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Mitigating low signal-to-noise ratio in geostationary satellite ocean colour observation

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The estimation of ocean color is one of the techniques in remote sensing used for the monitoring of environmental conditions such as phytoplankton, harmful algae or suspended particulate matter (SPM). This measurement is characterized by the water-leaving reflectance (WLR) which is the backscattering reflectance from the ocean received at top of the atmosphere. However, the WLR signal received at the sensor can be very small. One approach to improve the quality of the measured WLR is to study the signal-to-noise ratio (SNR) in the observed channel since SNR describes the proportion of the measured signal to the unwanted noise. This study aims to investigate the capability of a geostationary satellite, Himawari-8, in the ocean color observation by exploring the variation of the signal-to-noise ratio (SNR) in several areas. Noise evaluation has been performed over 8 geolocated grid-boxes with a spatial average of 5x5 pixels and a temporal average of 50 minutes. This work has been done by considering the grid-box distance to the Nadir and the local solar time variation. The results show that the SNR is affected by the position of the box relative to the coast and the local solar time. Overall, Himawari-8 seems to be capable of observing ocean color, especially with a satisfying temporal resolution, although the SNR is still far from the International Ocean Color Coordination Group (IOCCG) recommendations. Results are expecting to improve with the Flexible Combined Imager, the imaging sensor on board Meteosat

Third Generation, which has been launched at the end of the 2022 and is equipped with a dedicated ocean color channel.

Keywords : signal-to-noise ratio, water-leaving reflectance, geostationary satellite