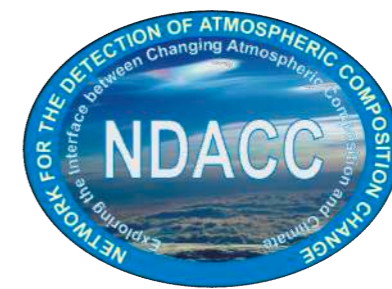
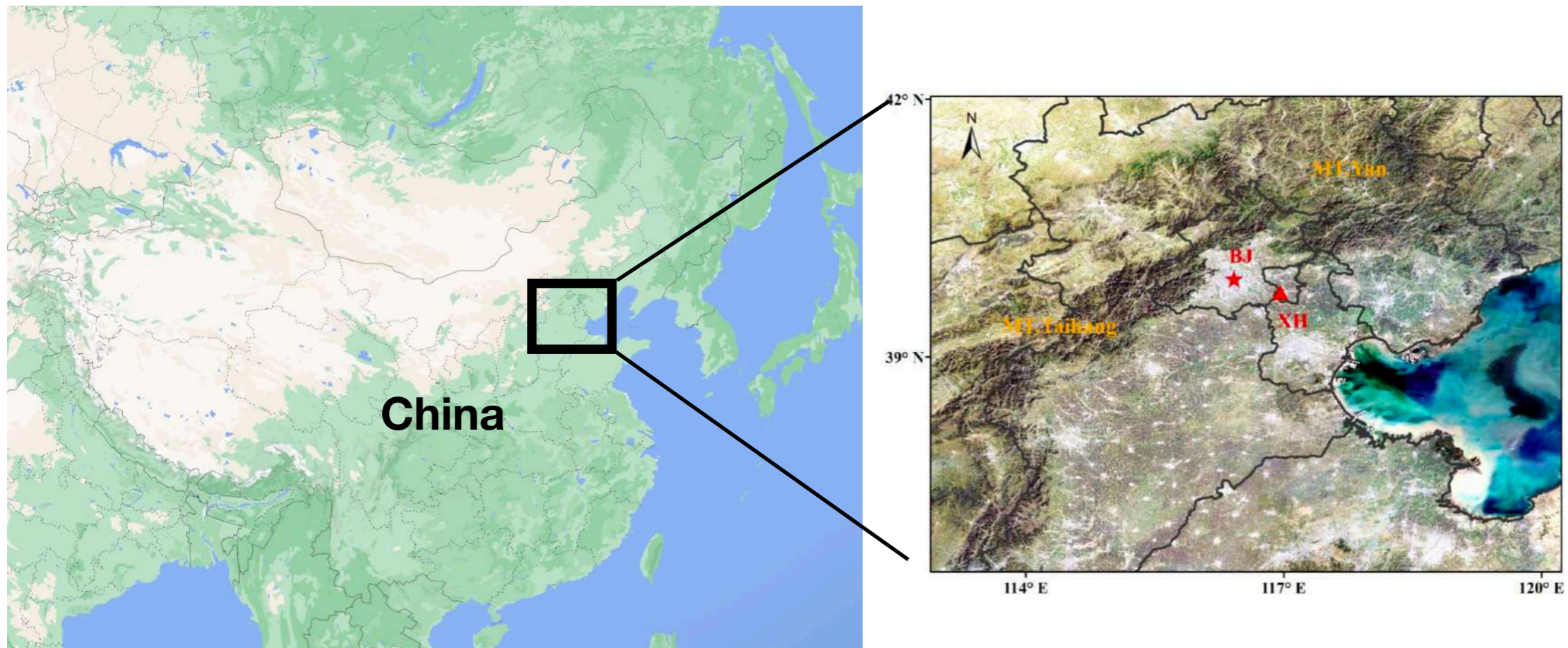




FTIR activities at IAP/CAS, China

Minqiang Zhou¹, Zhaonan Cai¹, Qichen Ni¹, Ke Che¹, Yi Liu¹, Pucai Wang¹, Weidong Nan¹, Bavo Langerock², Christian Hermans², Mahesh Kumar Sha², Corinne Vigouroux², Nicolas Kumps², Martine De Mazière²

