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Quality of Rrs is extremely important!
Common practice to evaluate Rrs

\[ \text{Rrs} \ [\text{sr}^{-1}] \]

411 nm

\[ R^2 = 0.xx \]
\[ \text{RMSE} = 0.yy \]

In situ Rrs [sr\(^{-1}\)]

[CHL], IOPs, PFTs, ... are not derived from Rrs at 1 band, rather from an Rrs spectrum

Such regression analysis cannot measure the quality of an Rrs spectrum!
Need to measure the quality of an entire Rrs spectrum!
> 900 hyperspectral Rrs

Quality Assurance System to measure Rrs spectrum quality
23 water types

Wei et al. (2016)
Three spectral Rrs matrices

Centroids

Upper bounds

Lower bounds

Wei et al. (2016)
an Rrs spectrum  

Find reference Rrs  

Compare and score  

Quality Score:  

\[ C_{tot} = \frac{0 + 0 + 1 + \ldots + 1}{9} = 0.78 \]

Wei et al. (2016)
Truecolor image

Per-pixel scores

Low scores in blue, high scores in yellow
Per-pixel scores

Low scores in blue, high scores in yellow

Rrs matchups

Bad Rrs

USA

Canada
Truecolor image

Low scores in blue, high scores in yellow

Per-pixel scores
Per-pixel scores

Low scores in blue, high scores in yellow

Rrs matchups

Bad Rrs

Rrs vs. Wavelength (nm)

USA
What is the impact of questionable Rrs spectra?

SeaBASS

[CHL] algorithm

Wei et al. (2016)
MODIS Rrs

North Atlantic Gyre (NAG)
Impact on long-term “trends”

Monthly Chl with OCx algorithm

Wei et al. (2017)
Summary:

- Evaluations of Rrs at discrete bands provide a partial answer of the quality of Rrs spectrum.
- It is required to measure the quality of an Rrs spectrum, i.e., treat the entire Rrs spectrum as an entity.
- A QA system is now developed to meet this requirement, which can be refined with the availability of more high-quality Rrs data.
- Applications of the QA system obtained QA scores consistent with our understanding of good and bad Rrs spectra.
- Implication of the QA system to ocean color satellite Rrs can filter out questionable Rrs spectra and obtain more consistent results on long-term variations of ocean BGC properties.
- It is recommended to implement such a QA system to obtain improved longer-time (e.g., 8-day, monthly, etc.) data products.
Thank you!