

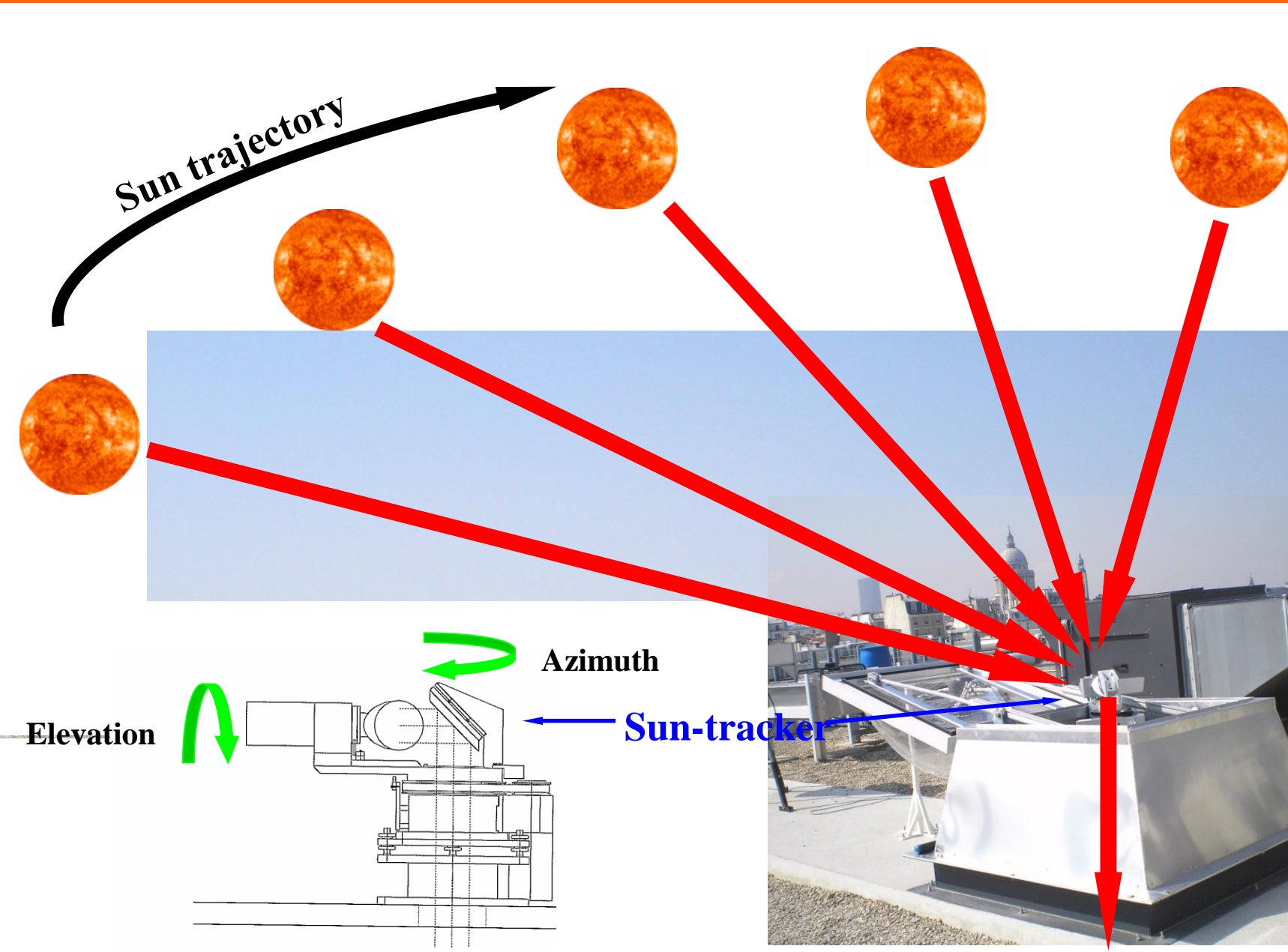
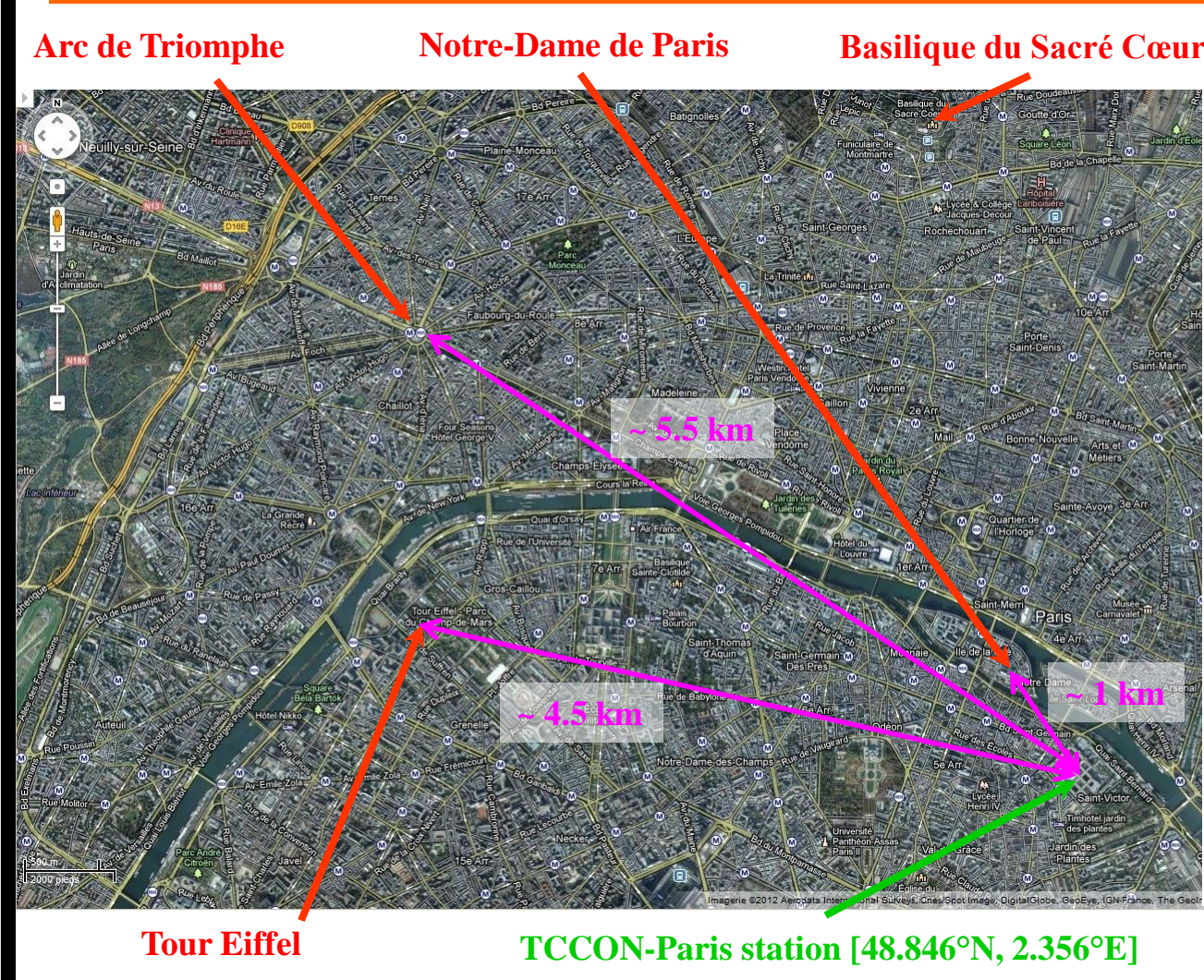
## RECENT RESEARCH ACTIVITES AT TCCON-PARIS