¹ IAP/CAS ² BIRA-IASB



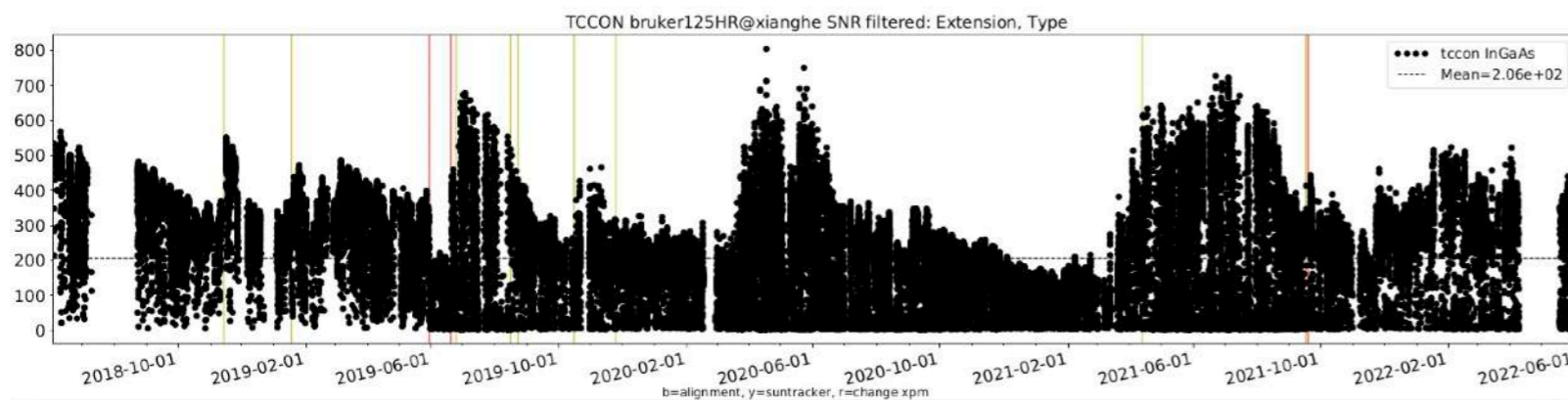
21-24 June 2022 TCCON/NDACC/COCCON annual meeting

Instruments and measurement status

Instruments	Bruker 125HR	Bruker EM27/SUN
Location	Xianghe	Around Beijing
Measurement mode	TCCON + partly NDACC (InSb)	COCCON
Retrieval code	GGG2020 (TCCON) SFIT4 (NDACC)	GGG2020 & PROPFFAST

We currently have **1 Bruker 125HR** and **4 Bruker EM27/SUN** instruments (Table).

The 125HR is continuously operated at Xianghe. Two EM27/SUNs are operated at Beijing and Xianghe, and the other two are operated for specific campaigns (For more information about the EM27/SUN measurements refer to [the poster of Zhaonan Cai](#)).



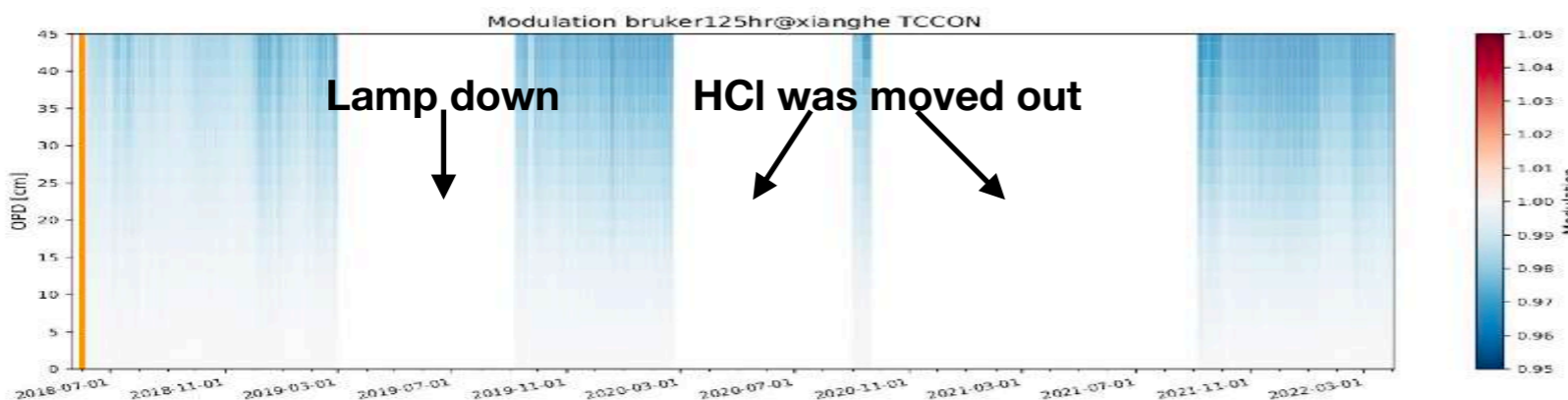
Due to the decline of the mirror, the SNR is varying with time. We normally clean the mirrors with pure water when we find the SNR is at a low level.



