**GOOMOS calibration aspects**

**Self-calibrating instrument**

- GOOMOS operating principle is inherently self-calibrating ensured on the assumption that the instrument transfer function does not change in the time between two measurements. However, parameters related to spectral assignment and precise wavelength are sensitive to thermal effects and settling of the optical bench.

- When the ENVIROCAL verification, specific observations in monitoring mode were performed in order to verify the normal operation of all instrument components. The outputs of these phase allowed to confirm that most of the in-flight performances were consistent in the ground calibration performed before the launch. It had also highlighted a high sensitivity of the CCD response to the environmental changes and the subsequent need to calibrate the dark charge of each orbit.

**Operational Calibration**

- Dark Charge (DC) calibration: data taken over a Dark Sky Area (no input flux expected) every orbit are used for removing the DC from the star signal.

- Wavelength calibration: a routine wavelength calibration is performed once a week.

**SCIAMACHY calibration aspects**

**Operational Data Calibration**

SCIAMACHY level 0 data is converted into "calibrated radiance" level 1b products by applying calibration algorithms and calibration parameters, for details see: http://atmos.caf.dlr.de/projects/scops/sciamachy_book/sciamachy_book.html

There are two major groups of calibration algorithms that are applied to the Calibrated Level 1b products on a ground-based processing chain.

- In-flight calibration (IA) level 1b data have an on-board CAL product.

- On-ground calibration: pre-flight instrument calibration data, the so called Key Data based on on-ground calibration campaigns.

**User Data Calibration with user tool SciaL1c**

The m-factor calculation is performed at the level 2 processor. The m-factor is calculated from measured sun spectra of the different light paths (nadir, limb, occultation). The m-factor calculation is performed by IFE-SOST, more details at http://www.iup.uni-bremen.de/sciamachy/mfactors/

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The m-factors are a measure of the deviation of the measured spectra from the simulated spectra. The m-factor is defined as the ratio of the measured spectrum to the simulated spectrum.

**Data Processing Chain**

The three Atmospheric Chemistry instruments on-board ENVISAT require that specific in-flight calibrations have to be applied not only to assign a physical unit to the raw measurements (e.g., radiance, transmission), but also to correct for instrumental effects (e.g., dark current). These calibrations are routinely performed with a well defined procedure that allows to account for long term degradation of instrument performances or for short term variation of measurement conditions. An accurate calibration of the flight measurements is crucial for data quality. Calibration measurements transmitted into Auxiliary Data Files (ADF) are directly used in the level 0 to 2 processing chain, as illustrated in this figure.

**Quality Control and Product Validation**

The science users can transform the level 1b products into fully calibrated level 1c products with the SciaL1c tool (http://www.iup.uni-bremen.de/sciamachy/mfactors/) selecting specific calibrations and extract for certain geographic areas, time intervals, spectral regions and measurement type of interest. The latest SciaL1c version includes also the possibility to correct the data for degradation applying the m-factor correction.