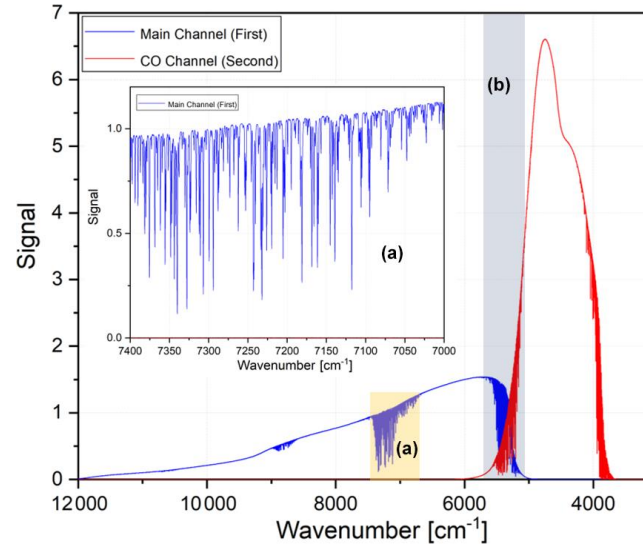


All check ups + calibration procedures DONE!!

Open-path laboratory measurement setup



H₂O absorption bands used for both channels

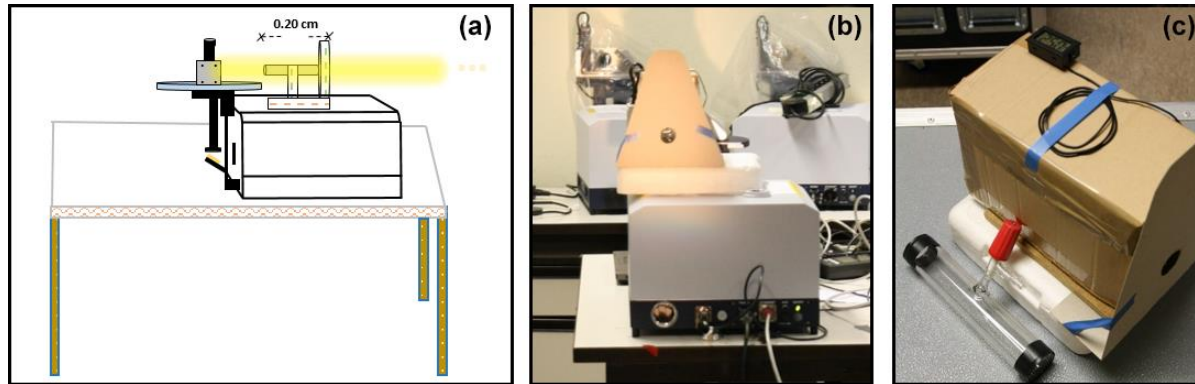


Current (improved) procedures:

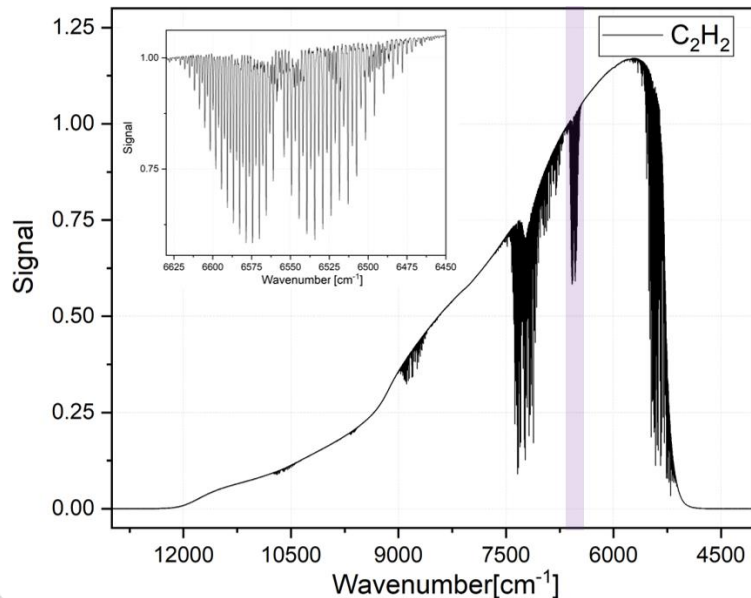
- > 2.5 hours spectrometer warm-up before lab meas are started
- Cell measurements added (C₂H₂ cell)
- Analysis of open path measurements: Distance travelled by the beam inside the instrument must be considered in the data analysis (instrument operated with open venting holes for ensuring constant H₂O VMR along the whole path).
- Use of improved H₂O line list for open path data analysis
- Accurate auxiliary data: pressure from KIT-TRO tall tower, lab T from local sensor

ILS calculated using LINEFIT 14.5!