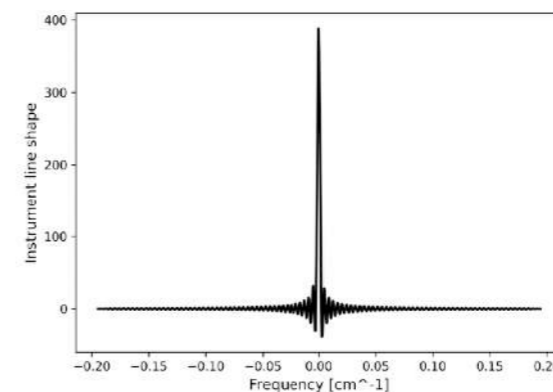
Before clean



After clean



The ILS of the 125HR instrument is measurement by HCl cell (NIR) and Her cell (MIR)

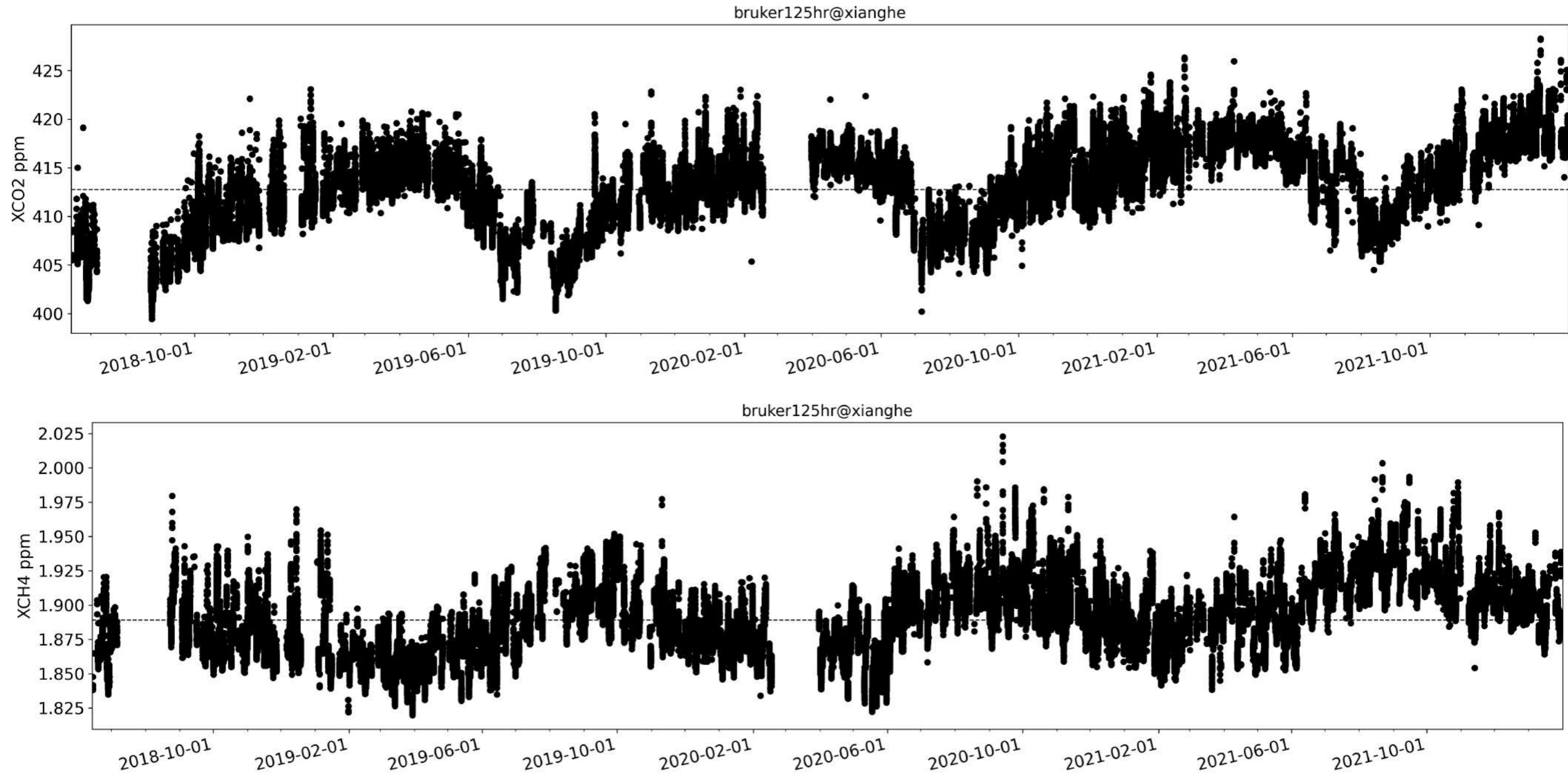


