Development and evaluation of the angular polarization feature for marine observation

Zihan Zhang[a], Wenyi Lu[b,*], Zhaoyu Liu[a] and Lei Yan[a]

[a] *School of Earth and Space Science, Peking University, Beijing 100871, China*
[b] *National Engineering Research Center for Geographic Information System, China University of Geosciences (Wuhan), Wuhan 430074, China*

[*] *Presenting author (2202310496@cug.edu.cn)*

Ocean observation is vital for understanding marine ecosystems, monitoring pollution, climate change, and ensuring marine environmental protection. Optical remote sensing is integral to ocean observation systems, yet its effectiveness is often hindered by complex ocean-atmosphere conditions. Polarization remote sensing emerges as a promising method to overcome these challenges by exploring the anisotropy of electromagnetic waves. This technology enhances identification accuracy and quantitative estimation capabilities for ocean observation by providing heightened contrast against background marine and atmospheric particles.

This study evaluates the applicability of the Degree of Polarization (DoP) feature in marine scenarios through theoretical simulations and sample measurements. Findings reveal limitations in the DoP feature's versatility and sensitivity for independent application in marine contexts. To address these limitations, the Angular Polarization (AP) feature, tailored for ocean observation, is introduced. Experimental assessments across diverse marine scenarios confirm the effectiveness of the AP feature, particularly in distinguishing water bodies with different refractive indices and highlighting variations in observation target properties.

Comparative analysis with conventional optical features and the DoP feature underscores the distinctive advantages of the AP feature. Utilizing unsupervised methods for classifying ocean observation targets, the AP feature yields an average improvement of +16.83% in accuracy. This research demonstrates the significant potential of polarization remote sensing, specifically the AP feature, for advancing ocean observation capabilities and facilitating informed decision-making for marine management and conservation efforts.

Preferred mode of presentation: Oral