

# Monitoring Water Quality Using Satellite Image Processing

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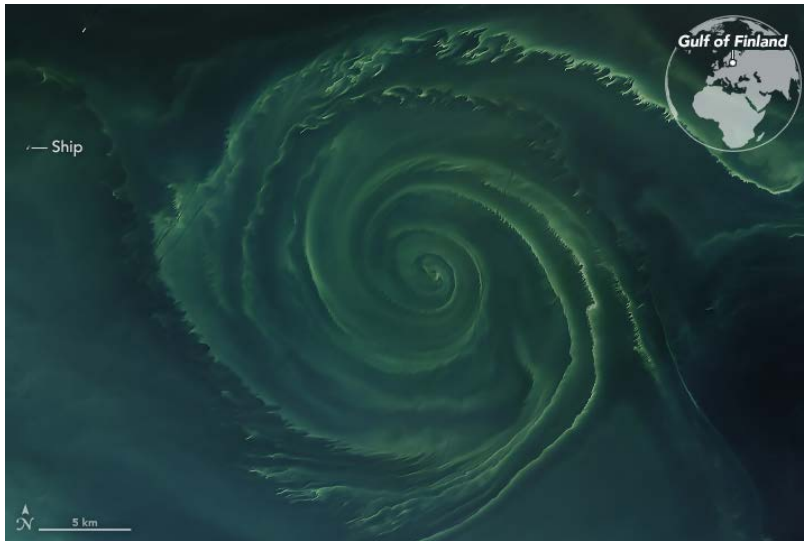
5, 12, and 19 September 2018



# Course Outline

September 5

Overview and Analysis of  
NASA Remote Sensing  
Data for HAB Monitoring



September 12

Introduction to SeaDAS for  
Image Processing and  
Data Analysis

SeaDAS is a comprehensive software package for the processing, display, analysis, and quality control of ocean color data. While the primary focus of SeaDAS is ocean color data, it is applicable to many satellite-based earth science data analyses. Originally developed to support the SeaWiFS mission, it now supports most U.S. and international ocean color missions.

The latest version (SeaDAS 7.5.1) is the result of a collaboration with the developers of ESA's BEAM software package. The core visualization package for SeaDAS 7 is based on the BEAM framework, with extensions that provide the functionality provided by previous versions of SeaDAS.

Responsible NASA Official: Gene C. Feldman  
Curator: OceanColor Webmaster  
Authorized by: Gene C. Feldman