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### TCCON-Paris site

The LERMA ground-based Fourier Transform Spectrometer (FTS-Paris) is located in downtown Paris at the Jussieu campus of Sorbonne Université. The FTS-Paris instrument (Bruker IFS-125HR) is associated to a sun-tracker installed on the roof terrace of the QualAir platform to perform solar absorption observations. Since September 2014, FTS-Paris is part of TCCON. The TCCON-Paris station provides rare hot spot measurements and contributes to satellite instrument validation. NDACC configuration measurements are also performed.

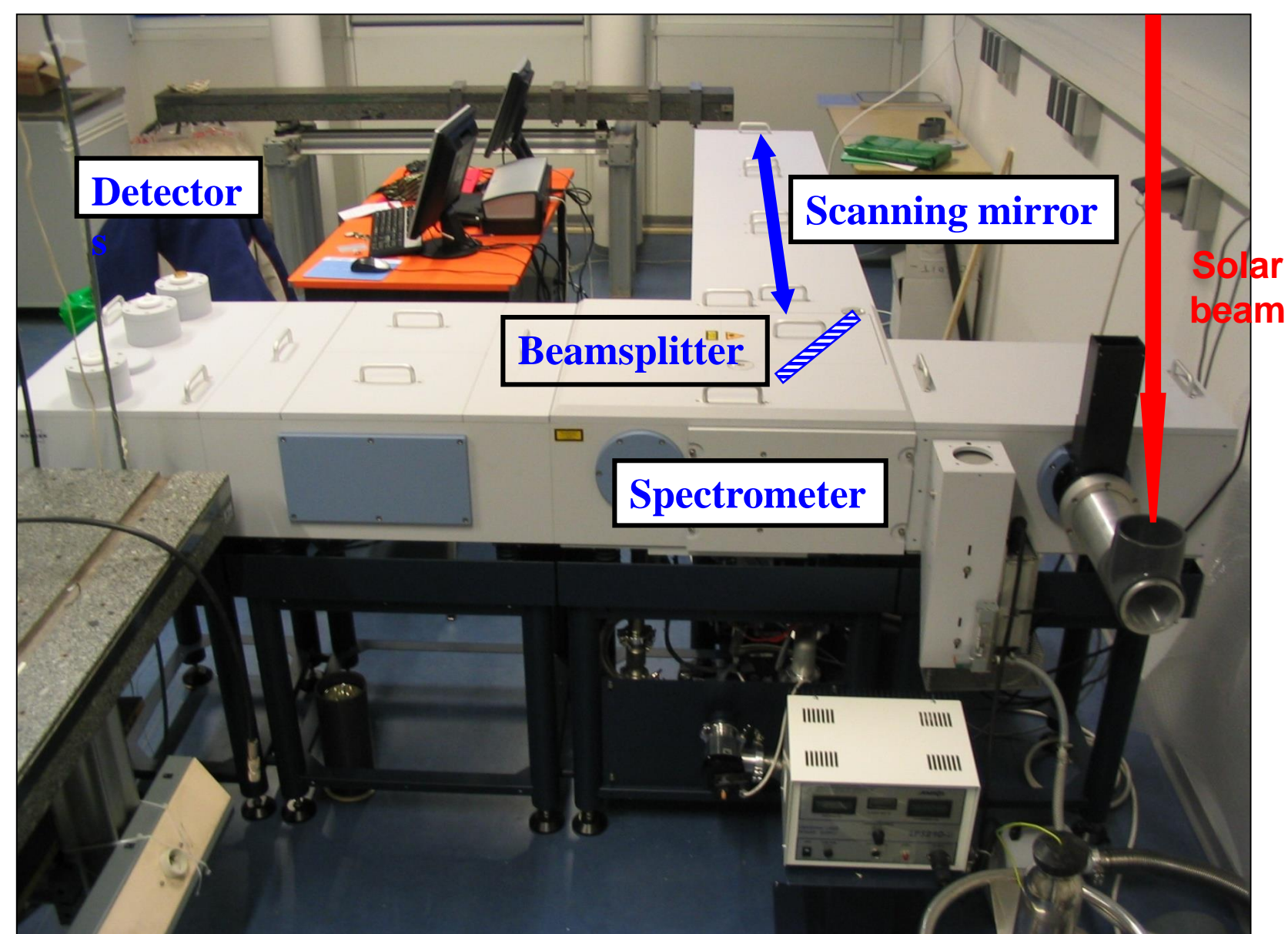


#### IR configuration

Internal source	Globar or tungsten lamp
Beamsplitter	KBr : 450 - 4800 cm <sup>-1</sup> CaF <sub>2</sub> : 1850 - 14000 cm <sup>-1</sup>
Entrance window	KBr : 450 - 25000 cm <sup>-1</sup> CaF <sub>2</sub> : 1850 - 14000 cm <sup>-1</sup>
MCT detector	D* > 2.5x10 <sup>10</sup> cmHz <sup>1/2</sup> W <sup>-1</sup>
InSb detector	D* > 1.5x10 <sup>11</sup> cmHz <sup>1/2</sup> W <sup>-1</sup>
InGaAs detector(+)	NEP < 5x10 <sup>-12</sup> W/Hz <sup>1/2</sup>
HBr & N <sub>2</sub> O cells	NDACC Ref. #80 & #26
HCl cell(+)	TCCON Ref. #15

