



The Portable Remote Imaging Spectrometer (PRISM)



Michelle Gierach & The PRISM Team
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Acknowledgments

The PRISM Team:

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NASA Partner: AFRC



PRISM Sensor and History

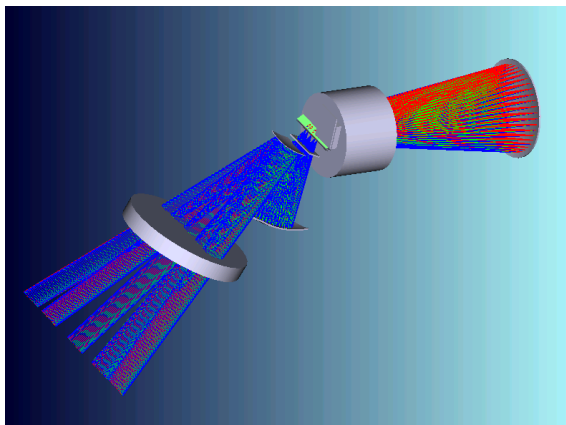
PRISM is a state-of-the-art imaging spectrometer optimized for the needs of coastal ocean science, providing high SNR and dynamic range, low polarization sensitivity, high spatial resolution, and high uniformity.

- PRISM development award: 2009
- First flight: May 2012
- First science campaign: Aug. 2012
- Additional science campaigns: January 2014, April-May 2014
- All campaigns utilized Twin Otter Aircraft (GRC and TOIL)
- Typical altitude range 1-10 kft
- Reached maximum TO aircraft altitude of ~20 kft in May 2014

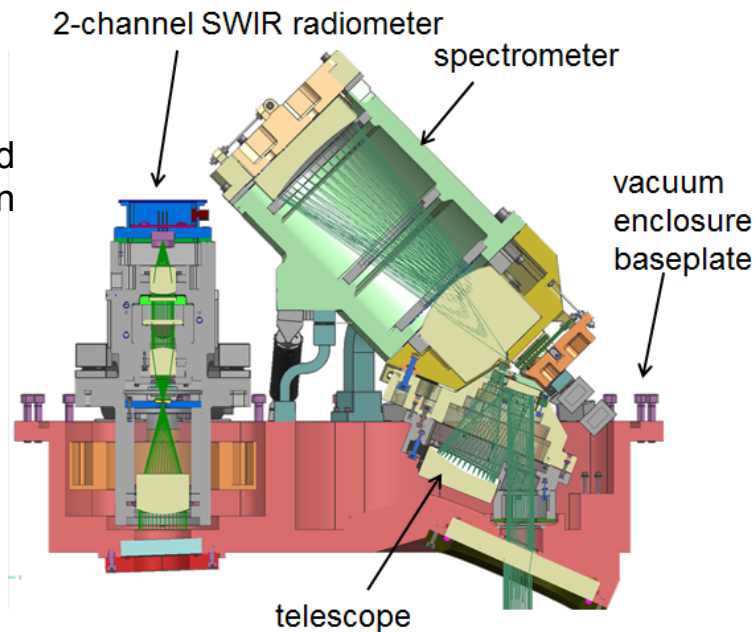




PRISM Specifications and Design



High throughput and high uniformity Dyson spectrometer

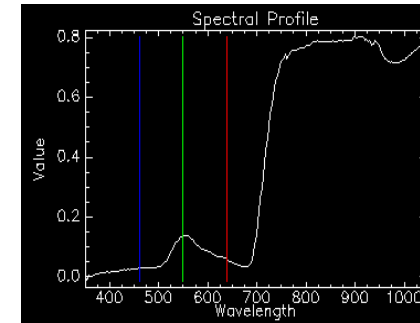
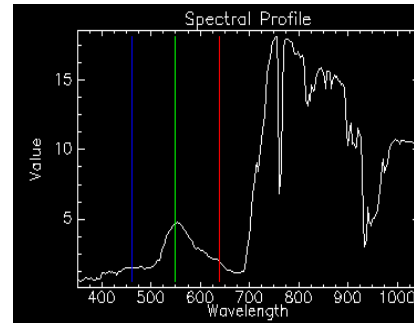
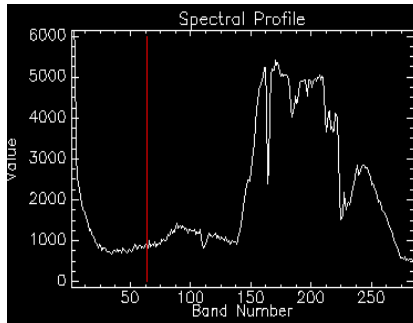


