

List of the relevant Definitions, **associated with the Science Requirements**

Introduction

All definitions mentioned in the OMI-EOS Science Requirements Document (SRD) (RS-OMIE-KNMI-001, Version 2 of 7 December 2000) are listed according to the following rule: **Definition w.x.y.z**, in which **wxyz** stand for respectively chapter (**w**), section (**x**), subsection (**y**) and number of the definition (**z**) in the SRD.

Science requirements (SRD Chapter 3)

- Definition 3.1.1** Priority ‘A’ products are those products which shall be retrieved by OMI to fulfil the OMI mission objectives and they shall be available directly after launch.
- Definition 3.1.2** Priority ‘B’ products are those products which shall be possible to retrieve by OMI and which are desirable products that provide an extra contribution to the OMI mission objectives, but which are not necessarily available directly after launch.
- Definition 3.2.1** The pragmatic definition of the accuracy is: the RMS difference between 1) product values retrieved from simulated (“measured” and calibrated) theoretical Earth radiance spectra generated with a state of the art radiative transfer model (including well-defined atmospheres) and 2) the input product values used for the generation of these spectra. The theoretical spectra should be fed into instrument simulation software (“measured”), with all known error sources included; and calibrated with level 0-1b software.
- Definition 3.3.1** Global coverage means that OMI shall be able to measure the UV/VIS spectrum reflected from every part on Earth within 24 hours, except for regions which are not illuminated by sunlight in 24 hours.

Algorithm requirements (SRD Chapter 4)

- Definition 4.0.1** Level 0 data is the raw instrument data at original resolution, time ordered, with duplicate packets removed.
- Definition 4.0.2** Level 1b data is the radiometrically corrected and calibrated data in physical units at full instrument resolution as acquired.
- Definition 4.0.3** Level 2 data is the geolocated geophysical product, e.g. ozone column
- Definition 4.0.4** Ancillary data is data other than instrument measurements, originating in the instrument itself or from the satellite, required to perform processing of the data.. They include orbit data, attitude data, time information, spacecraft engineering data, calibration data, data quality information and data from other instruments.
- Definition 4.05** Auxiliary data is the data required for instrument processing, which does not originate in the instrument itself or from the satellite. Some auxiliary data will be generated in the ground segment, whilst other data will be provided from external sources.
- Definition 4.2.4.1** Spectral knowledge is defined as the error in the wavelengths assigned to the radiance and irradiance spectra.
- Definition 4.2.5.1** Spectral stability is the difference in the wavelength registration of a CCD-pixel between the radiance and irradiance spectra.
- Definition 4.2.7.1** The reflectivity is defined as the ratio of the Earth radiance and the solar irradiance.

Instrument requirements (SRD Chapter 5)

- Definition 5.1.1.1** The Total Spectral Range is defined as the wavelength range imaged onto the detector, including the overlap regions. In the Global- and Spatial Zoom-in Measurement, this equals to the wavelength range actually present in the instrument data.
- Definition 5.1.1.2** The Full Performance Range is the Total Spectral Range up to the wavelengths where the useful signal from two overlapping channels is equal. This is the wavelength where (about) half of the energy is deposited in each of two overlapping channels.
- Definition 5.1.1.3** The Spectral Sampling Distance is the wavelength range [in nm/pixel] over which a signal is sampled over a pixel.
- Definition 5.1.1.4** The Spectral Resolution is the full width at half maximum (FWHM) (in [nm] or [pixels]) for the instrument response for a monochromatic input.
- Definition 5.1.2.1** The Instantaneous Field-Of-View (IFOV) is the FWHM of the pixel response curve obtained when moving a point source in swath and/or flight direction.
- Definition 5.1.2.2** The global observation mode is the observation mode with the 2600 km swath and $13 \times 24 \text{ km}^2$ ground pixels. In the spectral range of 270 – 310 nm, the pixel size in the across-track direction may be larger, but at most doubled (i.e. $13 \times 48 \text{ km}^2$). The swath will be symmetric with respect to the sub-satellite track.
- Definition 5.1.2.3** The spatial zoom-in mode is the observation mode with a ground pixel size of $13 \times 12 \text{ km}^2$ and full spectral coverage, but is allowed to have a limited swath width of at least 725 km. In the spectral range of 270 – 310 nm, the pixel size in the across-track direction may be larger, but at most doubled (i.e. $13 \times 24 \text{ km}^2$). The swath will be symmetric with respect to the sub-satellite track.
- Definition 5.1.2.4** The spectral zoom-in mode is the observation mode with a ground pixel size of $13 \times 12 \text{ km}^2$ and a full swath of 2600 km. A limited spectral coverage is allowed, but shall be at least 306 - 432 nm to cover the most important scientific products. The swath will be symmetric with respect to the sub-satellite track.
- Definition 5.1.2.5** Sub-pixel read-out means that at one selected wavelength per CCD no co-addition of CCD images in the flight direction is performed.
- Definition 5.1.3.1** The exposure time is the time the image-part of the CCD is illuminated (the nominal exposure time is 0.4 s). After illumination, frame transfer takes place, and the image is transferred to the read-out part of the CCD.
- Definition 5.1.3.2** The read-out time is the time it takes to read the read-out part of the CCD (the nominal read-out time is 0.4 s).
- Definition 5.1.3.3** The co-addition time is the time in which several images are co-added. The nominal co-addition time is 2 s (i.e. 5 images are co-added to one: data is summated in the flight direction to improve S/N and reduce data rate).
- Definition 5.1.3.4** Binning is the summation of data of several CCD pixels along a column in the CCD (i.e. in the swath-direction) into one larger ground pixel to improve S/N and reduce data rate. (Nominally, 8 pixels are binned in the global mode).

- Definition 5.1.3.5** Bad pixels are: pixels with anomalous dark current, reduced charge transfer efficiency (CTE), reduced quantum efficiency, or anomalous pixel response function and all pixels in columns on the CCD whose signal is transferred through a pixel with one of the aforementioned effects.
- Definition 5.2.1.1** The most critical gas, which is defined as being the data product that requires the highest S/N ratio in a specific wavelength range.
- Definition 5.2.2.1:** The effects contributing to multiplicative factors are:
1. absolute radiometric calibration taking into account that common optical paths cancel in the calculation of the reflectance.
 2. linearity charge transfer efficiencies
 3. polarisation effects between the primary mirror and the first scrambler surface
 4. spectral structures similar to absorption structures
 5. gain settings
- Definition 5.2.2.2:** The effects contributing to additive factors are:
1. stray light
 2. dark current
 3. exposure smear
 4. charge transfer inefficiencies
 5. memory effects in CCD, DEM and ELU
 6. electronic offset
- Definition 5.2.2.3** Non-linearity is defined as is the maximum excursion relative to linear behaviour.
- Definition 5.4.1** The effective spectral slitfunction is defined as the optical slitfunction convoluted with the Pixel Response Function (PRF).

Validation requirements (SRD Chapter 6)

- Definition 6.2.1.1** The commissioning phase is the first validation phase, in which absolute irradiance and absolute radiance shall be validate and a preliminary validation of the main level 2 data products shall be provided.
- Definition 6.2.2.1** The core phase is the second validation phase, in which all products shall be validated thoroughly in order to determine their accuracy.
- Definition 6.2.3.1** The long-term phase is the third validation phase, in which long-term changes in the accuracies of the products, e.g., due to instrument degradation, shall be detected and in which newly developed or advanced OMI data products shall be validated.