September 19

Image Analysis Exercise  
Using SeaDAS

# Learn More About ARSET

<http://arset.gsfc.nasa.gov/>

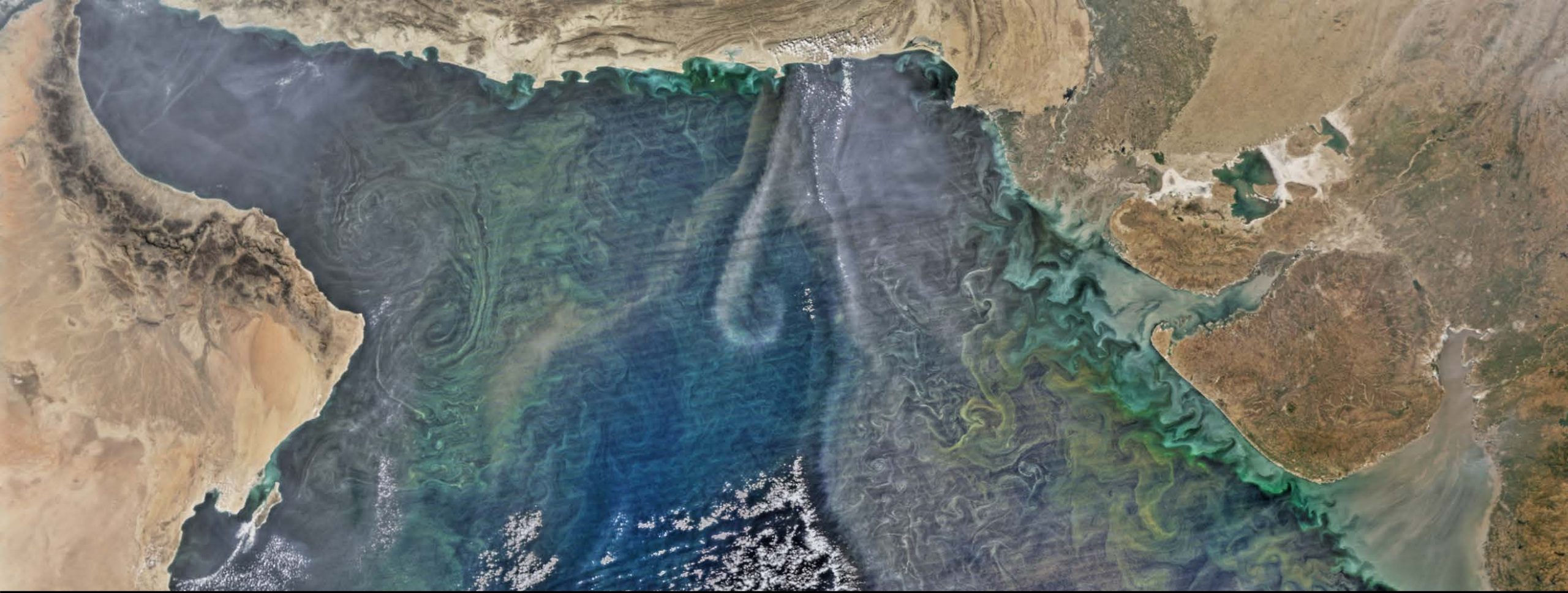
The screenshot displays the ARSET website interface. At the top, the NASA logo and 'ARSET Applied Remote Sensing Training' are visible, along with navigation links for 'Earth Sciences Division', 'Applied Sciences', and 'ASP Water Resources'. A search bar and a Twitter icon are also present. A navigation menu includes 'Home', 'About', and 'Trainings'. The 'Trainings' menu is open, showing categories: 'Fundamentals', 'Disasters', 'Health & Air Quality', 'Land', and 'Water Resources'. The 'Disasters' category is selected, highlighting a training event: 'Introduction to Remote Sensing of Harmful Algal Blooms', scheduled for Tuesdays, Sep 5-26, 2017, with a 'Register Now' button. The sidebar on the right lists 'ARSET' links: 'Online Trainings', 'In-Person Trainings', 'Sign up for the Listserv' (highlighted with a mouse cursor), 'Tools Covered', 'Suggest a Training', 'Personnel', and 'Resources'. Below this is an 'Upcoming Training' section for 'Water' with the title 'Satellite Observations of Water Quality for'.



# Outline for Week 2

- Overview of SeaDAS
- Demonstration: Analysis of MODIS Images using SeaDAS
  - Focus: Chesapeake Bay
  - Download Landsat OLI images for Lake Victoria
- Exercise: MODIS Image Analysis for Lake Victoria Using SeaDAS