The max ME loss at 45 cm is about **3.8%**

TCCON measurements at Xianghe

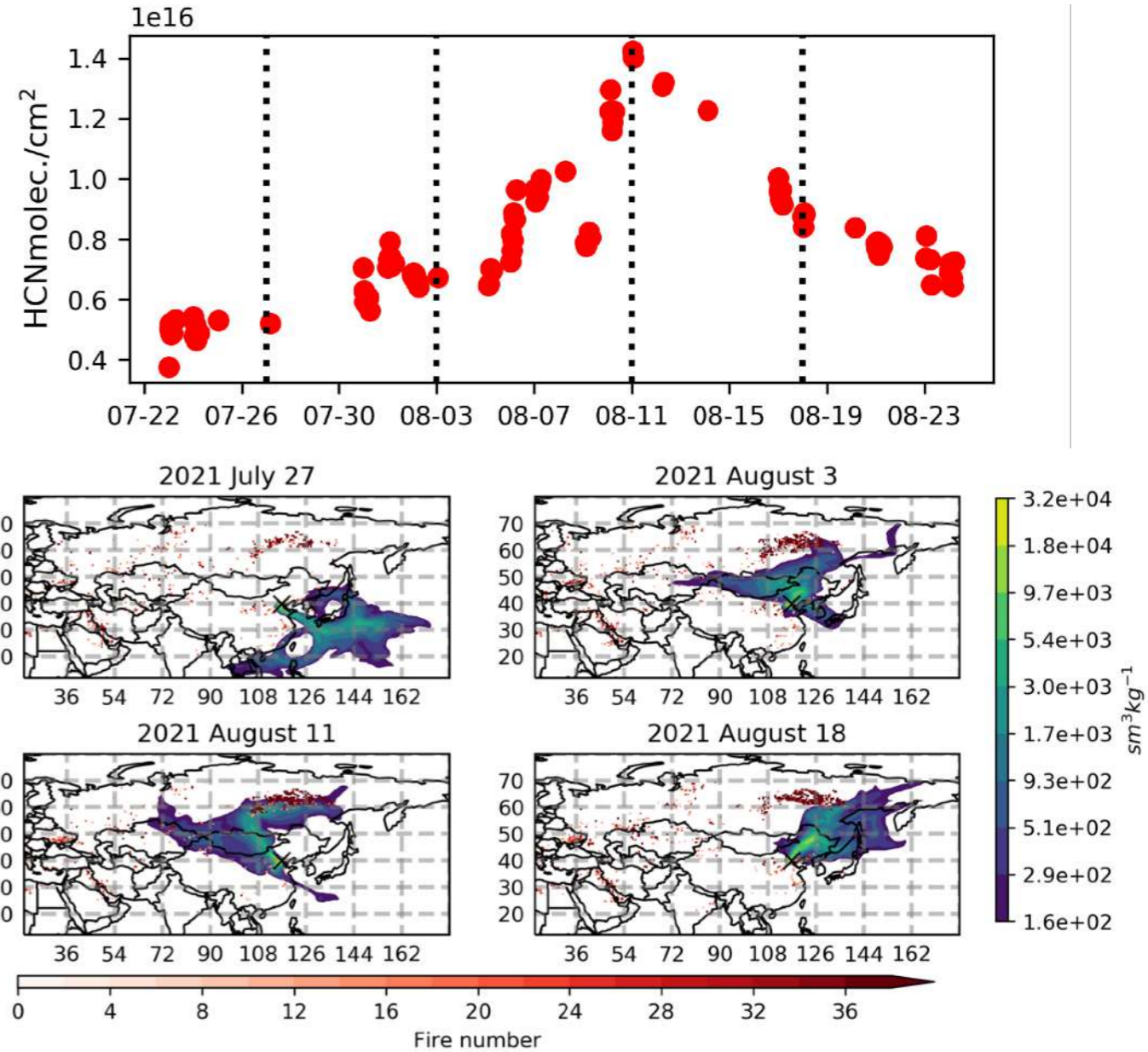
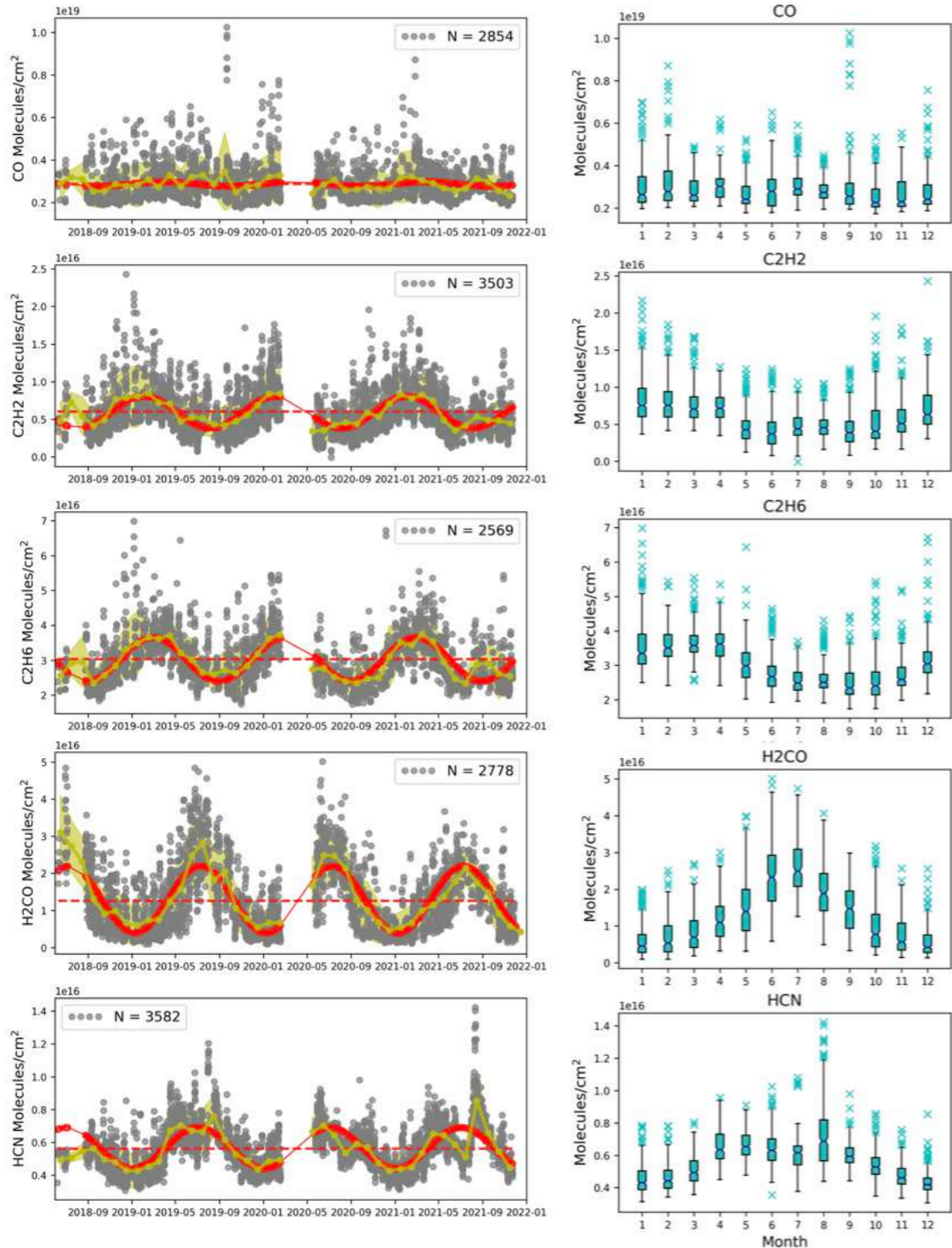
Target species: CO₂, CH₄, CO, N₂O, HF, H₂O, HDO