C₂H₂ laboratory measurement set-up



C₂H₂ absorption band used

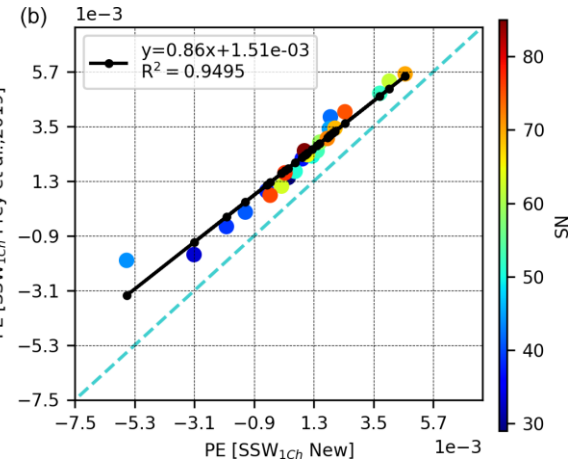
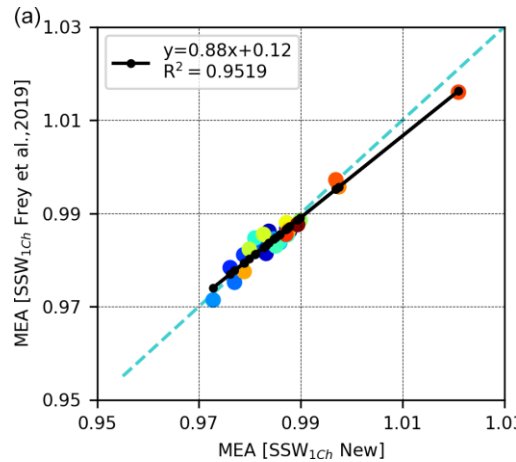
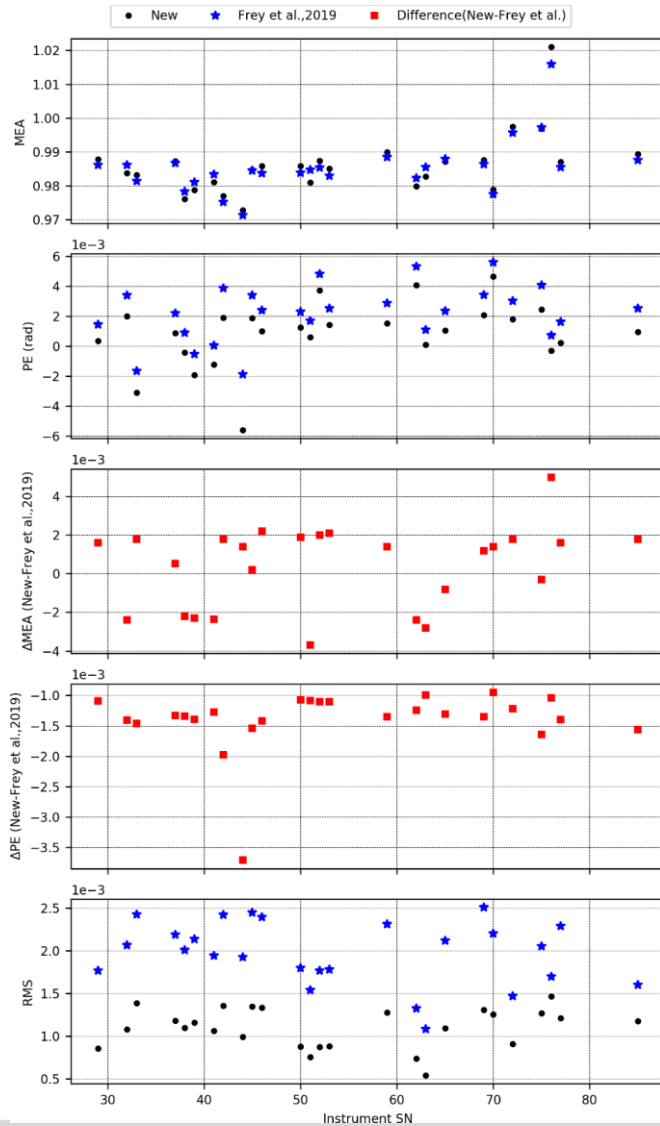


- Measured variables in the cell with respect to the IFS125HR.