## Overview of SeaDAS

<https://seadas.gsfc.nasa.gov/>

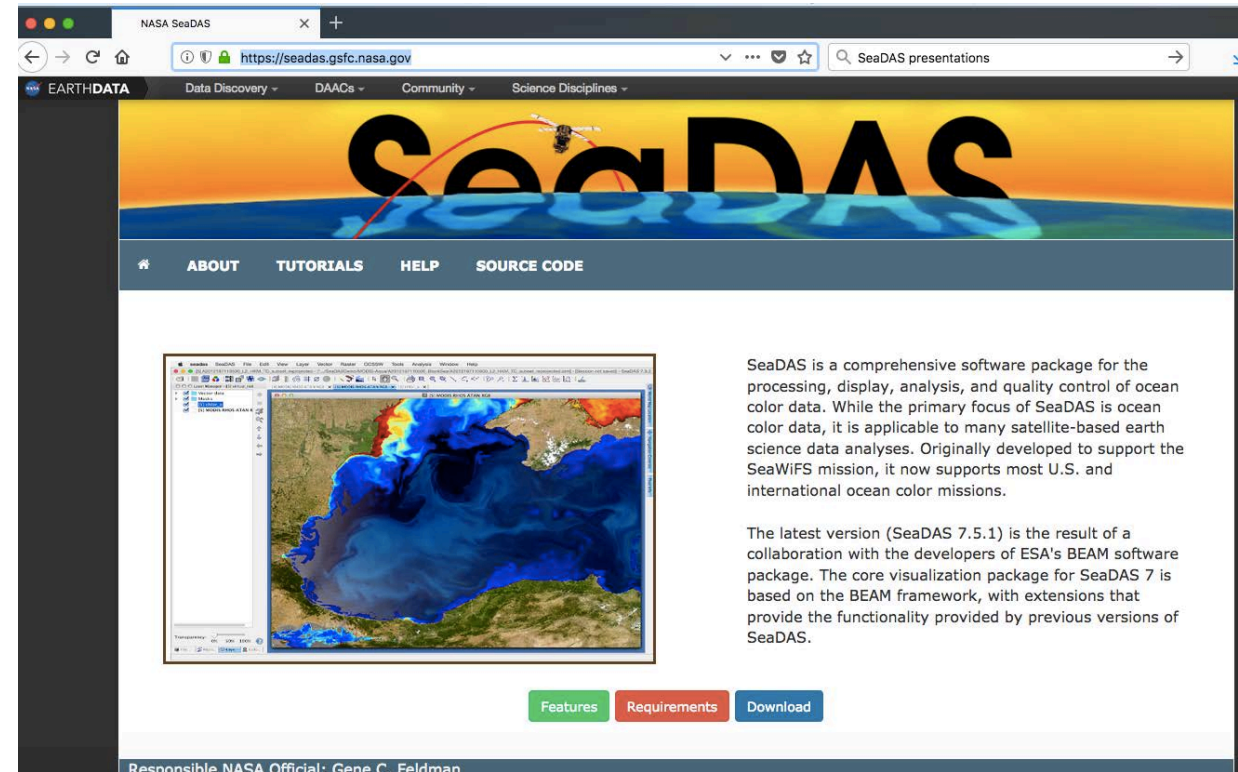
Acknowledgement: Daniel Knowles ([Daniel.s.Knowles@nasa.gov](mailto:Daniel.s.Knowles@nasa.gov)), Ocean Biology Group

# What is SeaDAS?

<https://seadas.gsfc.nasa.gov/>

SeaDAS is a comprehensive software package for the processing, display, analysis, and quality control of ocean color data

- Latest version is **SeaDAS 7.5.1**
- Developed in collaboration with ESA, based on BEAM software
- On-line documentation, download, and tutorials are available to work with SeaDAS
- Available as command-line version and Graphical User Interface



# SeaDAS Requirements

<https://seadas.gsfc.nasa.gov/requirements/>

- Runs on:
  - Linux
  - Mac OSX
  - Windows
- Source code (in C) available for installation

## SeaDAS Configuration and Requirements

SeaDAS is currently available for Linux, Mac OS X, and Windows. The Windows version currently does not support the science data processing code. The [SeaDAS source code](#) is publicly available.

### Minimum Suggested Hardware:

Platforms	Linux Intel Mac OS X
Memory	256 MB minimum, 1 GB+ suggested
Disk:	SeaDAS software package (Display only version): ~200 MB SeaDAS software package (with processing capabilities for all sensors): ~5GB 10GB of free space is also suggested for rudimentary data processing and storage.
Display:	15" Console or X-terminal with 20MB memory 1280x1024 resolution 24-bit X display plane depth 256 colors display minimum

### Requirements:

The core visualization package of SeaDAS is written in Java. A minimum Java JRE of version 1.8 is required. A suitable JRE is packaged with the Windows and MacOSX distributions. Linux users will need to separately install a suitable JRE.

<b>Operating Systems:</b>	<b>Linux:</b> tested on Ubuntu (16.04 LTS) <b>Intel Mac:</b> OS X 10.12
<b>Optional Compilers:</b>	gcc/g++/gfortran (version 4.5 or higher) or <a href="#">Intel Compilers</a>

Program	Version	Notes
Java	JRE 1.8 or above	Windows and MacOSX distributions come with a suitable JRE Linux users will need to separately install a suitable JRE
Bash	4.x	version 3.x should work, but not tested necessary only for science code
Python	2.6.5 or above	necessary only for science code <b>not (yet) compatible with version 3 and above</b>
Git	1.7.9 or above	necessary only for science code install/update option
cURL	7.x or above	necessary only for science code install/update option