Data between June 2018 and March 2021 is available at <https://tccodata.org/>



NDACC-type measurements at Xianghe

Target species: CO, O₃, NO, C₂H₂, C₂H₆, HCN, HCHO, N₂O ...



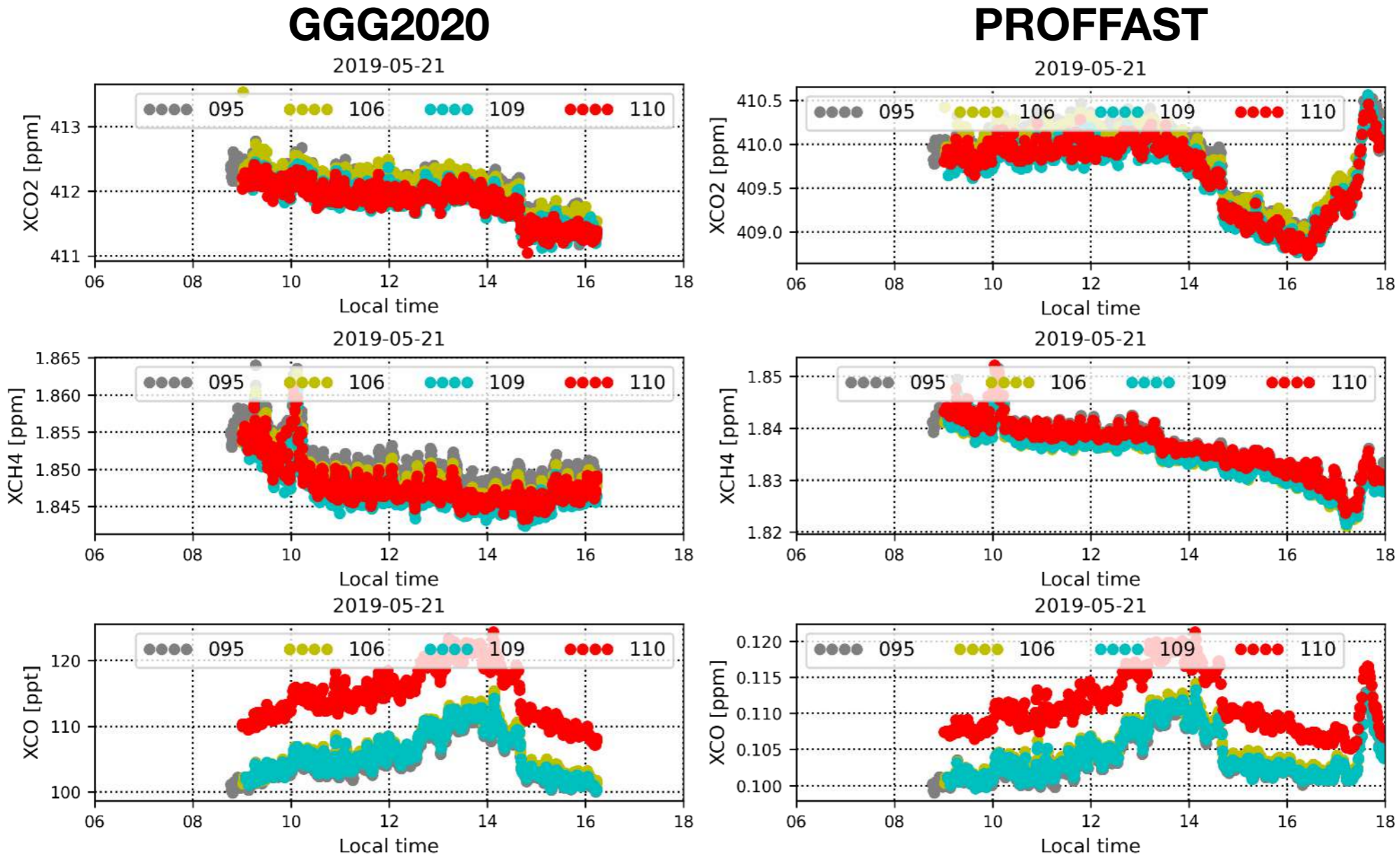
Enhancement of HCN in August 2021 coming from the boreal forest fire emission in Russia observed at Xianghe

