

# Deployment of a GreenHouse Gases Laser Heterodyne Radiometer (GHG- LHR) for the FRM4GHG ESA campaign

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# FRM4GHG Campaign

- **F**iducial **R**eference **M**easurements for **G**reen**H**ouse **G**ases.
  - ESA/UKSA funded project covering 2 years of summer measurements.
  - Location: Finnish Meteorological Institute, Sodankylä, Finland.



- Target species include CO<sub>2</sub>, CH<sub>4</sub>, CO and H<sub>2</sub>O.
- Aims include:
  - » Inter-comparison of co-located ground based sounding instruments.
  - » Local TCCON station provides reference data.
  - » Collection of reference data for satellite validation (e.g. Sentinel 5P).

# Deployed Instrumentation

Aircore (FMI/Groningen)



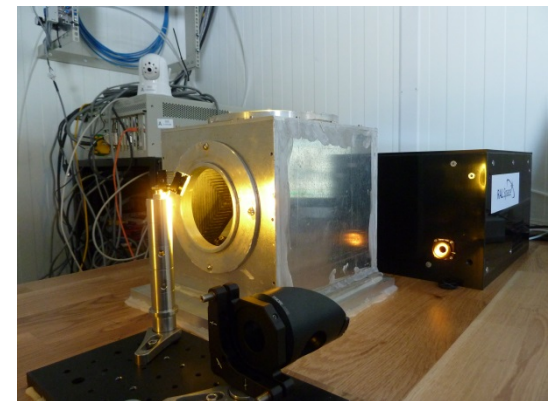
EM27 (Karlsruhe)

TCCON (FMI)



Vertex70 FTIR  
(U. of Bremen/BIRA)

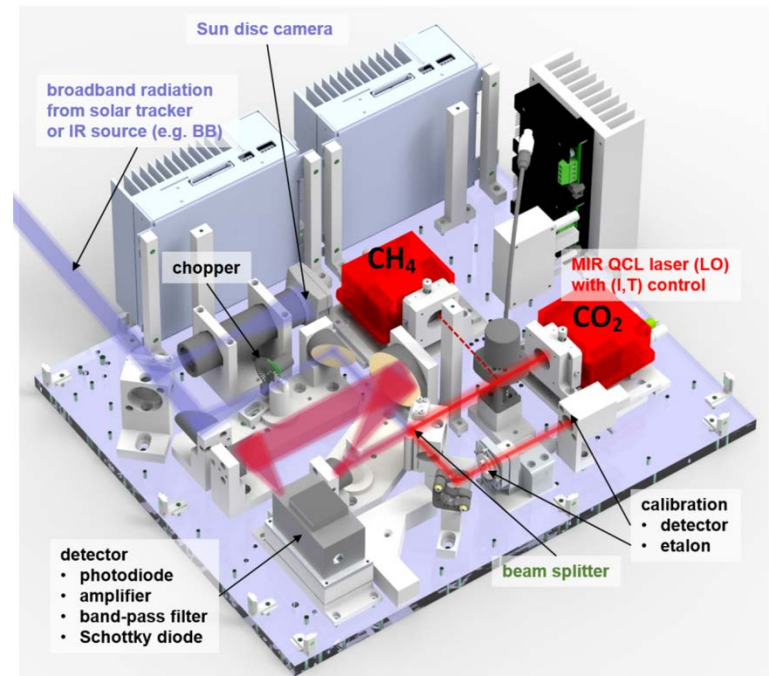
IR Cube  
(U. of Woolongong)



LHR  
(RAL)

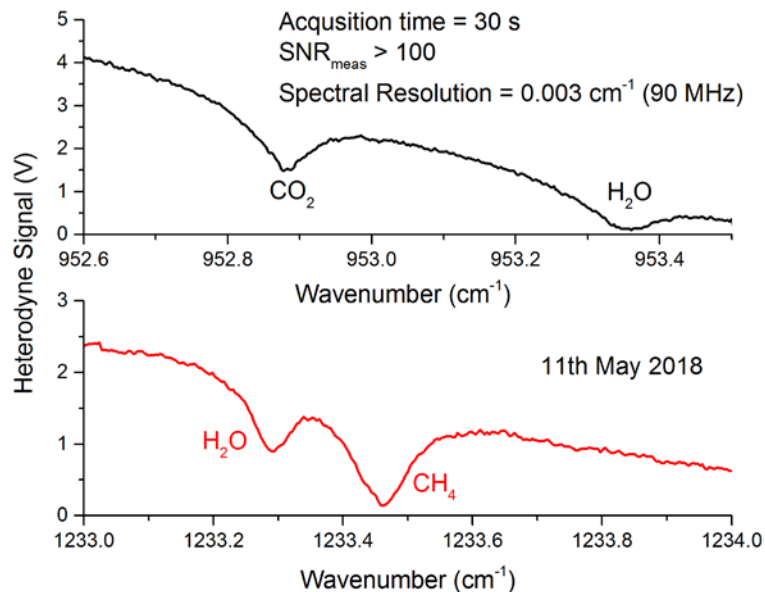
# Laser Heterodyne Radiometer

- Coherent detection of LWIR solar radiation.
- Wavelength tuneable laser provides spectral information.
- Advantages:
  - High sensitivity.
    - shot noise limit.
  - High spectral resolution.
    - < 100 MHz.
  - High spatial resolution.
    - ~mrads.
  - Directly measurable ILS.
    - RF filter response.
  - Compact, portable design
    - 45x37x22 cm

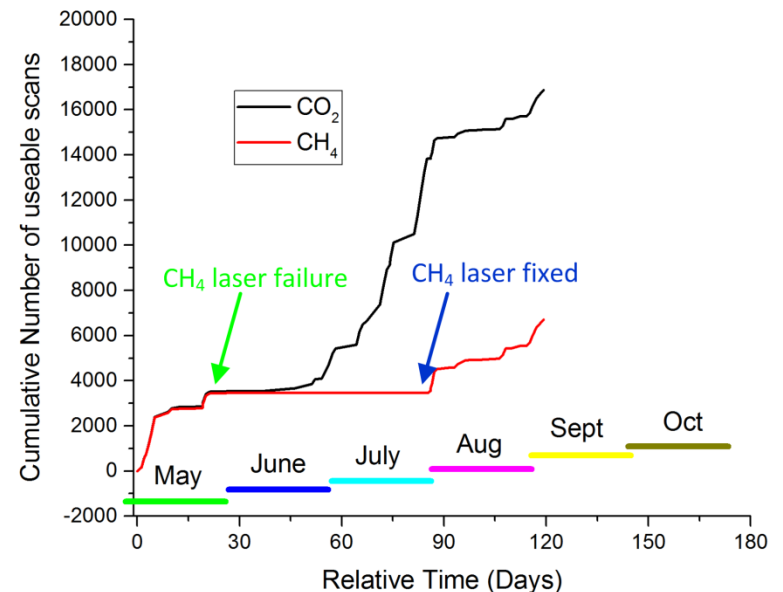


# Measurement Highlights

## Dual Channel (CH<sub>4</sub> and CO<sub>2</sub>)



## Acquisition Statistics



Retrieval of [CH<sub>4</sub>], [CO<sub>2</sub>] and [H<sub>2</sub>O] in preparation.  
- Total Column and vertical profiles