| | | |
|--------------------|---------------------------------|-------------------|
| Spectral | Range | 349.9 – 1053.5 nm |
| | Sampling | 2.83 nm |
| | Resolution (FWHM) | 3.5 nm typ |
| | Calibration uncertainty | <0.1 nm |
| Spatial | Field of view | 30.7° |
| | Instantaneous FOV sampling | 0.882 mrad |
| | IFOV resolution (FWHM) | 0.97 mrad |
| | Cross-track spatial pixels | 608 |
| Radiometric | Range | 0 – 99% R |
| | Sampling | 14 bit |
| | Calibration uncertainty | <2% |
| | Signal to Noise Ratio * | 500 @ 450 nm |
| | Polarization variation | <1% |
| Uniformity | Spectral cross-track uniformity | >95% |
| | Spectral IFOV uniformity | >95% |

| Parameter | Channel 1 | Channel 2 |
|---|-----------|-----------|
| Channel center (nm) | 1242 | 1608 |
| Bandwidth (nm, FWHM) | 22 | 56 |
| FOV (mrad, FWHM) | 2.4 | 2.4 |
| Boresight knowledge (mrad, rel. to spectr.) | 0.05 | 0.05 |
| Sampling | 13 bit | 13 bit |
| SNR @ 1.2 mW/cm ² sr | 325 | 390 |



PRISM Data Processing



Level 0: Raw instrument DNs

1. Measure incident radiance at 100 lines/sec.
2. Associate data with Inertial Measurement / GPS for orthorectification

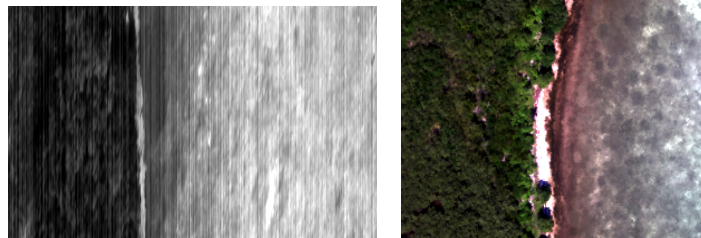
Level 1: Calibrated radiance

1. Characterize dark current
2. Correct panel artifacts
3. Correct panel tap boundaries
4. Correct pedestal shift
5. Apply flat field
6. Apply radiometric calibration

Level 2: Surface reflectance

1. Calculate atmospheric absorption, aerosol and molecular scattering based on aircraft imaging geometry
2. Retrieve water vapor and optical path for each spectrum
3. Correct data to apparent reflectance at the surface

Spatial processing: Cropping, binning and orthorectification





Data Dissemination

<http://prism.jpl.nasa.gov>

File Edit View History Bookmarks Tools Help

PRISM website: Home

prism.jpl.nasa.gov

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PRISM

Portable Remote Imaging Spectrometer

Welcome to the PRISM Website

- Home
- Instrument
- PRISM Status
- PRISM Data
- Quicklooks
- Publications
- Contact
- News and Information

About PRISM

The coastal zone is home to a high fraction of humanity and is increasingly affected by natural and human-induced events from tsunamis to toxic blooms and oil spills. Current satellite data provide a broad overview of these events but do not have the necessary spectral, spatial and temporal resolution to characterize and understand them.

To address this gap, a compact, lightweight, airborne Portable Remote Imaging Spectrometer (PRISM) compatible with a wide range of piloted and Uninhabited Aerial Vehicle (UAV) platforms was developed at the Jet Propulsion Laboratory. Optimized for the spectral range between 350 nm and 1050 nm, PRISM offers high temporal resolution and below cloud flight altitudes to resolve spatial features as small as 30 cm. The sensor performance defines the state of the art in light throughput, spectral and spatial uniformity, and polarization insensitivity.

