

Mapping Sargassum in the U.S. Virgin Islands with High-Resolution Satellite Imagery and Machine Learning

Thursday, October 23, 2025 4:40 PM (20 minutes)

Early Warning Systems are invaluable resources for communities attempting to mitigate the harmful effects of stranded and decomposing sargassum seaweed. Yet, forecasting systems are subject to the limitations of available satellite remote sensing data. Technology and resource availability often require a choice between spatial and spectral resolution, with implications of the tradeoff that vary across disciplines and methodologies. Higher spectral resolution can support calculations for popular algae indices that utilize Red-Edge and Short-Wave Infrared (SWIR) bands. On the other hand, since spatial resolution is proportionate to the total pixel count per area, increasing spatial resolution simultaneously enhances detection of small-sized features and diminishes uncertainty introduced by mixed pixels. This study utilizes satellite images from Planet's ultra-high resolution (0.5 m) 4-band (Red/Green/Blue: RGB; Near-Infrared: NIR) SkySat constellation. We use feature extraction techniques to create six raster datasets: True Color (RGB) and False Color (Color Infrared; CIR) raster band composites, calculated Normalized Difference Vegetation Index (NDVI), Dimension Reduction Analysis (DR), and Principal Component Analysis (PCA). Machine Learning (ML) model training and classification followed with Random Forest classification (>92% accuracy) for each of the derived datasets. Our results reveal that sargassum can be distinguished based on (a) raw spectral values (spectral profiles and histogram reflectance distributions) and (b) images and rasters directly derived from the raw spectral values (color composites, NDVI, and PCA). Based on these results, we conclude that ultra-high spatial resolution 4-band imagery is sufficient for detection and classification of sargassum, both on land and in the water.

Organized Session Details

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