# PROFFAST Ver 2.0

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# COCCON processing - origin

Development of code / tools is supported by ESA in the framework of several projects

(COCCON-PROCEEDS I + II, FRM4GHG II)

Team:

Frank Hase (KIT): PREPROCESS + PROFFAST

Darko Dubravica, Lena Feld, Benedikt Herkommer (all KIT): wrapper for processing of large data sets

Mahesh Kumar Sha, Bavo Langerock (both BIRA): HDF file generation, interfacing with EVDC data portal

GGG / PROFFAST comparison: Qiansi Tu + Mahesh Kumar Sha (BIRA) / Carlos Alberti / N. Jacobs + W. R.

Simpson (UoA) / Matthias Frey (NIES) / Jia Chen + Moritz Makowski + Maximilian Rißmann (TUM) / …

# COCCON processing – a three step procedure

- **PREPROCESS**
  - Generate spectra from raw interferograms
  - DC-correction, FFT (including phase correction), apodization (NBM), resampling
  - QC checks (spectral calibration, out-of-band artefacts, SNR)
  - Header info in *.bin spectrum: e.g. solar position (astronomical SZA, azimuth)

- **PROFFAST – PCXS**
  - Generates daily lookup table of x-sections from line-by-line calculations
  - Calculates column sensitivities for each species as fct of SZA range

- **PROFFAST – INVERS**
  - Performs spectral fitting on each spectrum
  - Performs post-processing, outputs XGAS results (empirical AICFs + ADCFs)

# COCCON Version 2

Please note:

A more detailed presentation on PROFFAST + update ver 2 is planned:
OCO-II STM (~ early March)

# COCCON Version 1

Only minor incremental upgrades (e.g. local vs UT computer time, write azimuth to output file, etc)

Except from one real bugfix (200810) – the effect on $XCO_2$ calibration remained undetected …

… then handled by suggesting a post-correction procedure (no interim update of gas calibration factors).

# COCCON Version 2

- Technical improvements in support of wrapper development (quiet run option, parallelization, error handling, …)
- LOS airmass integration (4 -> 5 coeffs)
- New TCCON map files (support wet + dry mixing ratios)
- Refined and updated TIPS table (use HIT20 data, 5 -> 7 coeffs)
- Extend Line shape handling (1st order LM, SDV)
- Line lists

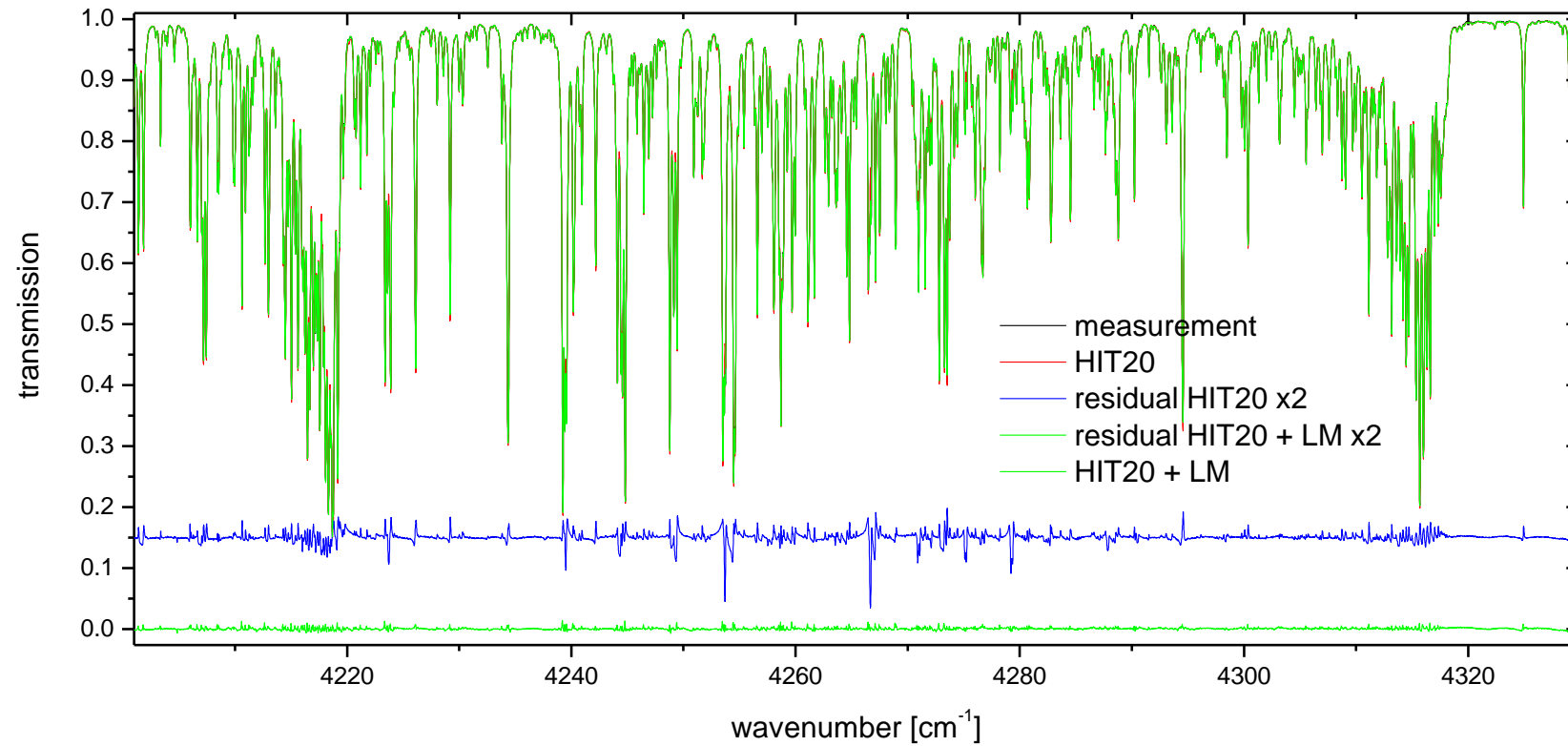solar: transmission spectrum table (G. C. Toon) GGG14 -> GGG20