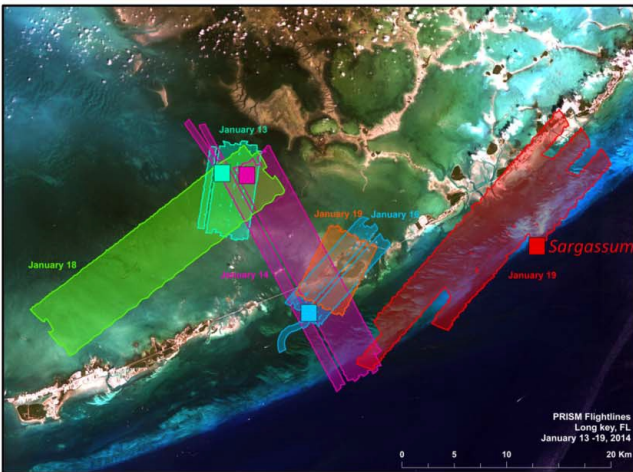
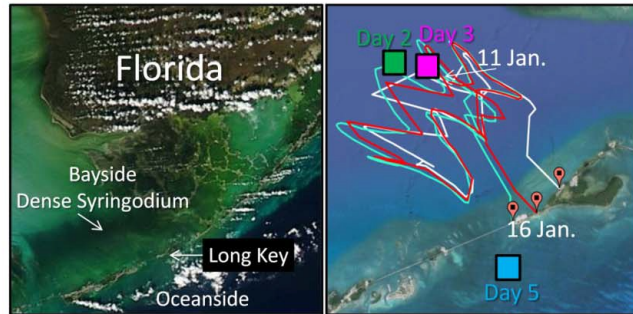
Latest News

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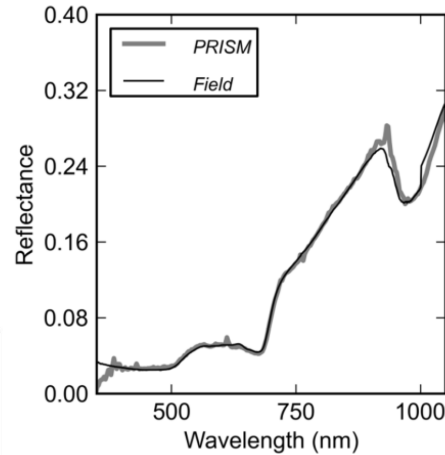


Floating vegetation and carbon transport in Florida Bay: Jan. 2014

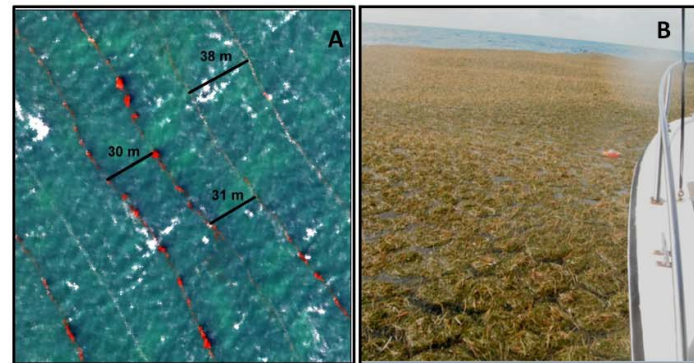
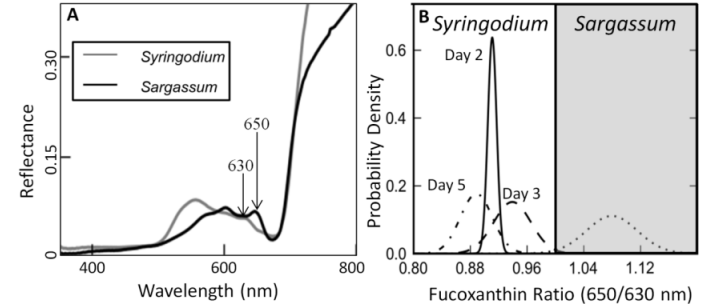


PRISM flightlines and drifter buoy locations

Verification with in-situ data



Algorithm development for distinguishing between vegetation types based on unique pigments



