

# SCIAMACHY QWG FP: Baseline Summary

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Knowledge for Tomorrow



# Outline

1. Introduction
2. History
3. Why still work with SCIA data
4. Level 1 Recommendations
5. Level 2 Recommendations

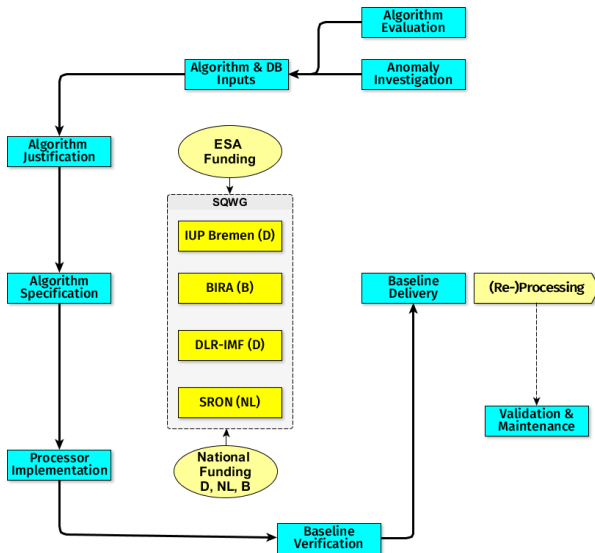


# Intro - Purpose of BL Summary

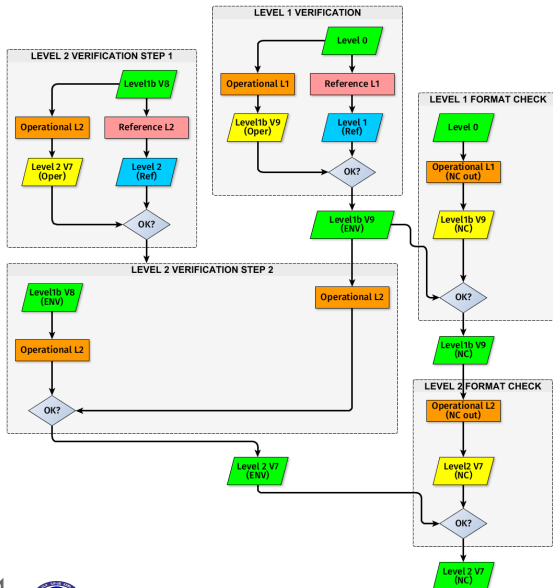
- Explain the history of SCIAMACHY data products and processing
- Describe the current status of the latest product version
- Propose future improvements that can be implemented and that would further enhance the product quality.
- The report comes with a comprehensive list of references that enables the reader to dig into the details



# Intro - QWG Set-up



# Intro - Testing Set-up



# History - Level 1

- 9 versions between 1998 and 2018
- 3 major phases:
  - 1998 – 2005: IDL prototype and the use of IECF
  - 2005 - 2012: IDL prototype and SciCal
  - 2012 - 2018: Switch to C++, no split between prototype and operational code
- The baseline report shows an overview over all calibration algorithms



# History - Level 2

- At the beginning of the project two Level 2 processors were developed in parallel:
  - an OL processor implemented by DLR-IMF with more complex algorithms
  - a NRT processor implemented by industry for Nadir products that aimed to distribute products within 3 hours after sensing.
- In 2004 both development lines were combined and the OL processor was chosen also for NRT processing
- In total the QWG delivered 5 processor baselines to ESA
- The baseline report shows an overview over all Level 2 products with references



# Why still work with SCIA data

1. It is the only instrument (past, present or planned) that spans the wavelength range from 214 – 2385 nm with a moderately high spectral resolution.
2. It is the only instrument that provides limb measurements for its extended wavelength range
3. It is the only instrument that observed the moon regularly for 10 years at a moderately high spectral resolution
4. It was the first instrument that provided measurements of the greenhouse gases CH<sub>4</sub> and CO<sub>2</sub> as well as CO.
5. The data are an essential part of long time series needed to assess climate change and Ozone hole trends (see also the climate change initiative (CCI) of ESA, where SCIAMACHY data are used).





# L1 Recommendations (I) - Summary

Recommendation	Description	Status
Error Estimates	Improve Uncertainties for Level 1 ⇒ <a href="#">FDR4ATMOS</a>	Needs a combination of studies, partially available
Non-Linearity Channel 1-5	Expand existing study for non-linearity in UVN channels and if confirmed implement operational algorithm	Algorithm needs to be refined and tested
Dark correction	Review existing dark correction and derive improved error estimates and orbit phase dependencies	Algorithm and implementation straight forward
DBPM channels 6 & 7	Extend the existing method of deriving individual pixel thresholds for the DBPM to channels 6 and 7	Algorithm probably needs significant adjustment
Light Leak Channel 7	Correct the stray light caused by a light leak and make channel 7 usable for retrievals	No algorithm yet, needs to be found in study
Sun Glint Polarisation	Verify polarisation correction for SCIAMACHY using sun glint observations	No algorithm yet, needs to be found in study
Spectral Calibration SWIR	Use in-flight data to update the spectral calibration in SWIR channels	Algorithm available, need to find proper parameters and solution for DBPM influence, operational interface ready



# L1 Recommendations (II) - Summary

Recommendation	Description	Status
Absolute Radiometric Calibration	Reconcile on-ground measurements and improve the absolute radiometric calibration	First Algorithm ideas available, need to be detailed
Calibrated Lunar Observations	Calibrate moon observation and provide spectrally resolved moon spectra for other applications	First Algorithm ideas available, need to be detailed
Degradation Correction	Re-analysis of degradation correction to solve jumps from on-ground to in-flight, model the recovery in later years and improve NIR and solar irradiance correction.	First Algorithm ideas available, need to be detailed
Improved BRDF ESM	Remove ESM diffuser speckles	First Algorithm ideas available, need to be detailed
Absolute Calibration Diffuser ASM	Provide absolute calibration for ASM diffuser	First Algorithm ideas available, need to be detailed



# L1 Recommendations (III) - Spectral calibration



# L2 Recommendations (I) - Summary

Recommendation	Description	Status
Error Estimates	Review of the uncertainties of (all) products	Needs major work
SWIR retrieval improvements	Update to latest BIRRA prototype and investigation for an operational CO <sub>2</sub> product	Prototype processor available for CH <sub>4</sub> , CO. Adjustment needed for CO <sub>2</sub>
Long Term CO <sub>2</sub> Series	Generate a CO <sub>2</sub> data set for SCIAMACHY as a start for a long term data set using one algorithm for past, current and future missions	Algorithm available, application to new data products and quality assessment to be done before operational implementation.
Limb Clouds	Implement new algorithm for Limb cloud detection	Algorithm description (ATBD) available
Limb retrieval kernel improvements	Update to the latest improvement in radiative transfer and abandoning approximation since computational speed is no longer a major concern	Prototype processor available, implementation in operational needs adjustments
Limb Aerosol Size Distribution	Retrieve aerosol size distribution from Limb measurements	Algorithm available, application to new data products and quality assessment to be done before operational implementation
Limb Water Vapour	Adjustment of existing algorithm to increase computational speed viable for full mission operational retrieval	Prototype processor available, implementation in operational needs adjustments
Tropospheric ozone	Apply existing limb-nadir matching algorithm to updated data	Algorithm available, application to new data products and quality assessment to be done before operational implementation



