SCIAMACHY L2 Ground Processor V. 7 Phase F Re-processing

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Introduction

SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY) was a scanning nadir and limb spectrometer After the platform failure in April 2012, SCIAMACHY is now in phase F. It had unique capabilities:

- It could measure in Nadir, Limb and Occultation modes
- It observed Sun, Moon and Earth regularly for 10 years
- It covered the wavelength range from 212 nm to 2386 nm in 8 channels.
- It could detect a large variety of atmospheric gases (e.g. O_3, H_2CO, CHOCHO, SO_2, BrO, OClO, NO_2, H_2O, CO, CH_4, among others) and did provide information about aerosols and clouds
- It measured column densities and vertical profiles of trace gas species in the mesosphere, in the stratosphere and in the troposphere.

The latest Level 2 version 7 was re-processed and is now under validation (see poster A. Keppens).

Products and Processing Chains
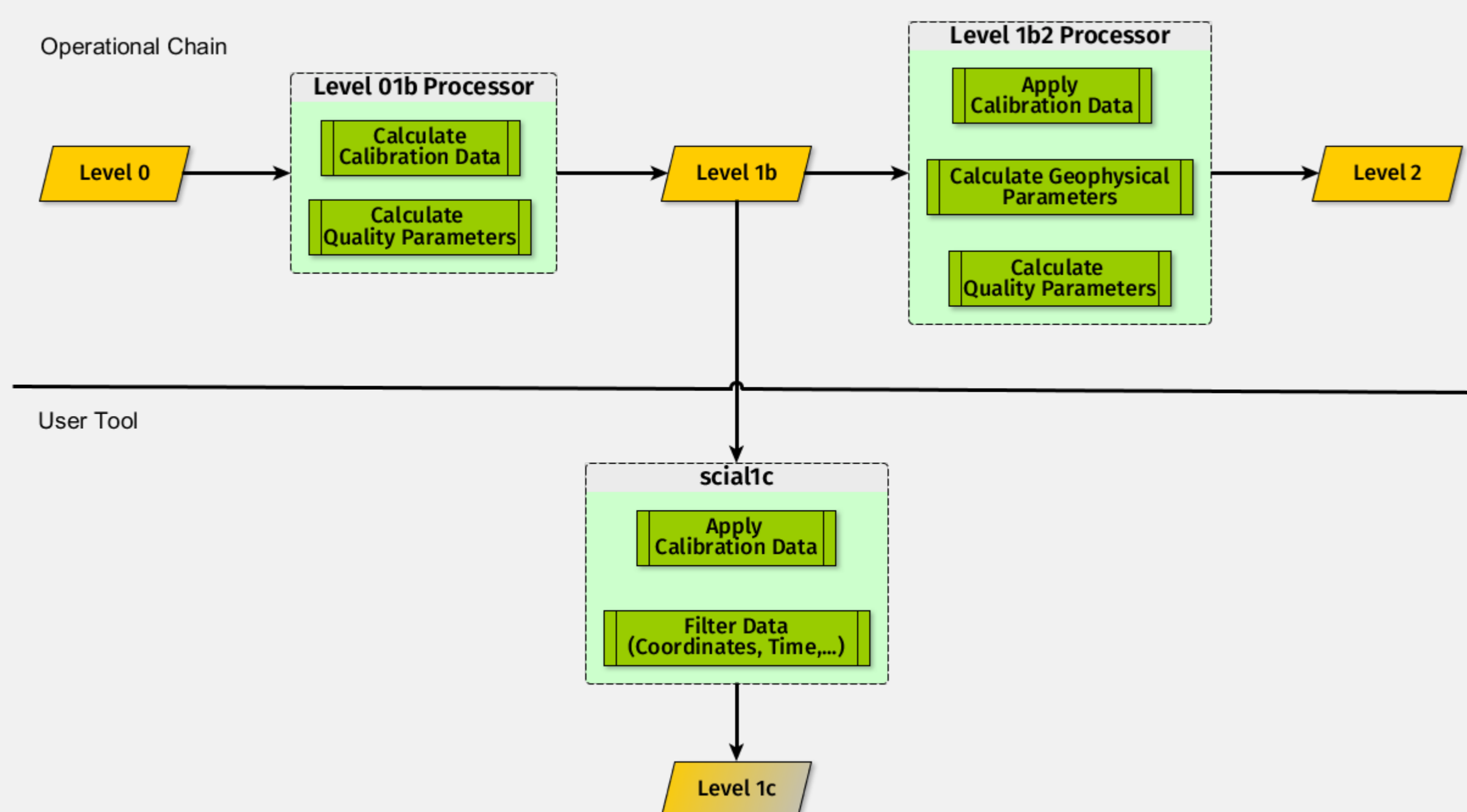
Limb Clouds

