Remote Sensing of Suspended Sediments in a Tropical Open Bay

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Abstract
This study presents descriptive and empirical results of optical parameters associated to Total Suspended Sediments (TSS) in a tropical open bay located at the west coast of Puerto Rico. Spatial analyses indicated that absolute values of TSS, remote sensing reflectance (Rrs) and total backscattering (bp) increases with proximity to the shoreline. A good relationship between bp and TSS was established (R^2=0.7) in all wavelengths. The regression analyses between Rrs and TSS indicate that best wavelengths to estimate TSS are between 589 to 645 nm. It was found that a red to green ratio improved the correlation results. Rrs at 645 nm measured with the field spectroradiometer showed the highest correlation coefficient with MODIS reflectance. Sensors with better spatial and spectral resolution are needed in order to generate operational products of TSS in these highly variable water bodies.

Methods

Field Work

- Study area showing the areas of river discharge and the location of monitored stations
- Optical package was used to collect all the necessary data in river stations
- Water samples were collected in each station
- Spectroradiometer Gill 1900 - Greys measurements of Rrs within the range of 370-1000 nm

Spatial variability of TSS

- The single band regression analyses supports the use of wavelengths at 589 nm or 620 to estimate TSS, because both showed the higher square correlation coefficients comparing wavelengths of HS-6. Better relationships between red to green reflectance ratios suggest that suspended sediments dominate water optical properties, over the effect of phytoplankton and CDOM substances

TSS Spectral Response

- Figure 5. The best regression with MODIS data was found with Rrs, with a fairly good correlation coefficient of 0.69. However, this analysis indicated that it is a challenge to define any relationship between MODIS reflectance and in situ measurements of optically active components in this area. This difficulty could be diminished by the incorporation of more observations in the dataset.

Results

Empirical relationships between in situ optical parameters and TSS

- The best regression with MODIS data was found with Rrs, with a fairly good correlation coefficient of 0.69. However, this analysis indicated that it is a challenge to define any relationship between MODIS reflectance and in situ measurements of optically active components in this area. This difficulty could be diminished by the incorporation of more observations in the dataset.

Conclusion

Results of this study provided a baseline for better understanding spatial and spectral variability of remote sensing parameters and their relationship with TSS. Regression analyses suggest that this quality parameter dominates the water-leaving signal between 589-645 nm. The high spatial variability in optical parameters of the study site in combination with the relative low spatial resolution of MODIS demonstrated that a better ocean color sensor is required for coastal studies in tropical open bays. Results also show that use of band ratios will improve the development of algorithms and their application in these waters.

Literature Cited


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