(+) Equipments supported by LEFE/INSU

The FTS-Paris and all other equipments were financed by UPMC and LERMA

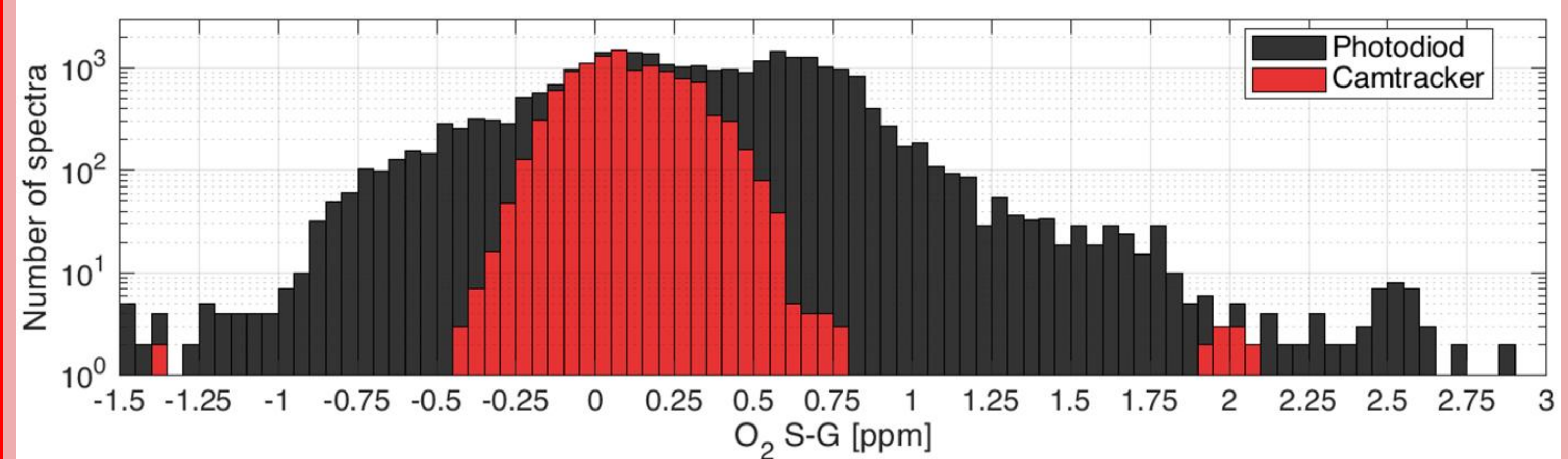


FTS-Paris with its sun-tracker  
(Figure from Té *et al.*, RSI, 2010)

### Tracking system accuracy improvement

- ⇒ Replacement of the photodiode pointing system by the new CamTracker system (model A547N-CAM)
- ⇒ CamTracker control software version 1.77
- ⇒ Improvement of the tracking system accuracy (pointing less dispersive)

#### ILS modulation & phase using HCl gas cell (Koshelev 2018)



### Research activities @TCCON-Paris

#### ■ Participation in Paris area observation network (OCAPI)

- ⇒ Air pollution survey
- ⇒ EPPI project (2017-2019), Forget *et al.*, 2017

#### ■ EM27/sun activities (Vogel *et al.*, 2019)

- ⇒ Simultaneous measurements of two EM27/sun (CNES & LSCE) and TCCON stations @Paris & @Orléans/Trainou



#### ■ Contribution to space missions

- ⇒ Validation of satellite instruments: GOSAT, OCO-2, TROPOMI, ...
- ⇒ Preparation of new satellite missions: MicroCarb, MERLIN, IASI-NG, ...

#### ■ MAGIC validation & scientific project (Bes *et al.*, 2019)

- ⇒ MAGIC = Monitoring of Atmospheric composition and Greenhouse gases through multi-Instruments Campaigns
- ⇒ Several aims: set-up of scientific instruments to validate satellite missions, better characterization of the atmospheric trace gas vertical distribution, complementary and/or synergic study, site characterization, ...
- ⇒ Multi-partners: CNES, LMD, LSCE, LERMA, GSMA, LOA
- ⇒ Multi-instrumentations deployment: in situ surface measurement, TCCON integrated column measurement, COCCON measurement using EM27/sun, Aircore balloon measurement, aircraft measurement, ...
- ⇒ Intensive measurements campaign during the European COMET project (MAGIC-COMET, May 2018)
- ⇒ Next campaign during RINGO project (June 2019) located @Trainou, @Paris, @Aire-sur-l'Adour, @Clermond-Ferrand, ...