Global map ($2° \times 2°$) of the annual mean cloud top height (in km) for 2006. The superimposed red rectangles show the approximate size of three consecutive SCIAMACHY limb scans. The Limb Cloud retrieval SCODA (IUP) that also allows to distinguish and detect water clouds, ice clouds, NLC and PSC was refined for version 7.
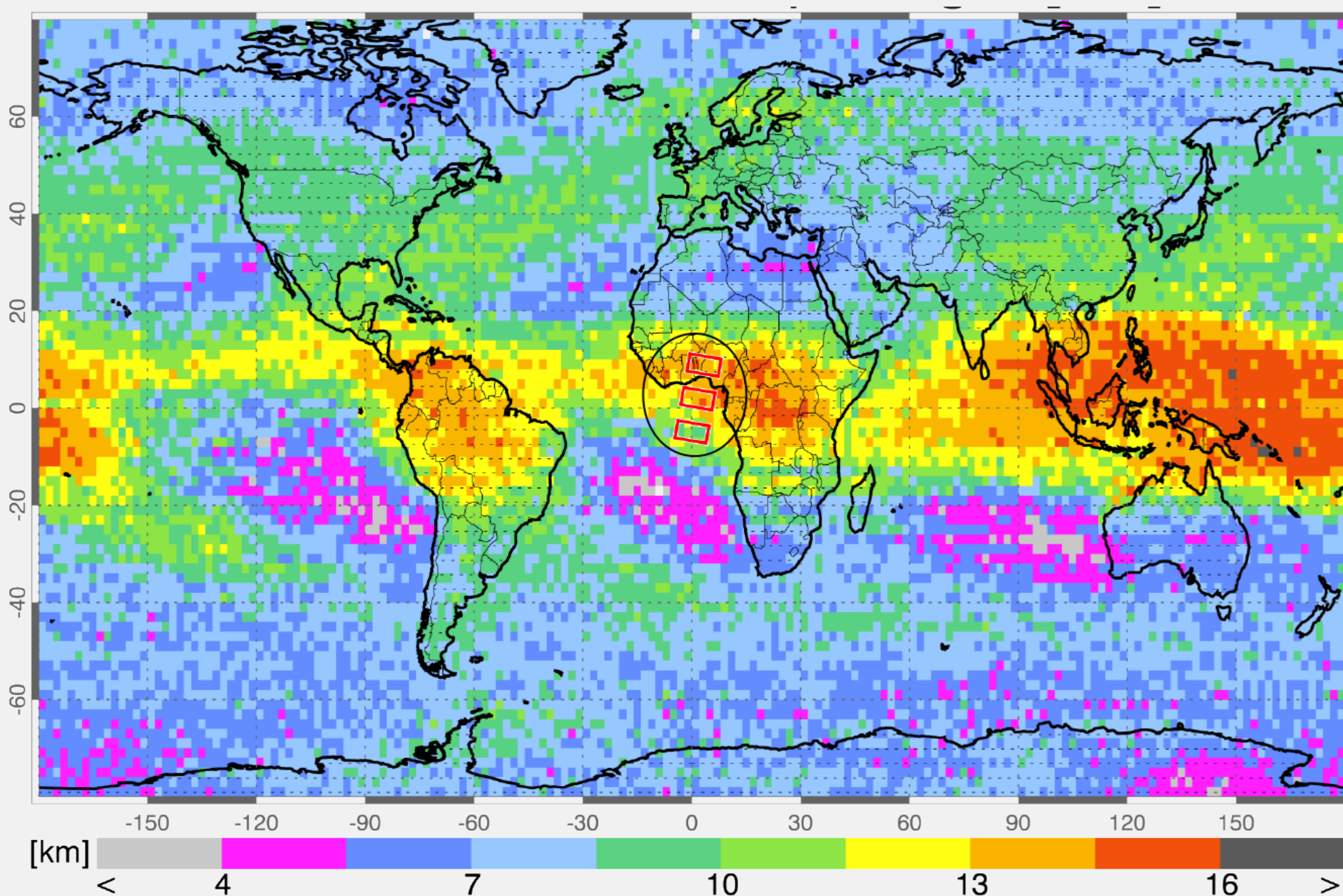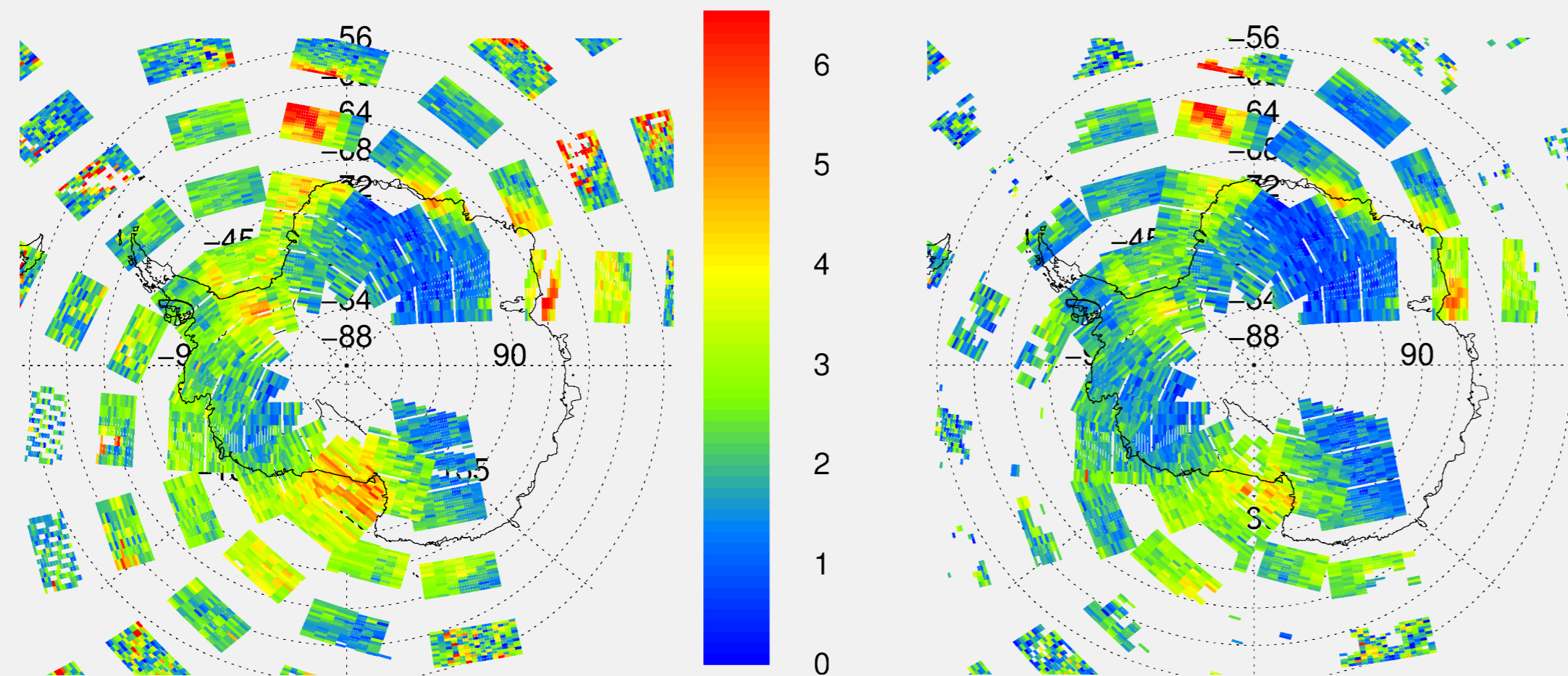