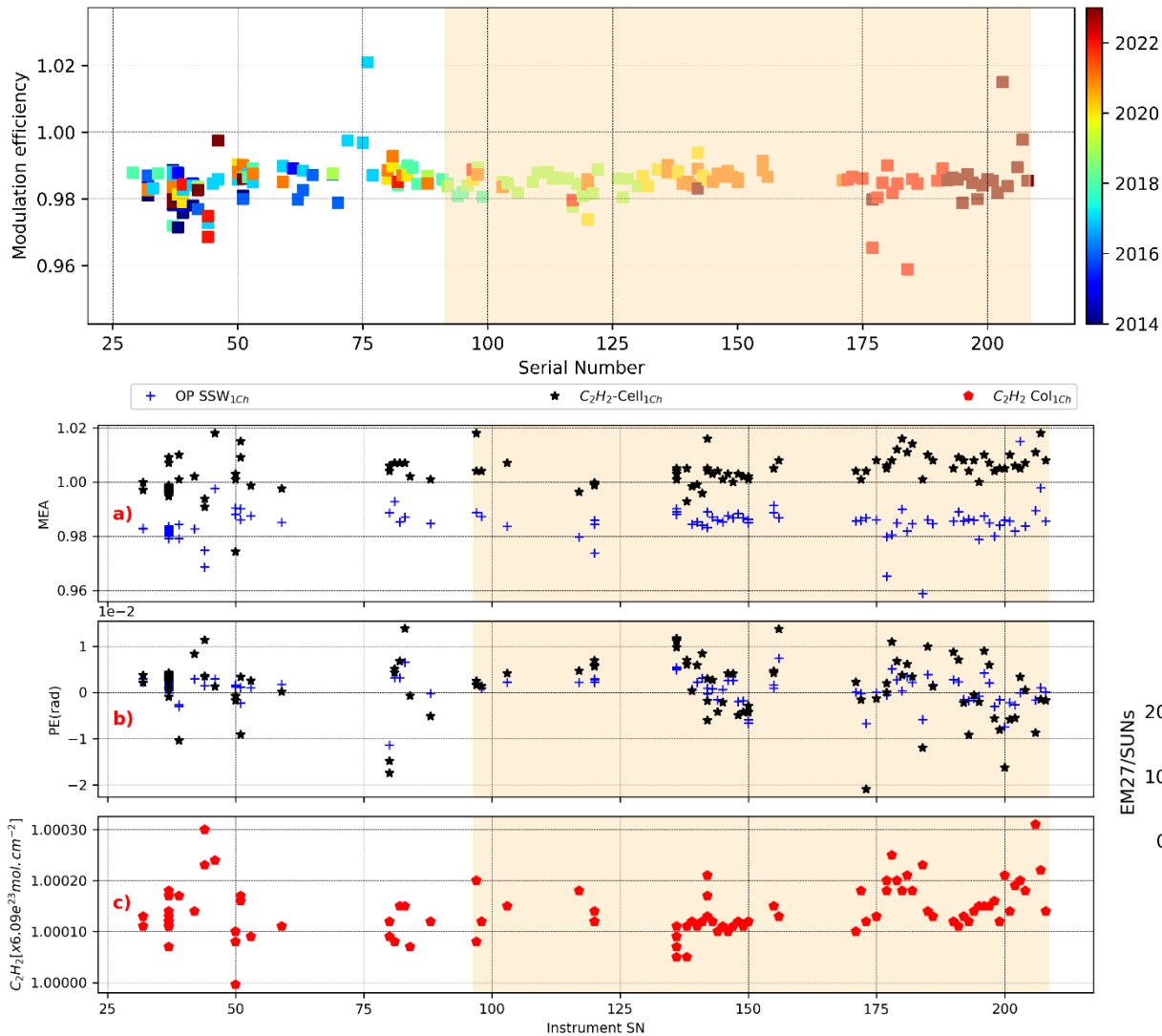
T [K]	p_{tot} [hPa]	p_{part} [hPa]
288.2	138.0	121.8
303.2	147.8	128.1

ILS calculated using LINEFIT 14.5!