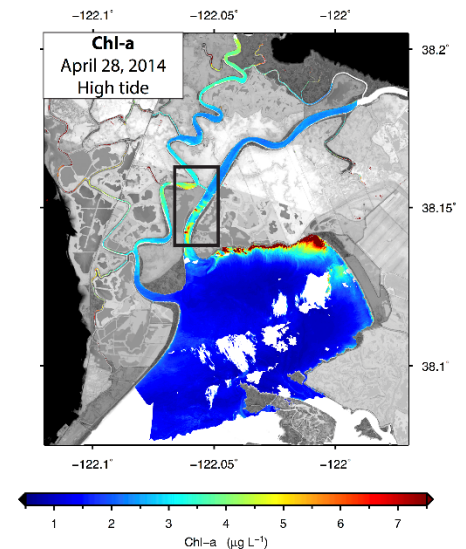
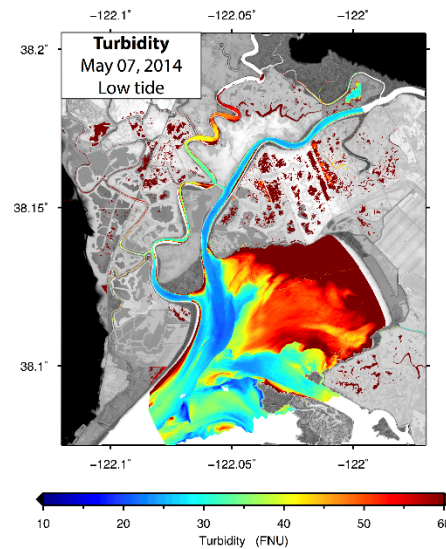
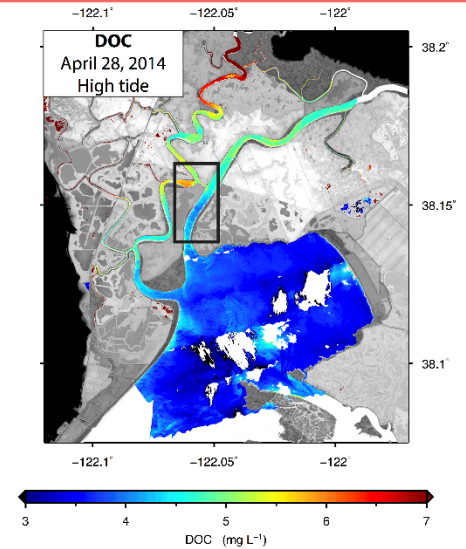
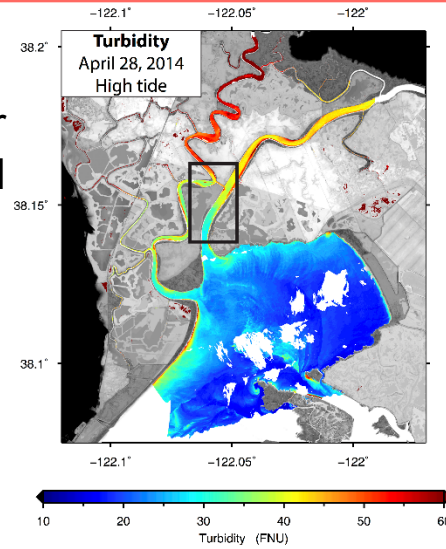
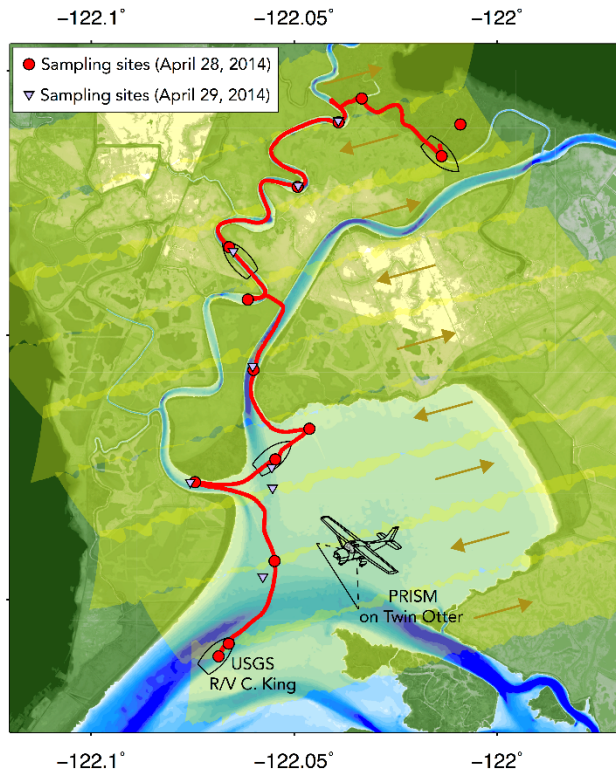
Floating seagrass wrack mapping with PRISM demonstrates required spatial scale.