gases:

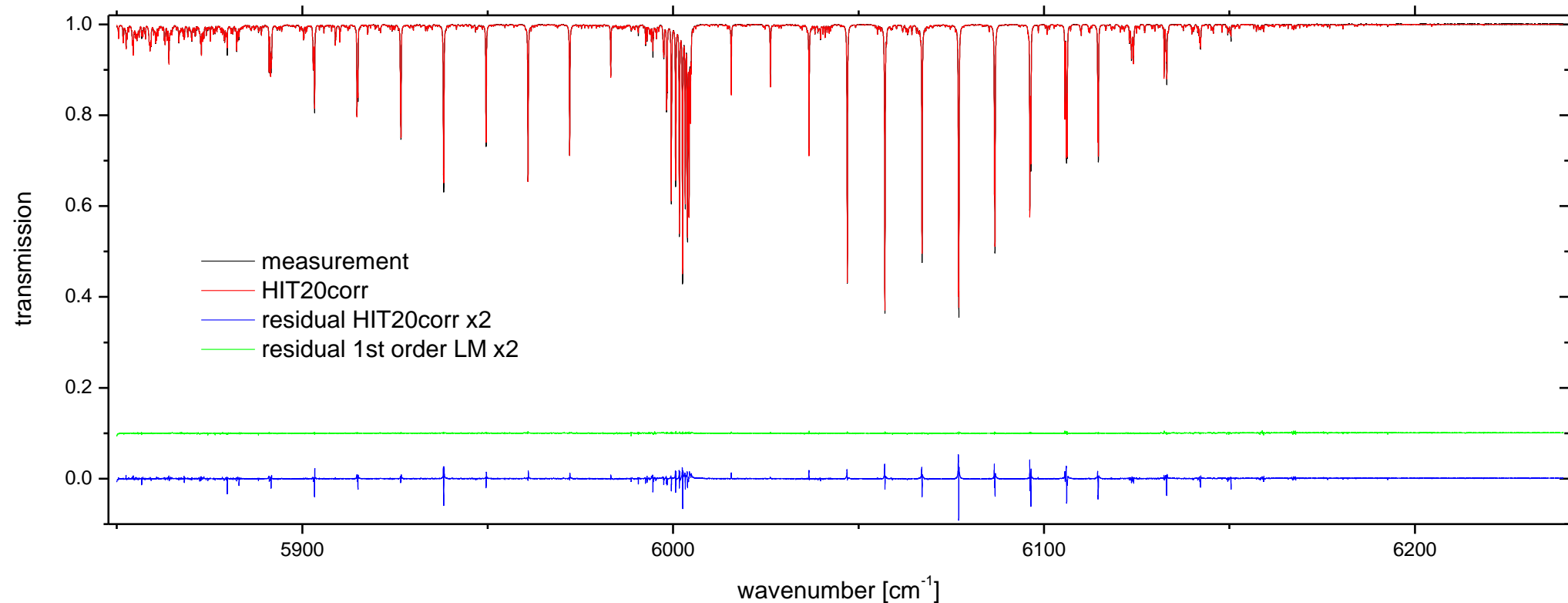ver 1: wild mixture (HIT08 with some empirical ad-hoc corrections, HIT12),    $O_2$: GGG14

ver 2: HIT20 ($H_2O$, $CO_2$ [+ LM + SDV], $N_2O$, CO, $O_2$ [+ SDV??])

        special item: $CH_4$ HITRAN: LM under construction ~ 1 a, DLR line list covers only S5P window (and uses HTP + 2nd order LM)

# CH$_4$: HIT20 + own cell measurements

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# Preliminary XGAS calibration results

| Ver 1 | Ver 2 (preliminary!!) |
|---|---|
| 0.8300, 0.000,0.0,"XH2O    " | 1.0000, 0.000,0.0,"XH2O    " |
| 0.9737,-0.007,0.0,"XAIR    " | 0.9920,-0.007,0.0,"XAIR    " |
| 0.9862, 0.005,0.0,"XCO2    " | 0.9955, 0.000,0.0,"XCO2    " |
| 0.9905,-0.014,0.0,"XCH4    " | 0.9917, 0.009,0.0,"XCH4    " |
| 0.9727,-0.017,0.0,"XCH4_S5P" | 0.9953,-0.003,0.0,"XCH4_S5P" |
| 0.9250, 0.103,0.0,"XCO     " | 0.9250, 0.060,0.0,"XCO     " |

Residuals in S5P window are reduced by ~40% - so an XHDO product might be in reach now for COCCON!