#### ■ Atmospheric species global study

- ⇒ HCHO study under lead of Vigouroux
- ⇒ C<sub>2</sub>H<sub>6</sub> study under lead of Mahieu
- ⇒ OCS study under lead of Hannigan/Ortega

#### ■ Funding sponsors

- ⇒ Sorbonne Université, CNRS-INSU, CNES, Région Ile de France, IPSL, ...

### Instrumental History

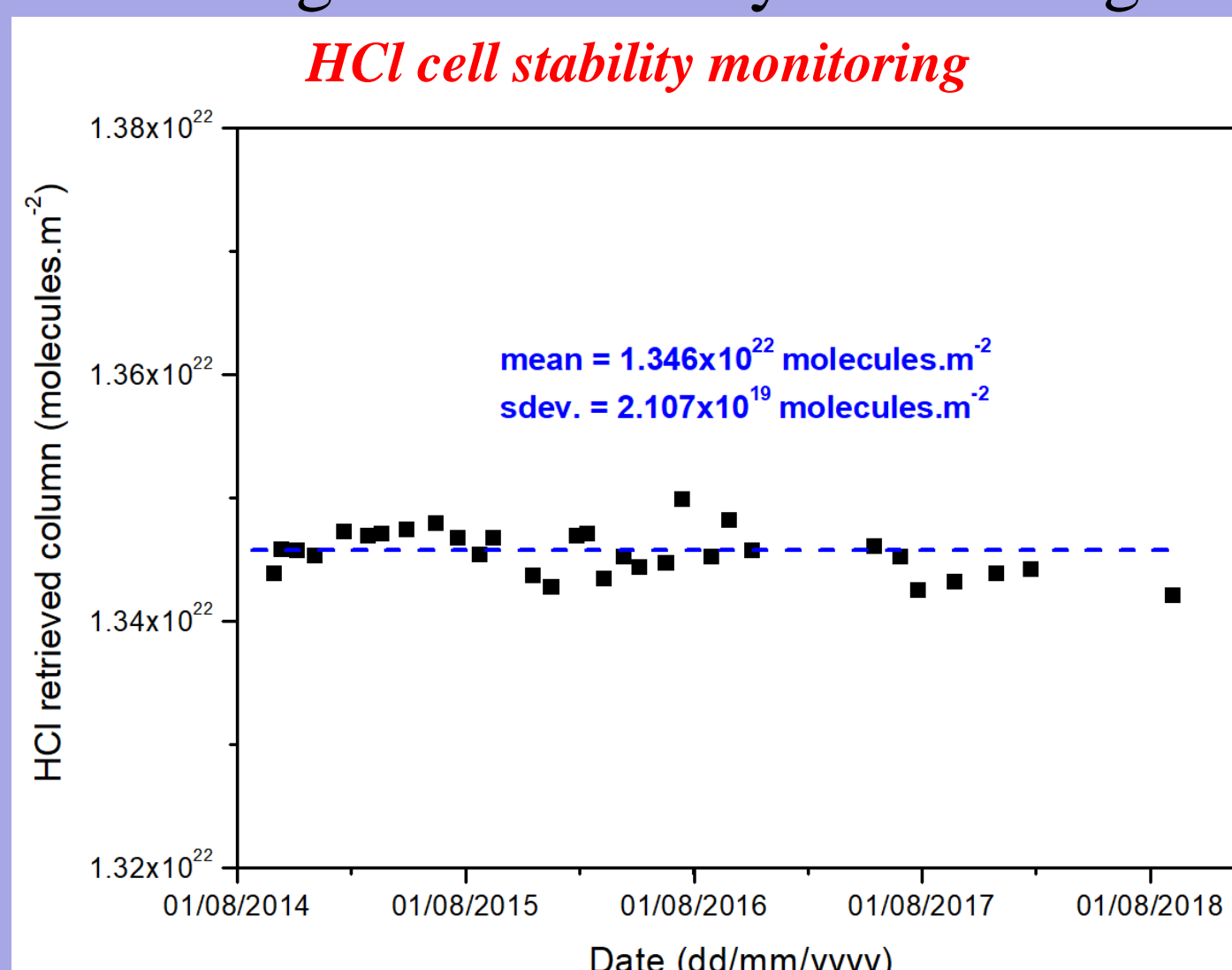
#### ■ Meteorological sensors

- Acquisition of a second pressure sensor (Vaisala PTB210)
- Calibration of the first pressure sensor (Vaisala PTB210)
- Humidity and Temperature sensor (Vaisala HMP155)