# SeaDAS Features

<https://seadas.gsfc.nasa.gov/features/>

## Visualization

- Advance Layer Management
- Mapping, Re-projection, Cropping
- Land, Water, Coastline Masking
- Bathymetry and Elevation
- Mathematical and Statistics Operations
- Plot Histograms, Scatter Plots, and Correlation Plots
- In Situ Data from SeaWiFS Bio-optical Archive and Storage System (SeaBASS)
  - <https://seabass.gsfc.nasa.gov/>

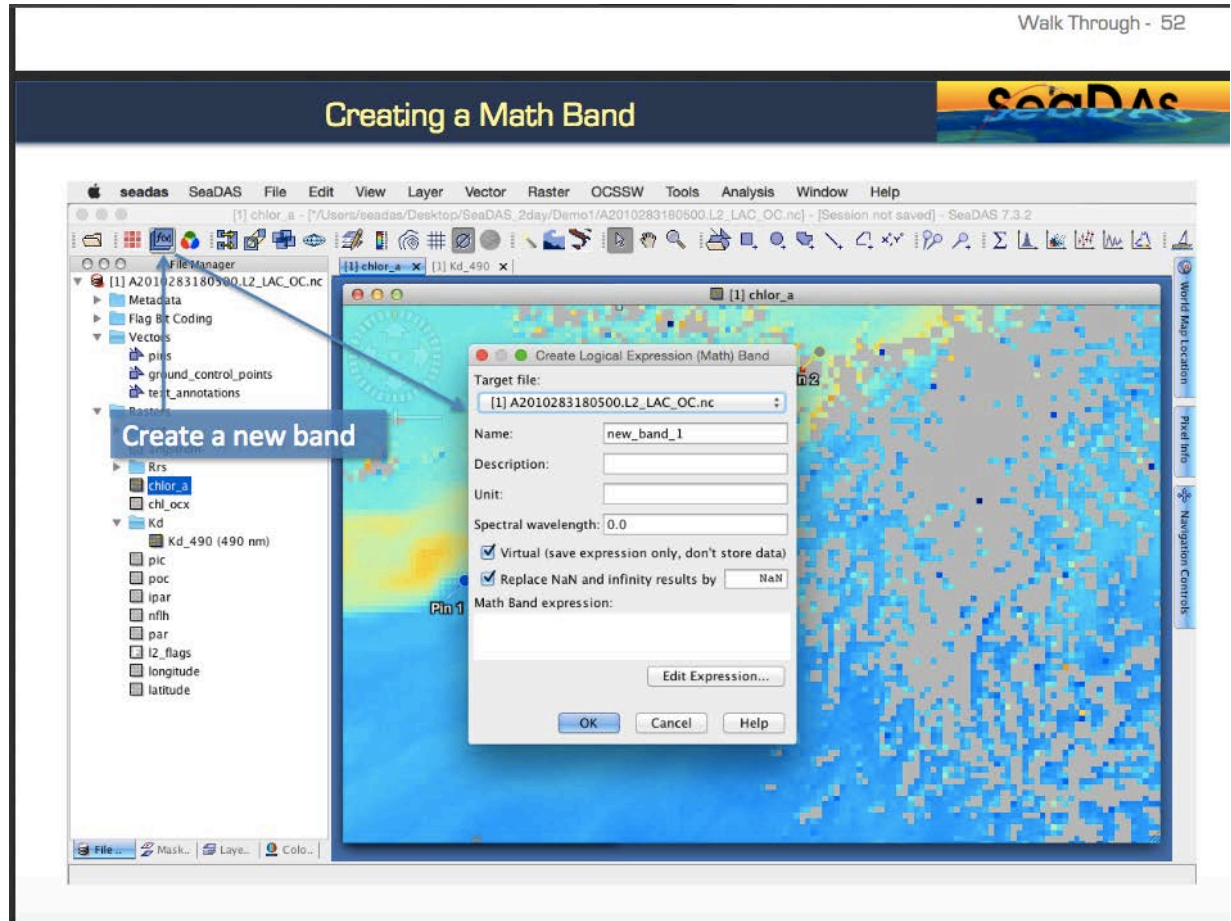


Image Credit: [An Exploratory Walk Through](#), SeaDAS Training Course