* H. Dierssen et al: "Hyperspectral discrimination of floating mats of seagrass wrack and the macroalgae Sargassum in coastal waters of Greater Florida Bay using airborne remote sensing", Rem. Sens. Environment, in print.



Water quality monitoring in the Sacramento Bay Delta: May 2014

Algorithm development and products for turbidity, dissolved organic content, and chlorophyll-a, supported by in-situ data.





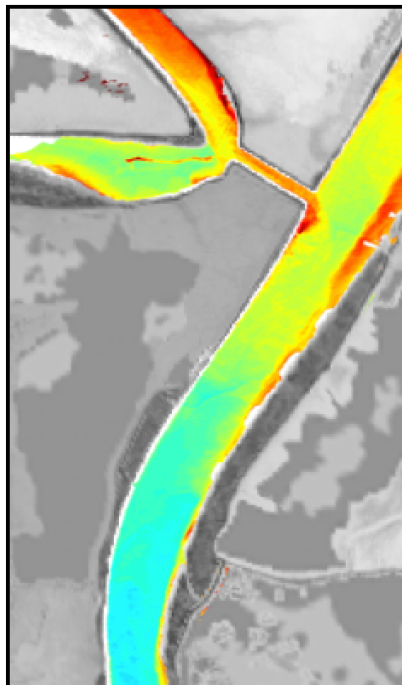
Water quality monitoring in the Sacramento Bay Delta: May 2014

