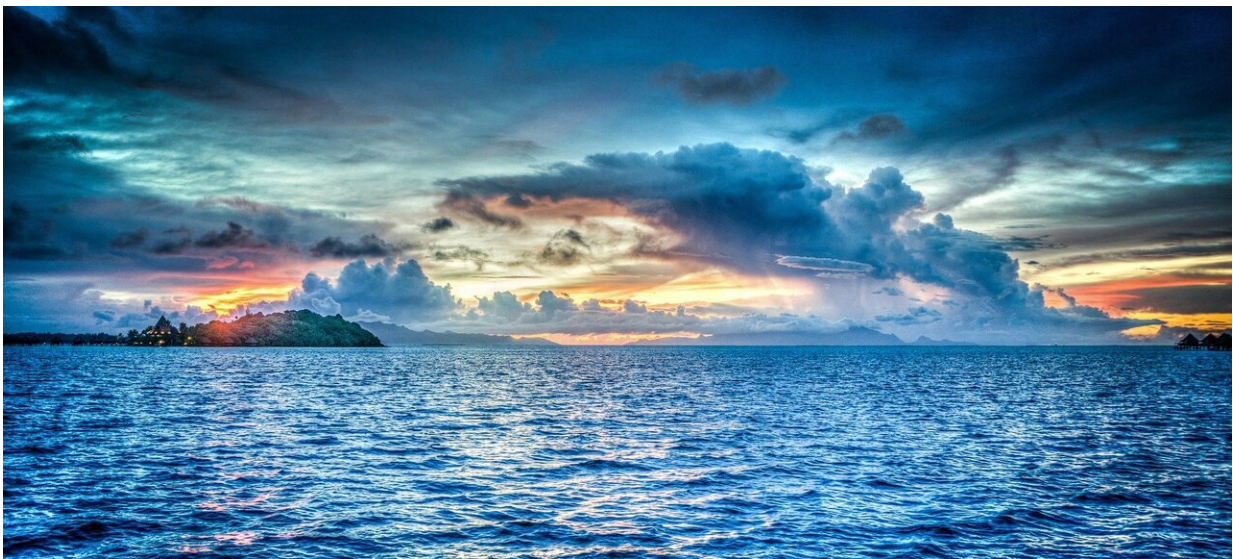


# Researchers evaluate performance of MODIS land reflectance products in water monitoring

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Satellite ocean color instruments are used to characterize physical, chemical, and biological variabilities in oceanic, coastal, and inland waters. However, the massive loss and large uncertainty of remote sensing reflectance data result in difficulty in monitoring nearshore coastal and inland waters.

Most of the coastal and inland waters are generally turbid; in these areas,

the contribution of water to signals of top atmosphere is raised, suggesting the possibility of using land reflectance products for water monitoring. The Moderate Resolution Imaging Spectroradiometer (MODIS) surface reflectance product (R\_land) has been used to monitor water clarity and suspended solids in waters.

Recently, a research group led by Profs. Duan Hongtao and Ma Ronghua from the Nanjing Institute of Geography and Limnology of the Chinese Academy of Sciences has provided a comprehensive evaluation of the performance of MODIS R\_land products against a field optical dataset. The dataset contains 4,143 reflectance spectra, 2,320 chlorophyll-a samples, and 1,467 suspended particulate matter samples across global nearshore coastal and [inland waters](#).

This work was published in *Earth-Science Reviews*.

"Despite the ease of using this product and its higher spatial resolution than the MODIS ocean bands, according to our assessment, R\_land might not be an optimal data source for monitoring inland and coastal waters," said Prof. Duan.

The results showed that R\_land overestimated [remote sensing](#) reflectance, particularly in 469 nm and 859 nm bands. In addition, land reflectance showed evident overestimations compared with the ocean color products derived using SeaDAS software in the East China Sea.

The researchers also reported noticeable negative values and patchiness in the R\_land imagery. R\_land was frequently negative in the pixels covered by cyanobacterial scums. "The negatives and patchiness in R\_land possibly resulted from [an] unsuitable mechanism to remove aerosols in generating R\_land over waters," said Prof. MA.

Existing algorithms did not estimate satisfactory chlorophyll-a and

suspended solids from R<sub>land</sub> across the global inland and coastal waters. Machine learning models outperformed the state-of-the-art algorithms for suspended particulate matter retrievals in global turbid waters from R<sub>land</sub>.

However, not all models, including machine learning models, can retrieve reliable chlorophyll-a from R<sub>land</sub>, due to the limited spectral information and uncertainty of R<sub>land</sub> products. This implies that R<sub>land</sub> might be able to quantify the parameters closely related to suspended solids (e.g., water clarity and extinction coefficients) in most waters; however, it is challenging to quantify pigments like chlorophyll-a.

"MODIS R<sub>land</sub> does not contain sufficient information that makes these existing algorithms usable. Consequently, various water color parameters from R<sub>land</sub> are difficult to retrieve except for several parameters, such as suspended particulate matter, turbidity, and [water clarity](#)," said Prof. Duan.

**More information:** Zhigang Cao et al, What water color parameters could be mapped using MODIS land reflectance products: A global evaluation over coastal and inland waters, *Earth-Science Reviews* (2022). [DOI: 10.1016/j.earscirev.2022.104154](https://doi.org/10.1016/j.earscirev.2022.104154)

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