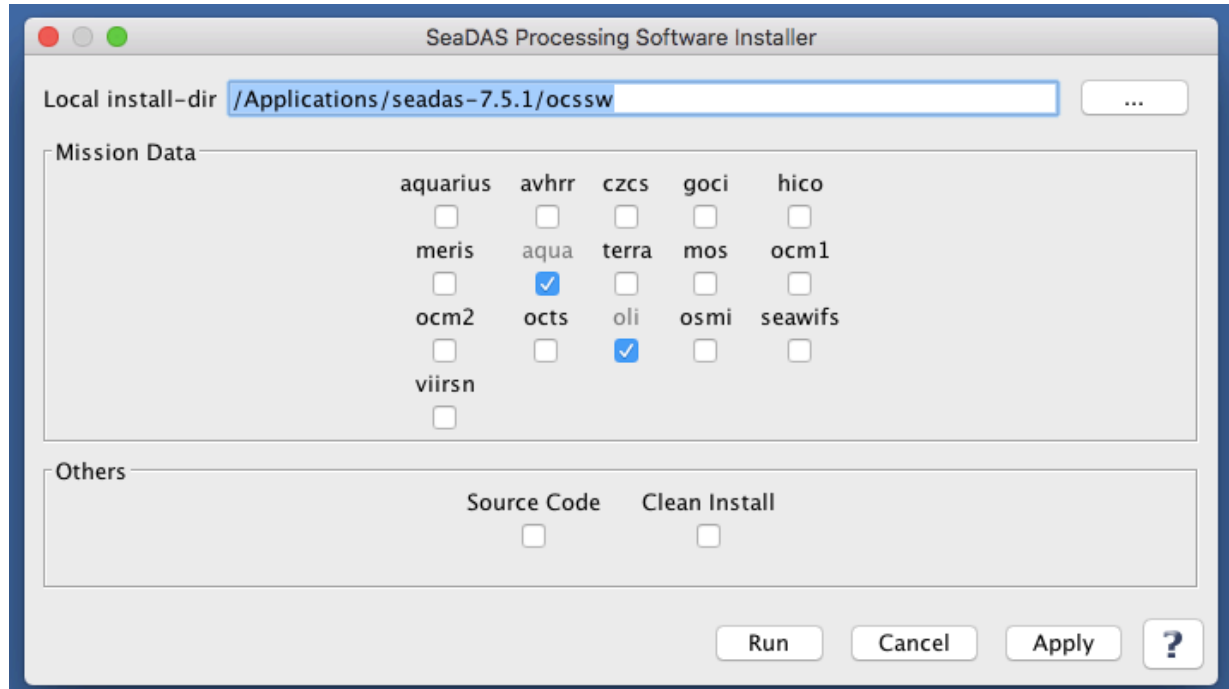
# SeaDAS Features

<https://seadas.gsfc.nasa.gov/features/>

## Data Processing

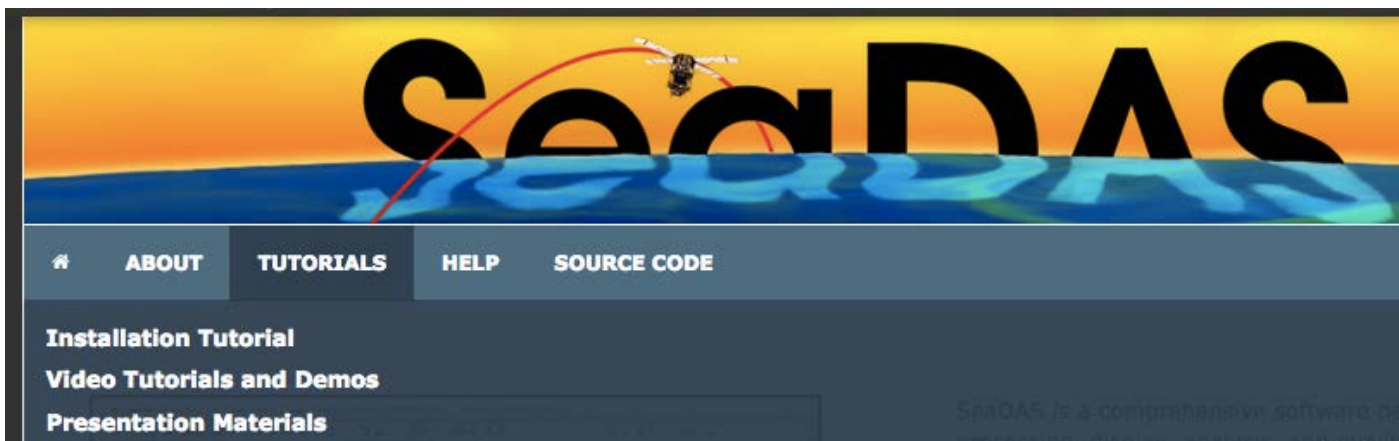
- Built primarily for SeaWiFS mission, now used to process MODIS and other sensors' ocean color data
- Features include:
  - processing of Level-0 to Level-1 MODIS data
  - atmospheric correction
  - converting Level-1 to Level-2 data
  - binning Level-2 data to Level-3
  - mapping Level-1, -2, and -3 data