Time series and seasonal variation of CO, C₂H₂, C₂H₆, H₂CO and HCN

(Zhou et al., submitted to ACP, 2022)

Inter-comparison among 4 EM27/SUN FTIR measurements

The four EM27/SUN (SN #095/#106/#109/#110) were operated together at the roof of IAP building for about 10 days in 2019



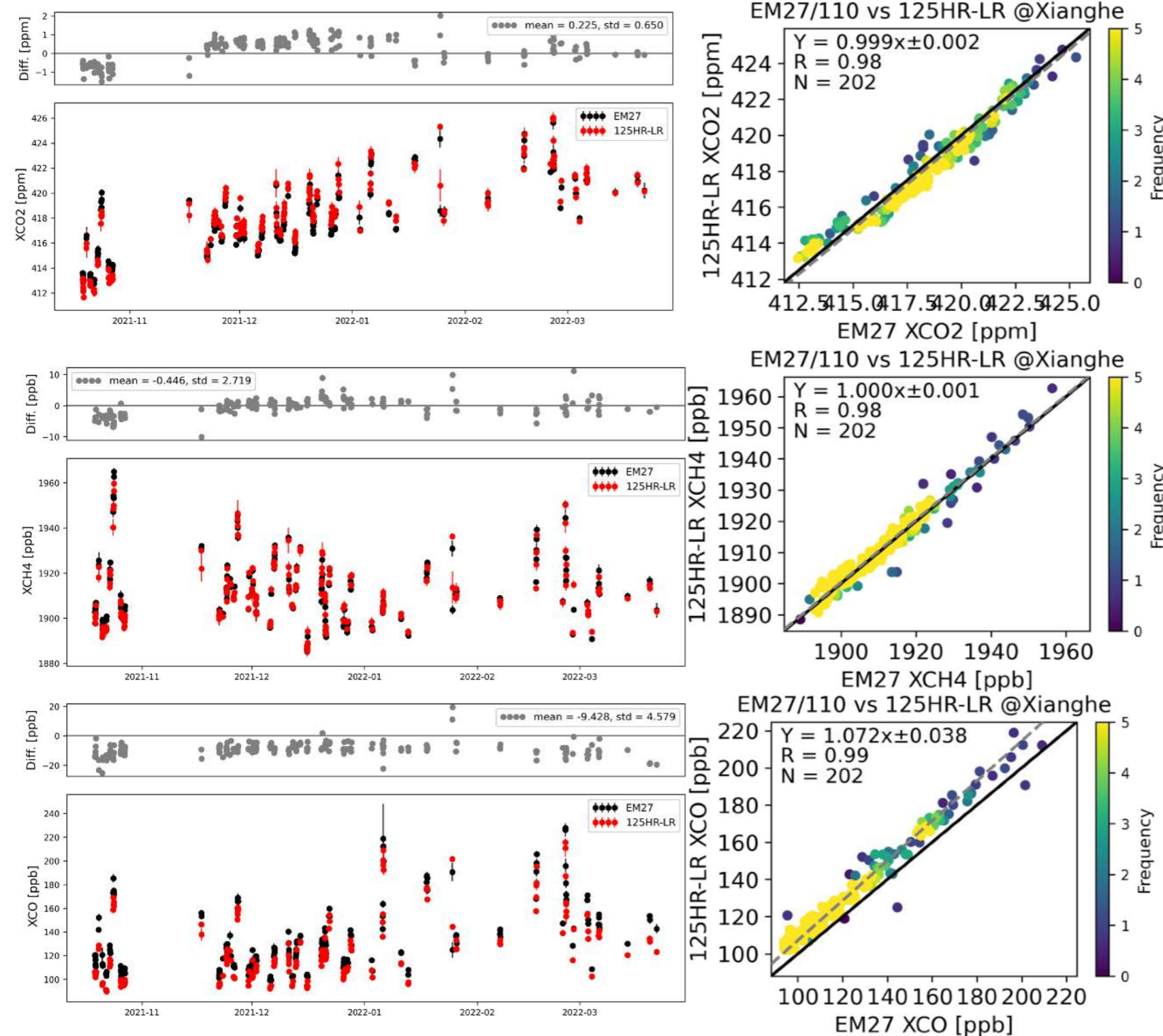
The time series of XCO₂, XCH₄, and XCO observed by four EM27/SUN measurements using the GGG2020 (left) and PROFFAST v1.0 (right) retrieval algorithms on 21 May 2019.