New: Tropospheric BrO

Bromine events as seen by SCIAMACHY. Left: BIRA reference. Right: DLR operational processing. Differences can be explained by different cloud information used.

BrO VCD$_{TROPO}$ (BIRA) [10^{13} MOLEC CM^{-2}], 13 OCTOBER 2006   BrO VCD$_{TROPO}$ (DLR) [10^{13} MOLEC CM^{-2}], 13 OCTOBER 2006

References & Further Information

SCIAMACHY Offline Processor Level1b-2 ATBD Algorithm Theoretical Baseline Document (SGP OL Version 7) Issue 3, 2018, https://atmos.eoc.dlr.de/sciamachy/docu_l2.html

Processor History

Switch: Date when products became available (after validation); *Maintenance*: Only small changes (if any)

| Product	V 3.01	V4.0	V5.0	V6.0	V7.0
Delivered		June 2008	June 2009	Winter 2012/13	
Switch	2007	not activated	October 2010	2013	2019 (tbc)
Nadir					
AAI	quality not sufficient	improved algorithm and usage of degradation corrections	Maintenance	Usage of calculated O3 VCD	Maintenance
O3	slight trend over time (< 0.5% Per year), GDP 4	degradation correction taken into account	smaller trend	improvements w.r.t. trends (from L1 improvements)	Maintenance
NO2	offset removed	new reference spectra	Maintenance	Maintenance	Maintenance
trop. NO2				new product	Maintenance
BrO		SCD implemented	VCD implemented	Maintenance	AMF Improvements
trop. BrO					new product
SO2		SCD, using reference sector	VCD, volcanic and pollution	Maintenance	VCD, AMF improvements
OClO			SCD	Maintenance	Maintenance
HCHO				new product VCD	Maintenance
CHOCHO				new product VCD	Maintenance
H2O			VCD	Maintenance	Maintenance
CO / xCO			VCD xCO quality tbc	xCO improvements	Maintenance
xCH4				new product	Maintenance
Clouds	OCRA/SACURA implemented	improvements due to degradation correction	new minimum reflectance data base improved OCRA Cloud Fractions	ice/snow/ clouds discrimination	Maintenance
Limb					
O3	TH offset removed, maximum of 4 limb O3 profiles per tangent height	improved forward model, optimised retrieval settings, substantially smaller low bias	clouds and aerosol improvements lower stratosphere	extension to upper stratosphere and lower mesosphere	Maintenance
NO2	TH offset removed	improved forward model, optimised retrieval settings, improved lower stratosphere values	clouds taken into account	Maintenance	Maintenance
BrO			product newly implemented	Maintenance	Maintenance
Clouds			flagging and cloud top height product implemented	NLC detection	Improvement of retrieval parameters and spectral ranges

Limb-Nadir Matching

SCIAMACHY had the unique capapbility to observe the same air volumes in nadir and in limb geometry. This can be used to retrieve tropospheric columns. Operationally it is used to determine tropospheric NO_2 columns.
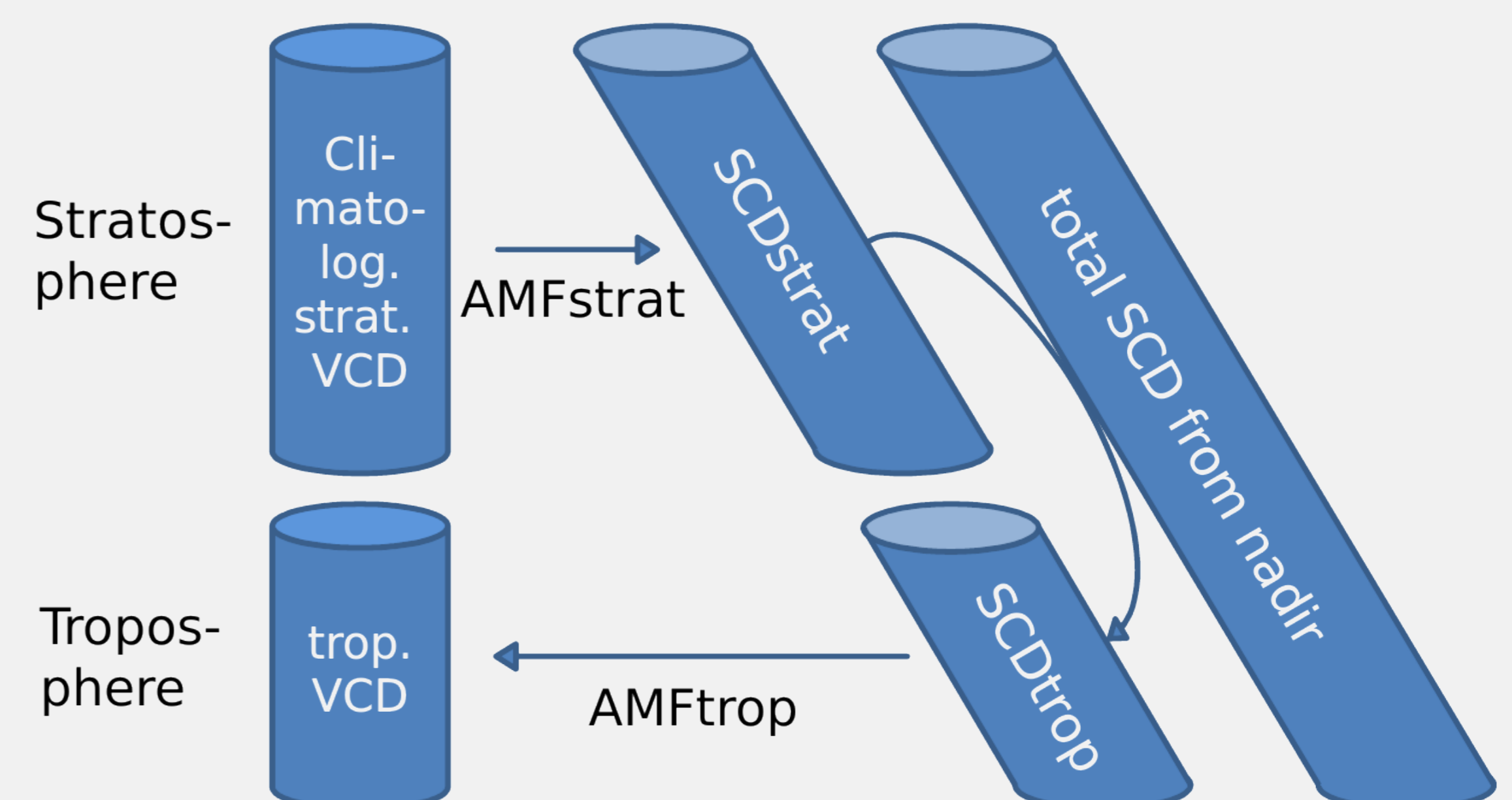
SWIR CO Retrieval & Level 1-2 Feedback

