

Assessing The Potential Of Hyperspectral Imagery To Detect And Map *Lyngbya* Spp.: A Biological Indicator For Presence Of Metal And Man-Made Objects In The Littoral Environment

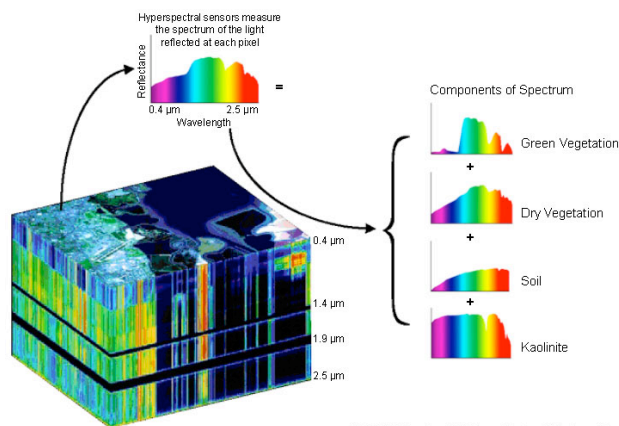
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The aquatic filamentous bacteria (Cyanobacterium) *Lyngbya majuscula* is a nitrogen-fixer found in coastal waters often attached or adjacent to sea grass, algae and coral. It is characterized by phycobiliproteins, unique pigments found only in cyanobacteria. To sustain photosynthesis and nitrogen fixation, *L. majuscula* requires iron proteins and is therefore sensitive to the availability of this metal. The hypothesis tested in this study concerns the potential use of hyperspectral imaging in detecting *L. majuscula* in coastal regions as biological indicators for the presence of iron debris or metal objects in the littoral environment. This concept would have potential benefits and applications in mine detection and countermeasure techniques.

A spectral library was developed for the benthic substrates of Midway Atoll, Northwest Hawaiian Islands, spectrally characterizing *L. majuscula* and the surrounding coral reef substrates. The data was analyzed to determine unique spectral characteristics of the benthic cyanobacteria in a mixed coral environment and evaluated against the resampled spectral resolution of a number of hyperspectral sensors: Airborne Visible/Infrared Imaging Spectrometer (AVIRIS), Hyperspectral Mapper (HyMap) and Compact Airborne Spectrographic Imager (CASI). The results of the in situ spectroscopy suggest a strong potential for all three sensors to detect these cyanobacteria in a mixed coral reef environment at four distinct wavelengths attributable to phycobiliprotein pigment absorptions unique to cyanobacteria. Of these four discriminative absorption ranges, the phycoerythrin absorption of 565-576 nm shows the greatest potential for segregating cyanobacteria from a mixed algal/ coral / sand environment.



(NEMO Project Office, United States Navy)

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