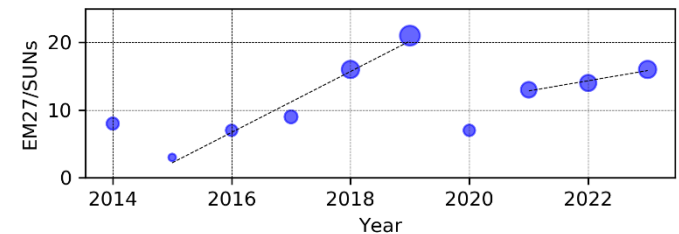
Comparison with the previous results published by Frey et. al., 2015



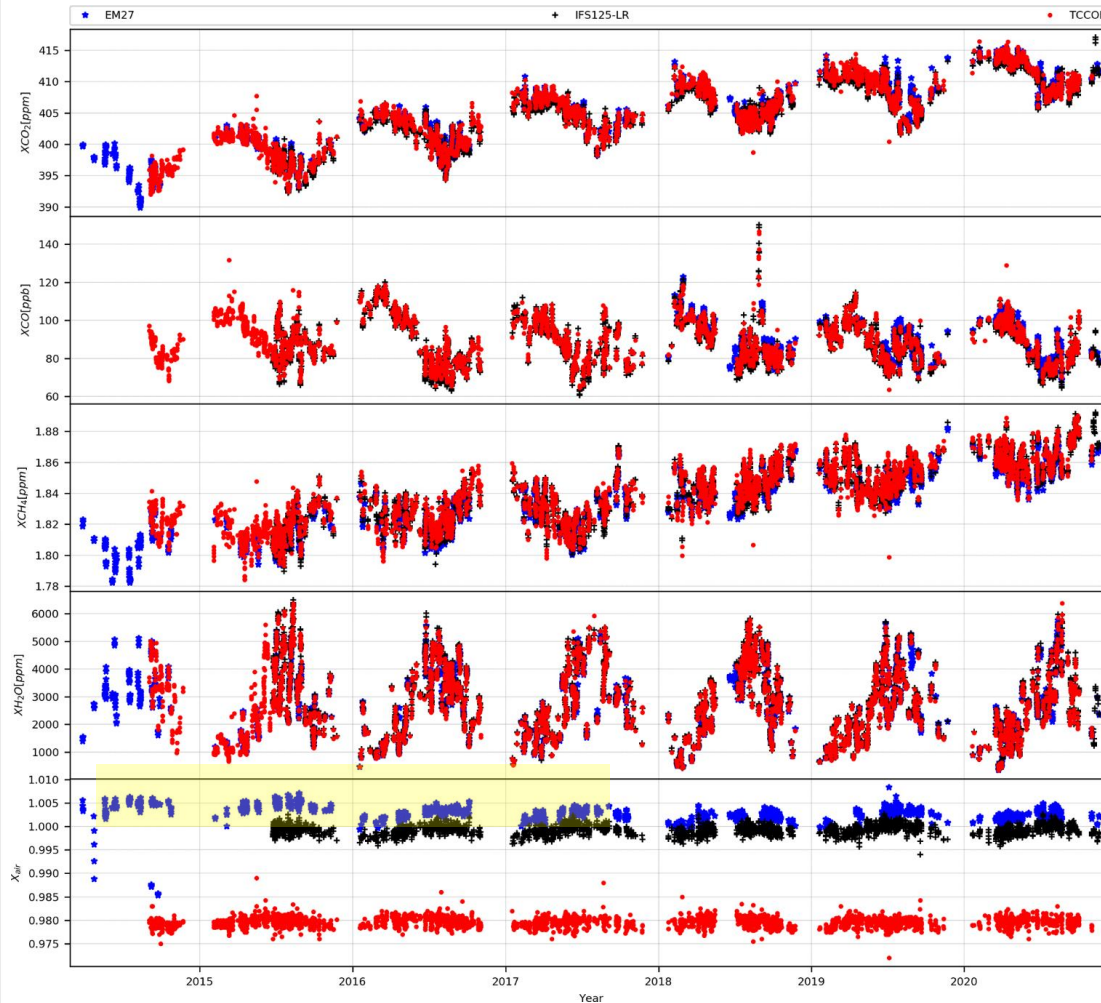
Improved open-path results for all spectrometers