## Ocean Color Science Software (OCSSW)



# SeaDAS Tutorials

<https://seadas.gsfc.nasa.gov/tutorials/>








## Materials from SeaDAS Presentations and Workshops

- [SeaDAS Introduction](#)
- [SeaDAS Tools](#)
- [SeaDAS Walk Through](#)
- [Graph Processing Toolkit \(gpt\) Introduction](#)

## Video Tutorials

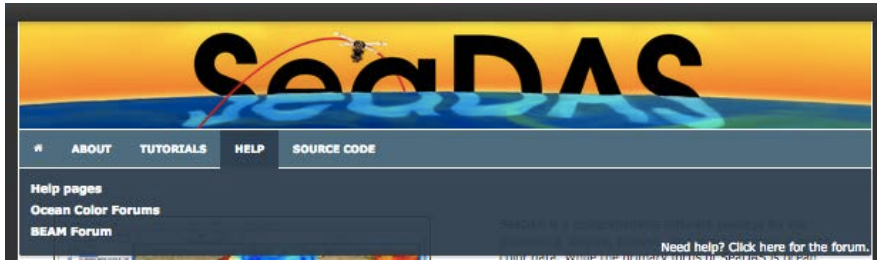
Several video tutorials have been prepared to help people learn to work with the SeaDAS software. These videos are listed below. We recommend viewing the first few in the order they are shown. The core videos are listed first first, followed by multi-tool case studies; everything below that appears in chronological order by release date.

	<p>Title: The Basics (Getting Started) Release Date: 2 April 2015 Duration: 9:31 Youtube: <a href="https://www.youtube.com/watch?v=rSTM1e7tfsg">https://www.youtube.com/watch?v=rSTM1e7tfsg</a></p>
	<p>Title: Masks Release Date: 2 March 2015 Duration: 8:51 Youtube: <a href="https://www.youtube.com/watch?v=k16x3sDJFQQ">https://www.youtube.com/watch?v=k16x3sDJFQQ</a></p>
	<p>Case Study Title: Sea Surface Temperature Anomalies Release Date: 21 October 2015 Duration: 39:08 Youtube: <a href="http://www.youtube.com/watch?v=5d1wCK7IDXE">http://www.youtube.com/watch?v=5d1wCK7IDXE</a></p> <p>A case study tutorial video which demonstrates many tools and concepts in SeaDAS. The full video may be viewed or it may be viewed starting at a particular section by clicking any of the links below.</p> <ul style="list-style-type: none"><li>00:00 - Introduction</li><li>00:57 - Part 1: Getting the Data</li><li>02:12 - Part 2: L3bin Processing</li><li>03:54 - Part 3: L3mappgen Processing</li><li>05:13 - Part 4: Adding Land Masks</li><li>08:19 - Part 5: Merging the Files: Collocate</li><li>11:06 - Part 6: Creating a Math Expression Band</li><li>13:12 - Part 7: Window Tiling and Synchronization</li><li>13:37 - Part 8: Masking with a Math Expression</li><li>15:20 - Part 9: Masking with a Shapefile or Geometry</li><li>17:07 - Part 10: Saving a Session</li><li>18:45 - Part 11: Reprojecting</li><li>19:54 - Part 12: Cropping</li><li>21:00 - Part 13: Adding Gridlines</li><li>22:18 - Part 14: Adding a Color Bar</li><li>24:05 - Part 15: Exporting the Image</li><li>26:16 - Part 16: Exporting the Color Bar</li><li>27:03 - Part 17: Statistics</li><li>28:48 - Part 18: Creating a Selectable Color Scheme</li><li>30:36 - Part 19: Creating a Default Color Scheme</li><li>33:15 - Part 20: Creating a Custom Color Bar</li><li>38:38 - Outro: El Nino 2016</li></ul>
	<p>Title: Bathymetry &amp; Elevation Release Date: 20 January 2015 Duration: 2:56 Youtube: <a href="http://www.youtube.com/watch?v=gZp7z1zU-eQ">http://www.youtube.com/watch?v=gZp7z1zU-eQ</a></p>
	<p>Title: A Synchronized View of Multiple Images with Color Bars Release Date: 2 August 2015 Duration: 6:58 Youtube: <a href="http://www.youtube.com/watch?v=E_XpGkVnN2w">http://www.youtube.com/watch?v=E_XpGkVnN2w</a></p>



