**Summary for breakout workshop #8 at IOCS 2019: Ocean Color Satellite Sensor Calibration**
**Chair: Gerhard Meister, NASA**

The meeting started with an introduction by the chair. The main issue was planning the next meeting, which will need to occur earlier than the next planned IOCS meeting, preferably in about 2 years. Several options were proposed:

- SPIE in San Diego, USA
- Sentinel 3 Validation Team meeting in Europe
- IVOS (The Infrared and Visible Optical Sensors Subgroup of CEOS)
- Ocean Optics

A survey among the group members regarding the venue for the next meeting was initiated.

The format of this year's meeting was a series of presentations, with ensuing discussions. Interest was high and some of the discussions took much longer than anticipated. The allocated time for the breakout session was significantly exceeded.

The first presentation was by Gerhard Meister (NASA) on the calibration program for the Ocean Color Instrument (OCI) on the Phytoplankton, Aerosols, Clouds, and Ecology (PACE) mission. In addition to heritage measurements, OCI will have the capability to measure changes to the radiometric gain linearity on-orbit.

Jack Xiong (NASA) presented results from the prelaunch calibration and characterization campaign for the JPSS-2 VIIRS sensor. Overall performance is as expected and good, with fewer non-compliances than for JPSS-1 VIIRS.

Ludovic Bourg (ACRI, ESA) showed qualitative results from the first lunar image acquisition of an OLCI sensor. It is likely that this work will lead to a refinement of the OLCI straylight correction. The 1020nm channel appears to be affected the most.

Shihyan Lee (SAIC, NASA) evaluated the impact of straylight on MODIS Aqua ocean scenes. The worst case assumption underlying the definition of the current NASA cloud flag for MODIS (and probably VIIRS as well) is too conservative. It should be investigated if the flag size can be reduced.

Kibeom Ahn (KIOST) presented the lunar calibration and MTF plan GOCI-II. Lunar measurements are possible without a spacecraft maneuver with GOCI-II because GOCI-II has a full disk imaging mode (a new feature relative to GOCI-I).

Menghua Wang (NOAA) showed that after April 27, 2018, VIIRS-NOAA-20 ocean color data quality meets the data Provisional (or even Validated) requirements. He also determined that before April 27, 2018 VIIRS-NOAA-20 ocean color data have some data quality issues due to discontinuities in the gain calibration.

Hiroshi Murakami from JAXA presented the on-orbit radiometric calibration of SGLI. A solar diffuser and lunar measurements were used for gain trending. Lunar measurements also verified the straylight correction. Additional analysis was required to improve consistency between the three telescopes.

Xianqiang He (SIO) talked about the on-orbit performance of the HY-1C/COCTS. A crosscalibration technique using MODIS Aqua was used for gain calibration and polarization characterization. The results were validated against MODIS Aqua, SNPP VIIRS and Aeronet-OC with good results.

Ewa Kwiatkowska (EUMETSAT) presented new results from the Sentinel-3 OLCI in flight diffuser characterization. On-orbit yaw maneuvers significantly improved the usability of the solar diffuser time series for relative gain trending over time, but could not reduce a constant bias in the calibration. In general, special care must be taken during prelaunch BRDF characterization of the solar diffuser to match the on-orbit view and illumination geometries as closely as possible and to obtain the most accurate BRDF at least at one of these geometries. For sensor intercomparison, the alignment accuracy specifications for the diffuser orientation relative to the instrument must be tight enough to allow matching the on-orbit angles across instruments.

Ludovic Bourg (ACRI, ESA) showed first results from the tandem flight of OLCI-A and OLCI-B. The comparison of the two data sets showed new possibilities that the ocean color sensor calibration community has not had before. The results will be extremely useful e.g. to investigate the radiometric gain differences between OLCI-A and OLCI-B. The slightly different spectral calibrations between the two sensors are a challenging feature when comparing the two sensors.

Based on the discussions following each presentation, we arrived at the following 3 main recommendations:

1) Every mission should evaluate if lunar observations can be acquired at least infrequently (for gain corrections and/or straylight evaluation). ESA and JAXA presented preliminary results of a straylight analysis of the lunar measurements. Results are extremely useful for evaluating the accuracy of the current straylight correction and may lead to improved correction algorithms/coefficients.
2) Every mission should evaluate if for a newly launched sensor, a tandem flight with another sensor is possible. A tandem flight is where one sensor follows the other in orbit closely, in order to achieve very similar view and illumination geometries. This provides an enormous data set for a direct comparison of the measured top-of-atmosphere radiances.
3) The gain calibration trends for ocean color sensors should not contain discontinuities or seasonal patterns that are not clearly supported by calibration measurements. If erroneous discontinuities or patterns do occur, they should be replaced by continuous trends in a timely fashion.