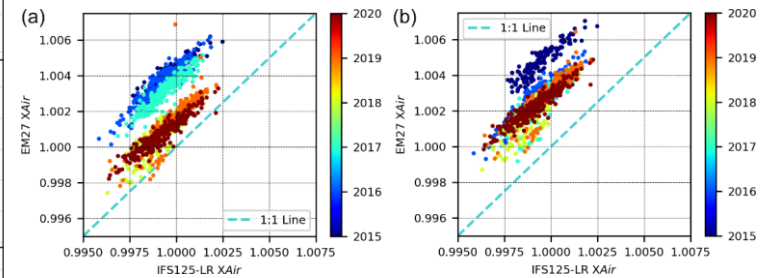
~70 instruments calibrated after Frey et al., 2019



Long-term stability of reference unit

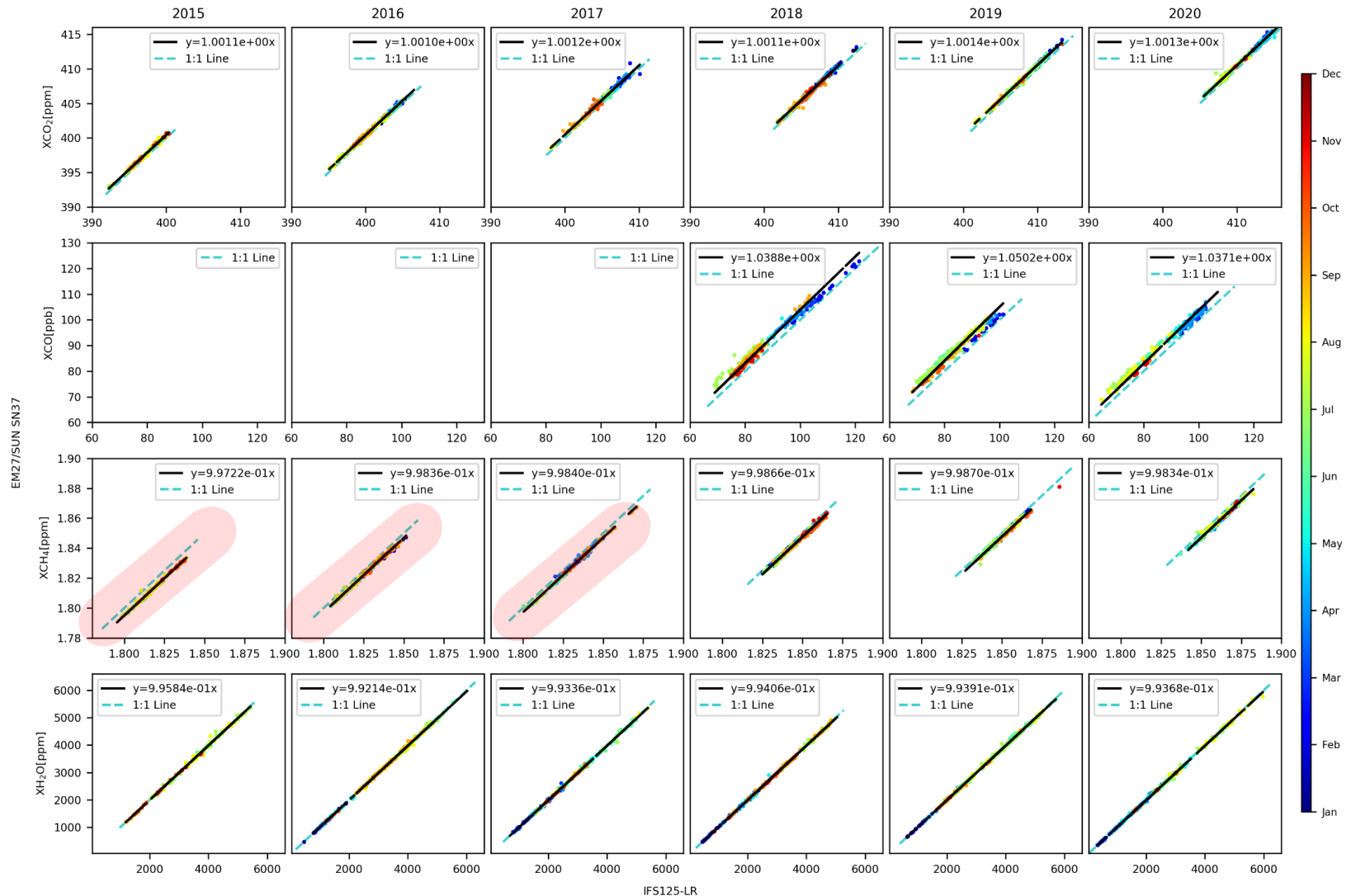


- Changes of X_{AIR} in time series of reference spectrometer



Solar side-by-side calibration measurements

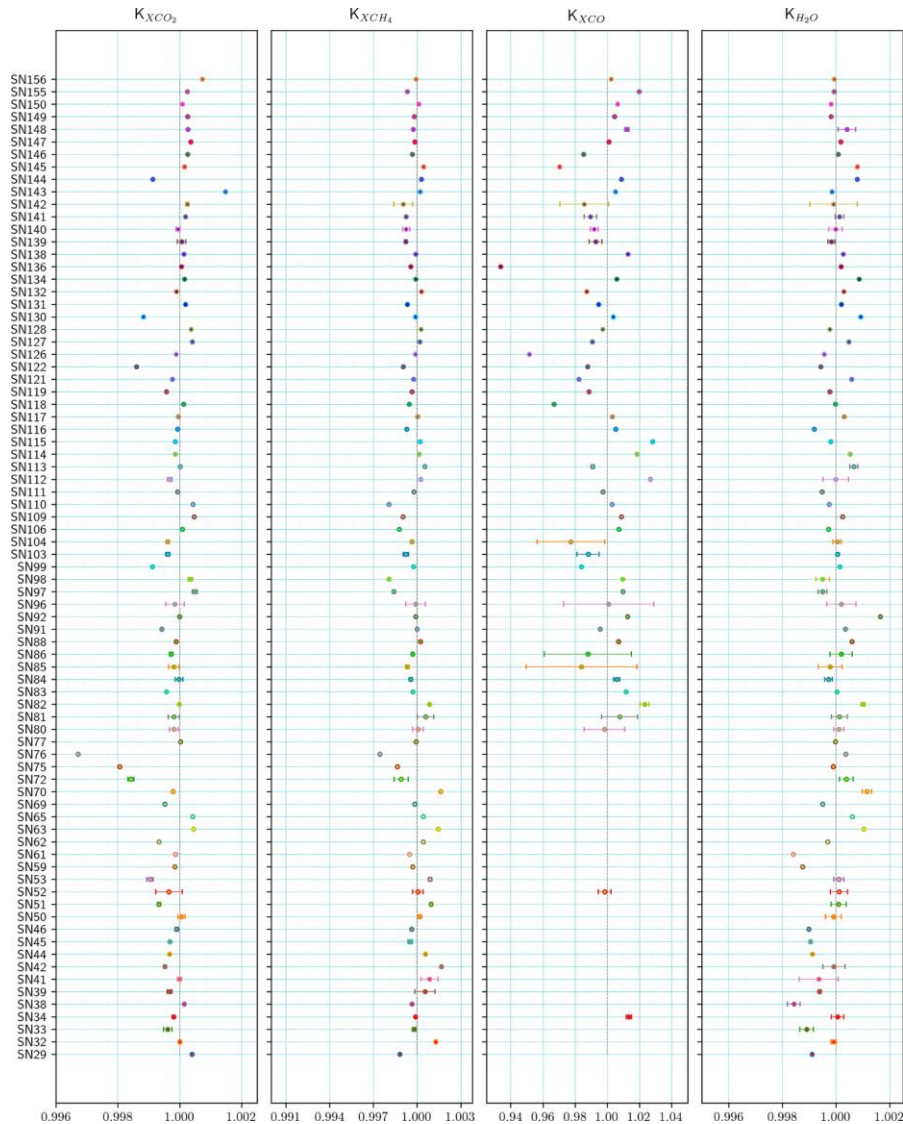
Correlations Xgas abundances retrieved with the COCCON reference vs TCCON instrument in LR mode



Solar side-by-side calibration measurements

Empirical X_{GAS} adjustment factors for all tested spectrometers

$$X_{\text{gas}}^{\text{corr}} = K_{\text{gas}}^{\text{SN}} \cdot X_{\text{gas}}^{\text{no-corr}}$$



- 120 EM27/SUN spectrometers have passed our Lab facilities so far (4 more being checked in these days)
- The lab and solar measurements helped to find tracker issues, channeling on detectors, misaligned instruments, bad-glued parts, camera problems,
- Several old instruments come back for servicing due to various issues, often these were re-tested by KIT (study long term stability)
- OP measurements are used as the primary method for COCCON network (available from the beginning, can be realized anywhere, no cell needed).
- The C2H2 cell method is used as an additional tool for assessing the instrument characterization.
- The COCCON calibration procedures are continuously refined.
- Current results on instrument characteristics are distributed as part of the PROFFAST pilot wrapper

Thanks for your attention!