# SeaDAS Forum

[https://oceancolor.gsfc.nasa.gov/forum/oceancolor/forum\\_show.pl](https://oceancolor.gsfc.nasa.gov/forum/oceancolor/forum_show.pl)



- For FAQs
- For Posting Questions

Ocean Color Forum Not logged in

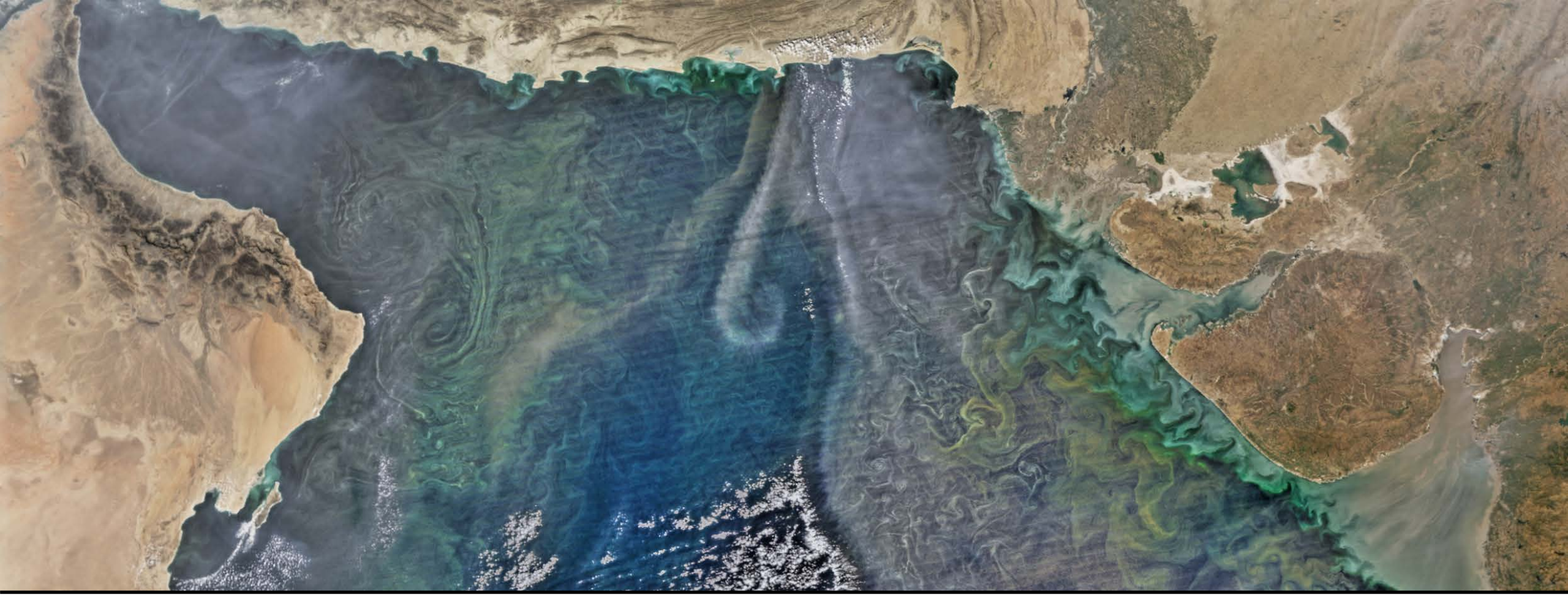
Forum [Ocean Color Home](#) [Help](#) [Search](#) [Login](#)

