

Evaluation of the polarization radiance field of a sunglint model with different slope distributions using Directional Polarimetric Camera

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The inflight calibration accuracy and remote-sensing measurements over the ocean are greatly affected by the contribution of the sunglint on the ruffled ocean. The Cox–Munk model [1] was developed many years ago and has been used for in-orbit calibration of polarized channels of detectors such as POLDER [2]. However, the probability density function (PDF) for slopes was obtained by the use of the Gaussian distribution, and the Gram–Chalier sequence model has been used to describe the deviation of the actual sea surface from the ideal case. Tartaskii *et al.* found that the Gram–Chalier sequence decomposition of a PDF model may have “negative probability” in some cases, so it has failed to describe large deviations from the Gaussian PDF. Therefore, a combination of Gaussian functions with different weights was created [3]. In summary, the study of the probability distribution of sea surface wave slope has become a mature and broad research field, and how these probability distribution models affect the polarization field distribution of the sea surface needs to be analyzed and evaluated by inflight sensors [4,5]. Recently, the Directional Polarimetric Camera (DPC), which was the first operational POLDER-type instrument in China developed by the Optical Remote Sensing Center of AIOFM was successfully launched [6]. The reference top of atmosphere (TOA) bidirectional polarization distribution functions (BPDF) of land and sea surfaces can be provided by multi-angle polarization detection of DPC, so in this project, we used various PDF models to establish BPDF distributions of the sea surface with different environment parameters (wind, chlorophyll content, salinity, etc.). Then, the BPDF models have been coupled into the 6SV algorithm in order to calculate the TOA polarized reflectance of the sunglint area with the input of prior data of atmosphere (from ECMWF, MODIS, etc). Finally, the comparison studies with the measurements from DPC for several slope distributions have been carried out and the accuracy of DPC’s polarization radiance also been validated.

References

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