#### ■ HCl gas cell

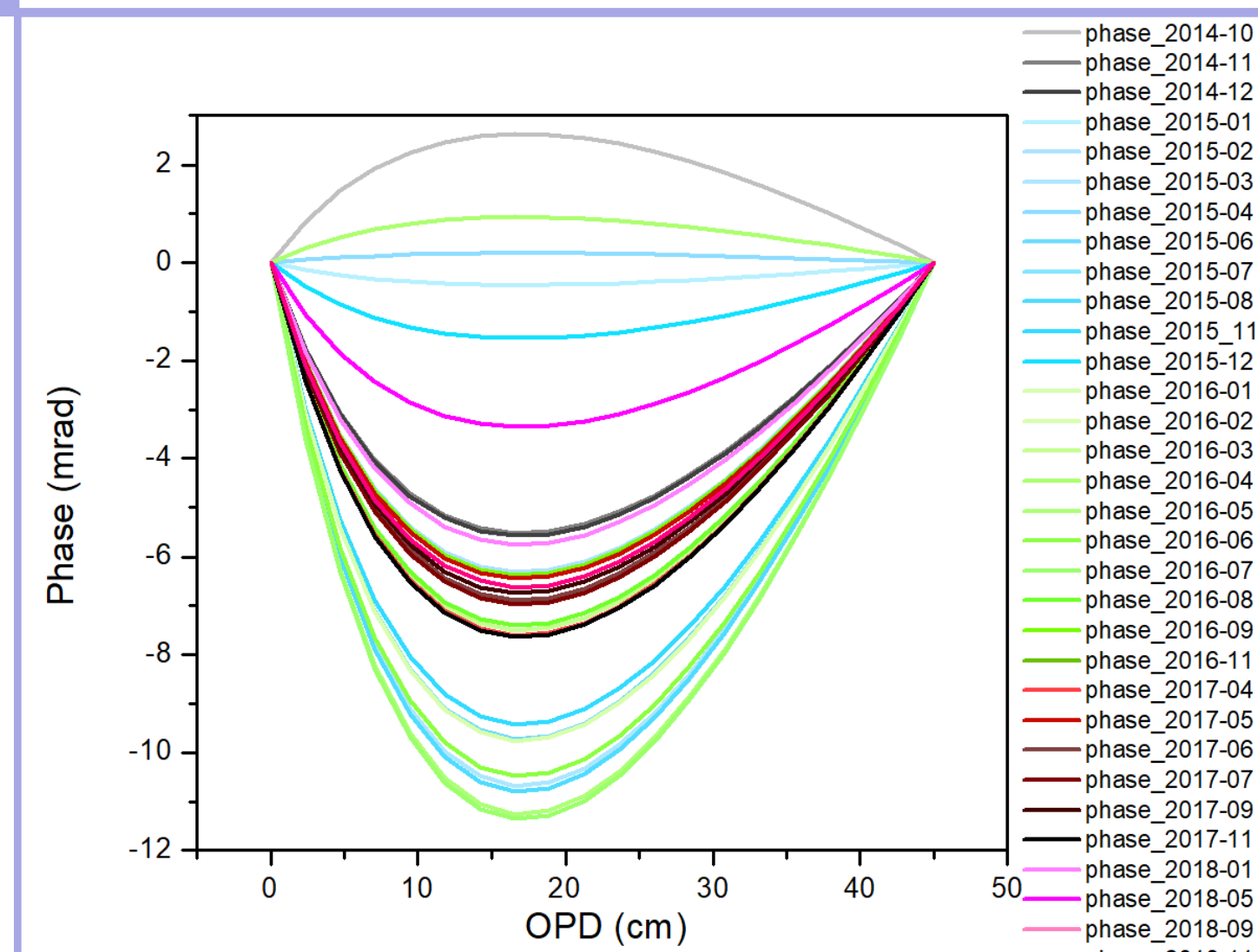
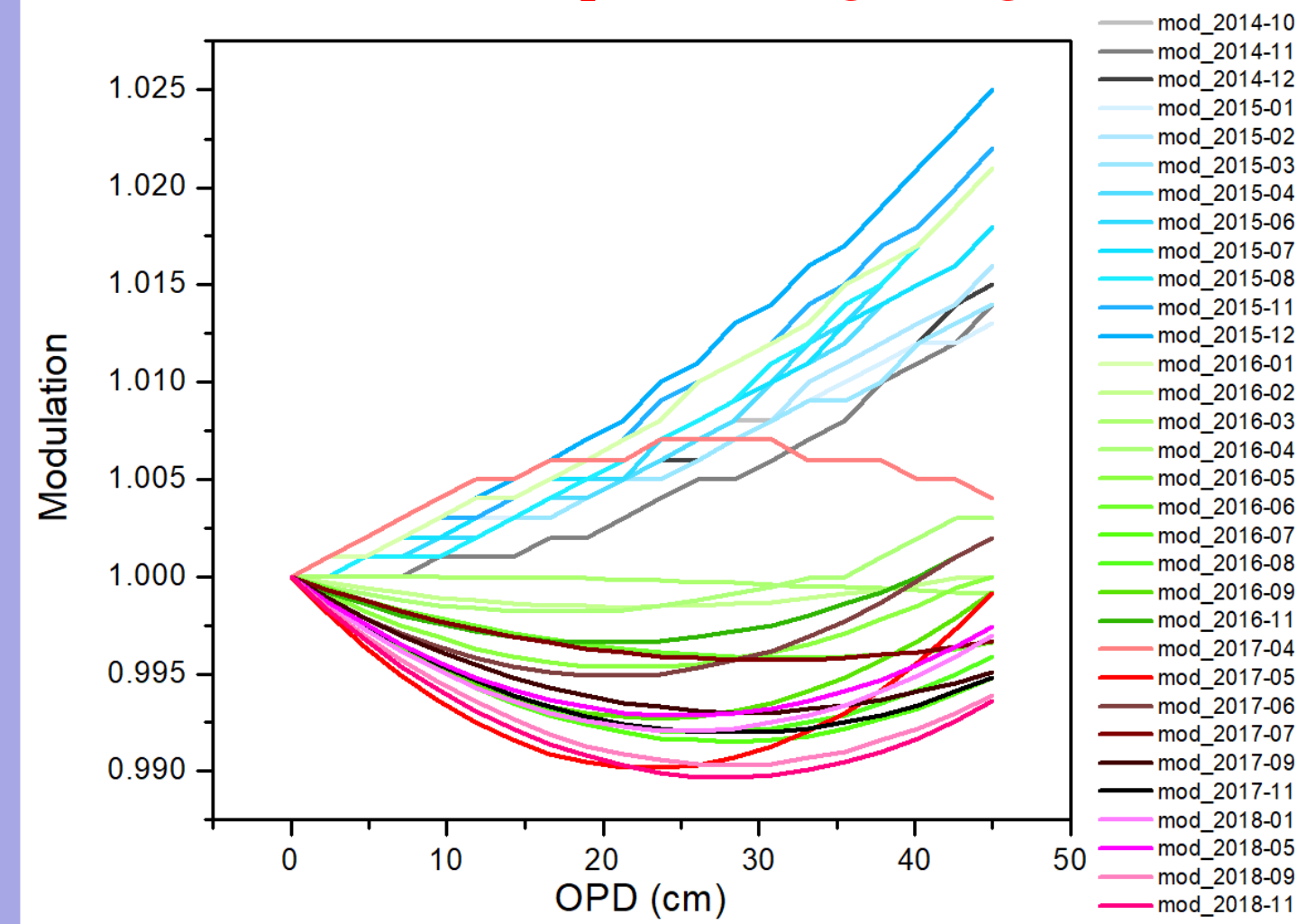
- cell #15 inside solar beam
- SNR ~3000 (over 30 cm<sup>-1</sup>)
- HCl cell spectra for TCCON ILS characterization
- HCl gas cell stability monitoring



#### ■ Upgrade of the A547 solar tracker controller

- Instrument shut down during the replacement of the controller (Feb.-May 2018)
- New controller operating in Windows system
- Upgrade supporting the Cam-Tracker system
- Replacement of the solar tracker elevation & azimuth mirrors

#### ILS modulation & phase using HCl gas cell



### References