Zoom-in example, spatial resolution 2.5 m

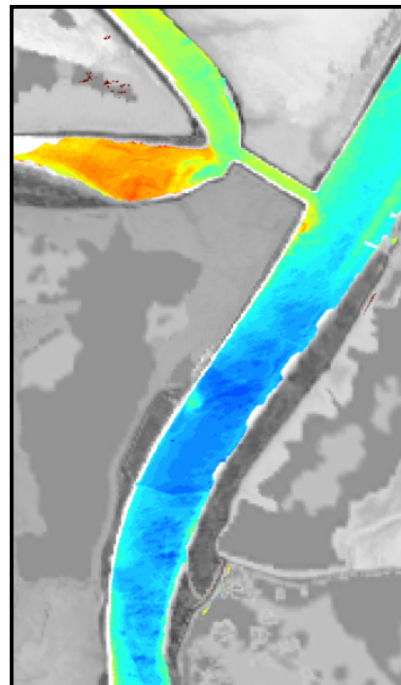
Remote Sensing Reflectance



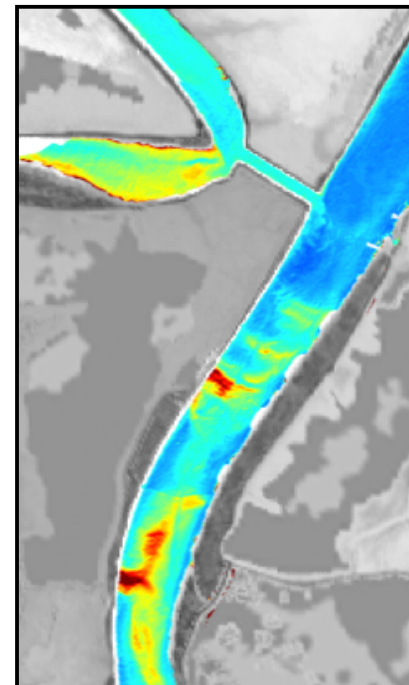
Turbidity



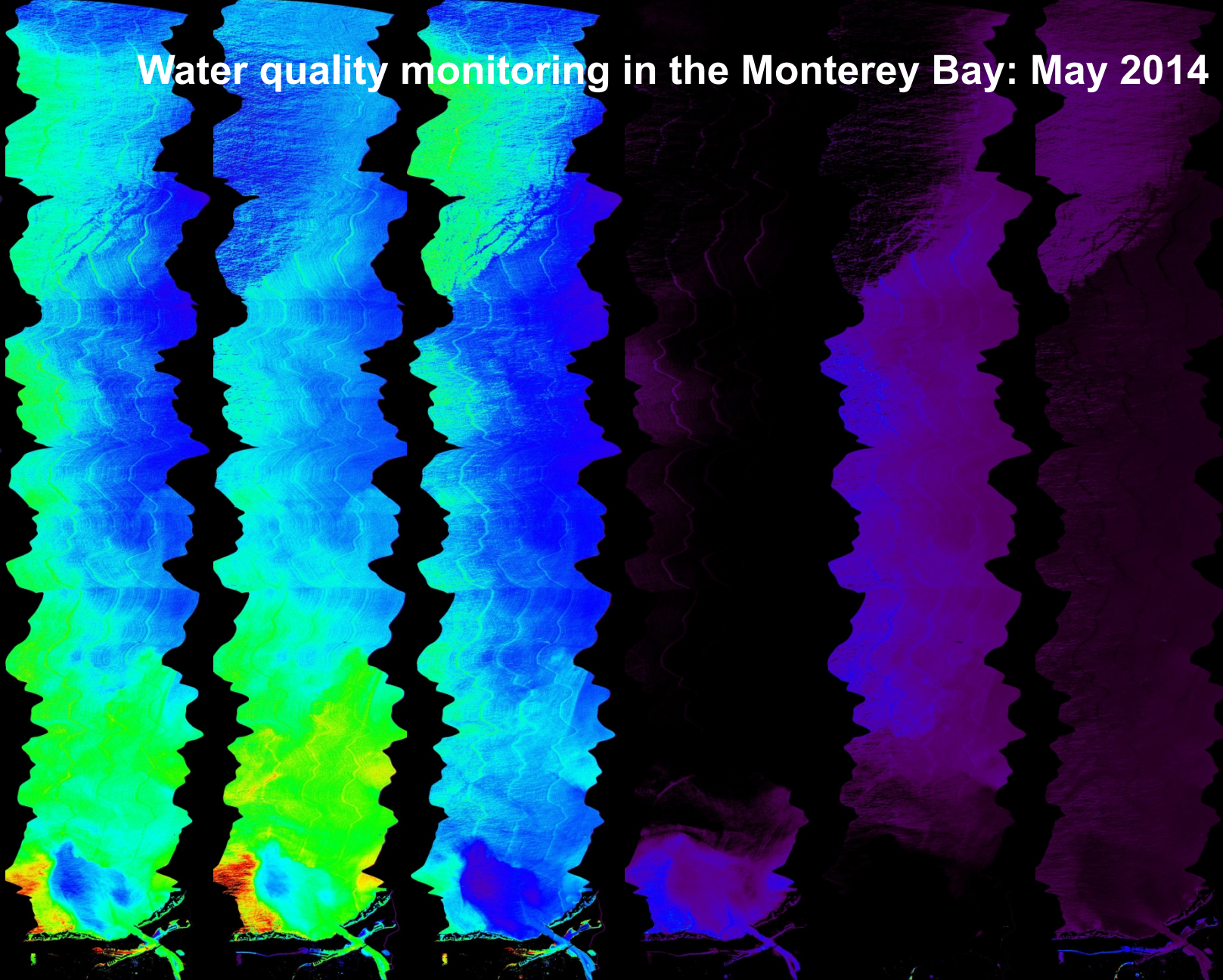
Dissolved Organic Carbon



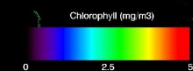
Chlorophyll-a



Water quality monitoring in the Monterey Bay: May 2014



Chlorophyll-a



Phytoplankton Species Discrimination (Taxon-Specific Chlorophyll-a)