- the XCO observed by SN110 is about 10% larger than the other three EM27
- The XCH₄ observed by SN095 is slightly (~0.15%) larger than the other three EM27

Comparison between EM27/SUN and 125HR measurements

The 125HR instruments started also the low-resolution measurements (0.5 cm⁻¹) in Oct 2021
 The EM27/SUN SN#110 has been operated close to the 125HR at Xianghe since Sep 2021

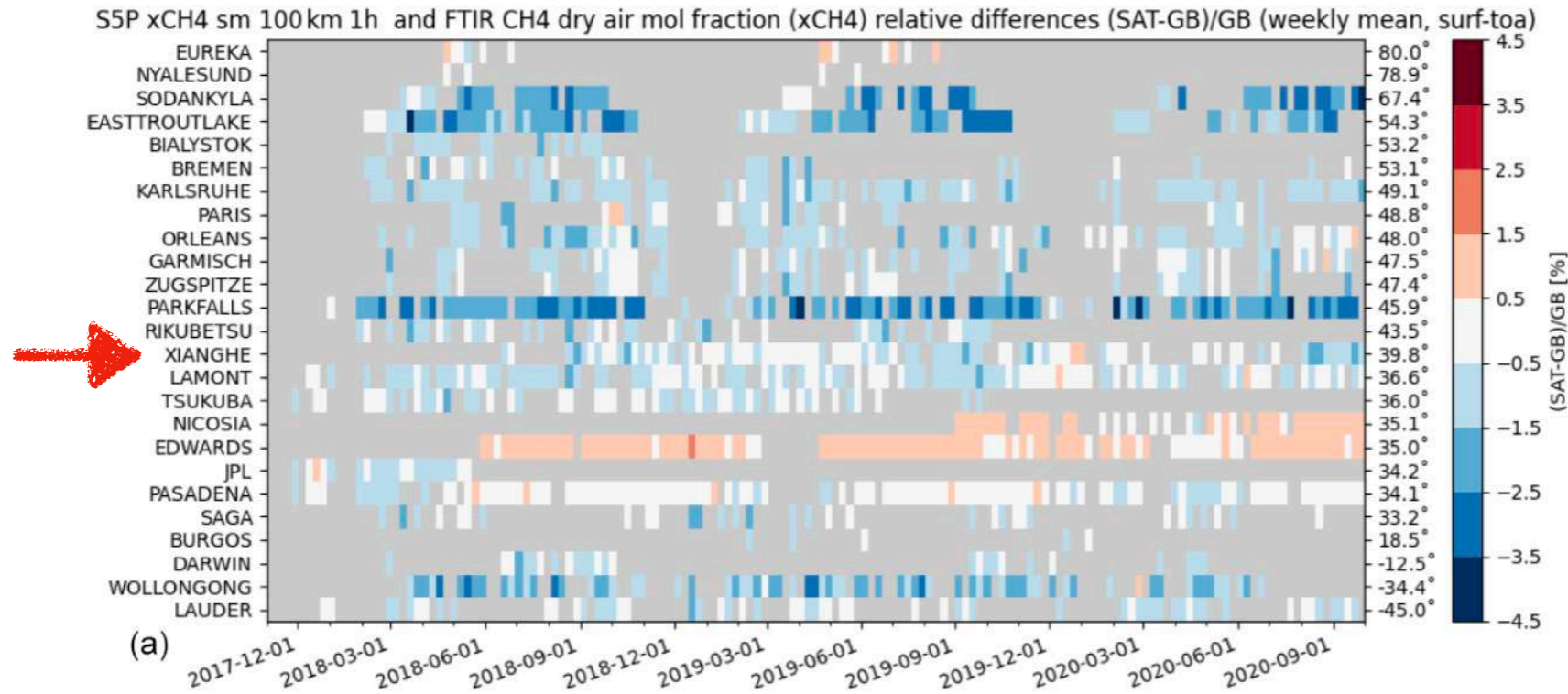
- Good agreement for all three species (R >= 0.98)
- The ~10 ppb systematic bias in XCO observed by the EM27#110 is also found
- The bias between EM27 and HR_LR in XCO2 seems to have a month-to-month variation.