Below we show two histograms with the distribution of CO values using **L1 V8** and two variants of **L1 V9** as input to the retrieval. The level 2 algorithm was not changed, but the result of CO is radically different (left). This V9 variant showed a smaller number of converging retrievals and a higher number of unrealistic values. The main reason was a different bad & dead pixel mask, showing that the determination of bad pixel is not as straight forward as one thinks and depends on the application. So this does not point to an error in the Level 1 algorithms but more to an incompatibility. The L1-2 feedback is especially important for retrievals that are on the edge of feasibility.
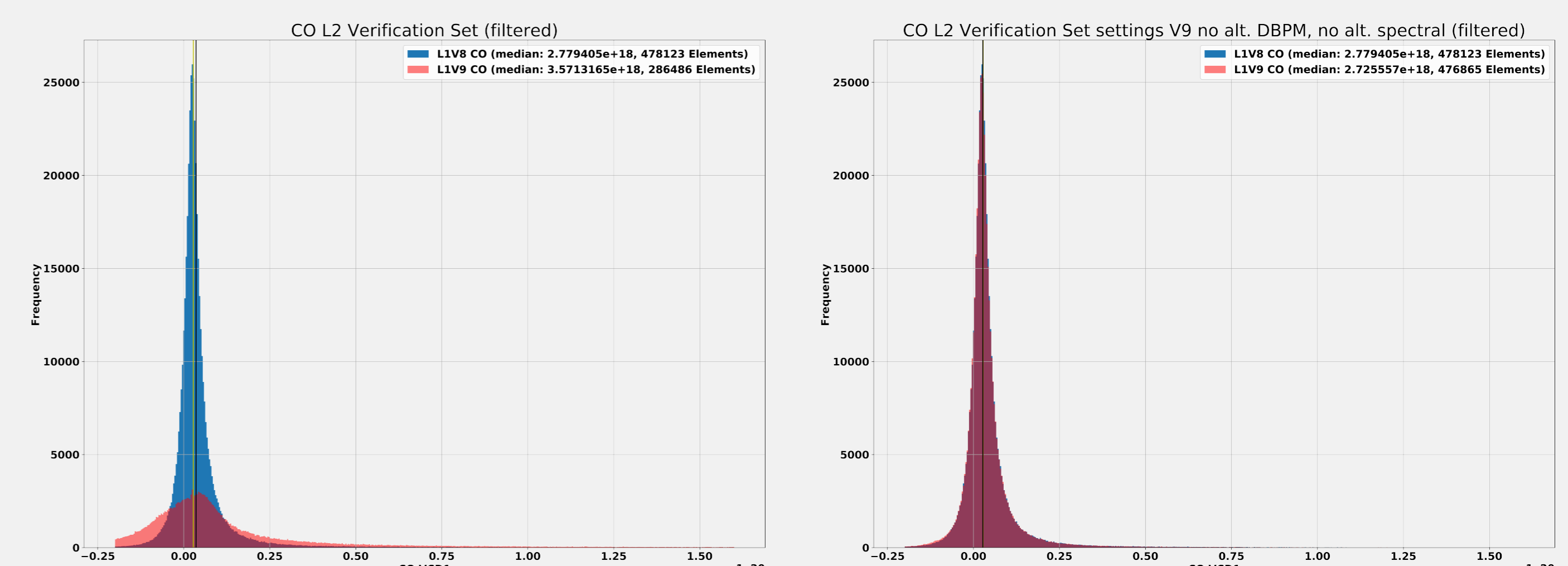
Contact Information

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