Enhancing Water Quality Monitoring in Inland Water Bodies: Evaluating Atmospheric Correction Methods for Sentinel-2 Data

Dewinta Heriza[1], *Chao-Hung Lin**[1]

[1] *National Cheng Kung University*

Optical remote sensing is a powerful tool for monitoring water quality in inland water bodies, such as lakes and rivers. By analyzing the spectral characteristics of the water, it is possible to estimate parameters such as chlorophyll-a concentration, turbidity, and dissolved organic matter. This information can be used to assess the health of the water body and inform management decisions. The feasibility and accuracy of using optical remote sensing for water quality management purposes depend on several factors, including the spatial and temporal resolution of the satellite images, the atmospheric conditions at the time of the image acquisition, and the availability of ground truth data for validation. Despite the potential benefits, the accuracy of data on inland water is significantly hindered by inaccuracies in atmospheric correction (AC). This study aims to address this gap by comparing two processors for atmospheric correction of Sentinel-2 data—namely, the Atmospheric Correction for OLI 'lite' (ACOLITE) and the polynomial-based algorithm applied to MERIS (POLYMER). The objective was to identify the most suitable processor for inland water bodies with varying turbidities. To achieve this, the algorithms used in ACOLITE and POLYMER were thoroughly tested for their performance in turbid waters. Furthermore, we compared the resulting inversion of the remote sensing reflectance (Rrs) using in-situ reflectance data from Gloria, a comprehensive global dataset of remote sensing reflectance from both inland and coastal waters. This dataset provided valuable ground truth information for the evaluation of the atmospheric correction processors. To demonstrate the capability performance of the compared processors, a quantitative assessment utilizing RMSE (Root Mean Squared Error) and MAPE (Mean Absolute Percentage Error) is conducted based on the comparison results. These metrics further reinforce the robustness and reliability of the study's findings.

Keywords: Atmospheric correction, ACOLITE, POLYMER, Sentinel-2