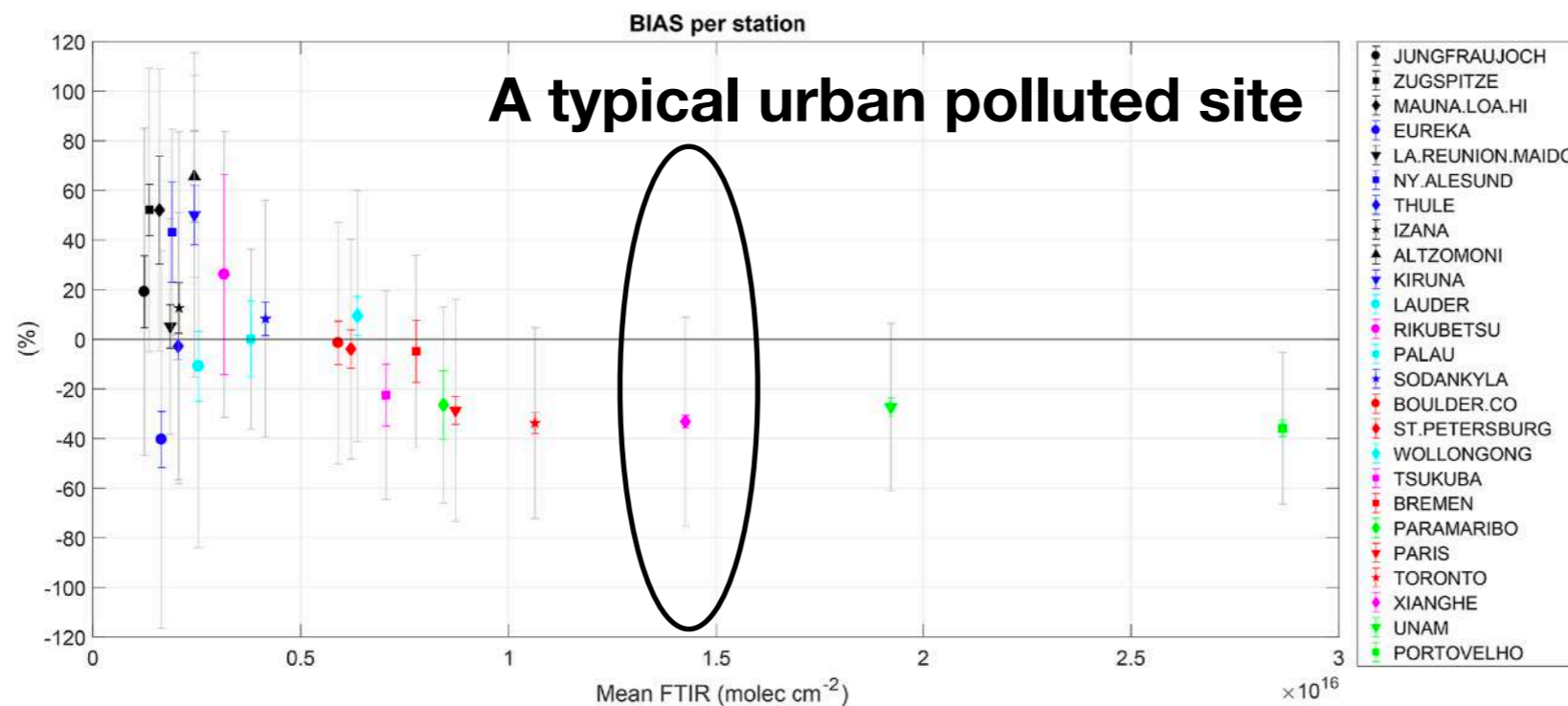
The time series and correlations of XCO₂, XCH₄, and XCO hourly means observed by EM27/SUN (SN#110) and 125HR with a low spectral resolution (0.5 cm⁻¹) at Xianghe

Satellite Validation

OCO-2/3 and TROPOMI satellite measurements are validated against the Xianghe 125HR measurements



(Sha et al., 2021)



(Vigouroux et al., 2021)

Conclusions

- One 125HR and four EM27/SUN FTIR spectrometers are currently operated at IAP/CAS, and all instruments are running well
- The differences among four EM27/SUN FTIR retrievals are observed, especially for EM27 SN#110 XCO retrievals
- The FTIR measurements are applied to understand the temporal-spatial variation of the target species in North China
- The FTIR measurements are applied to validate the satellite measurements

Great thanks TCCON/NDACC/COCCON communities for supporting the FTIR activities at IAP/CAS, China !