Forum

[Info](#) [Feeds](#) [Mark Old](#)

	Posts	Last Post
<b>Announcements</b>		
<a href="#">Ocean Color Announcements</a>	151	2018-08-16 14:08
<a href="#">SeaDAS Announcements</a>	91	2018-07-05 14:48
<b>Frequently Asked Questions</b>		
<a href="#">General Forum Information</a>	8	2008-04-14 08:41
<a href="#">SeaDAS 7 FAQ</a>	5	2017-03-28 12:41
<a href="#">SeaDAS 6 FAQ</a>	38	2011-01-17 17:59
<a href="#">Archive FAQ for SeaDAS 6</a>		
<a href="#">Data Products &amp; Algorithms FAQ</a>	33	2009-08-03 10:22
<a href="#">Data Access FAQ</a>	29	2013-06-20 14:13
<b>Products and Algorithms</b>		
<a href="#">Satellite Data Products &amp; Algorithms</a>	6204	2018-08-15 11:51
<a href="#">Satellite Data Access</a>	4045	2018-08-14 20:04
<a href="#">Field Data - SeaBASS</a>	124	2018-04-23 05:44
<b>SeaDAS</b>		
<a href="#">SeaDAS 7 - General Questions</a>	4676	2018-08-20 15:27
<a href="#">SeaDAS 6.x - General Questions</a>	11914	2016-04-11 08:35
<a href="#">SeaDAS 6.x Virtual Appliance for Windows</a>	386	2014-10-28 09:31

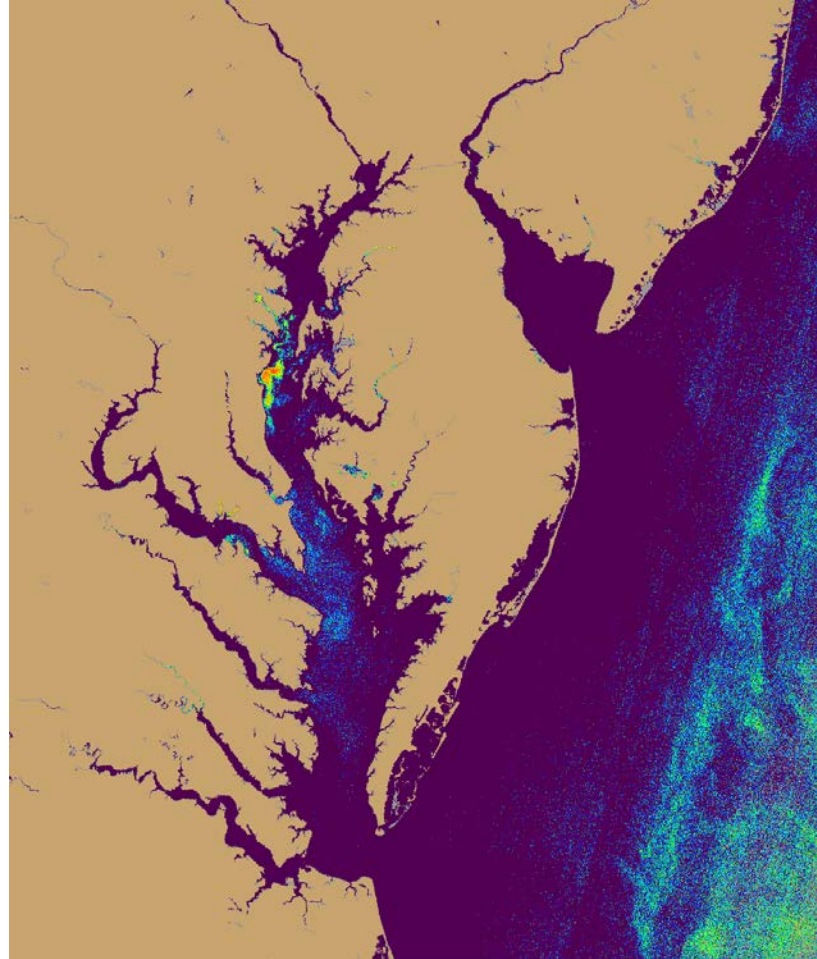




Demonstration of SeaDAS

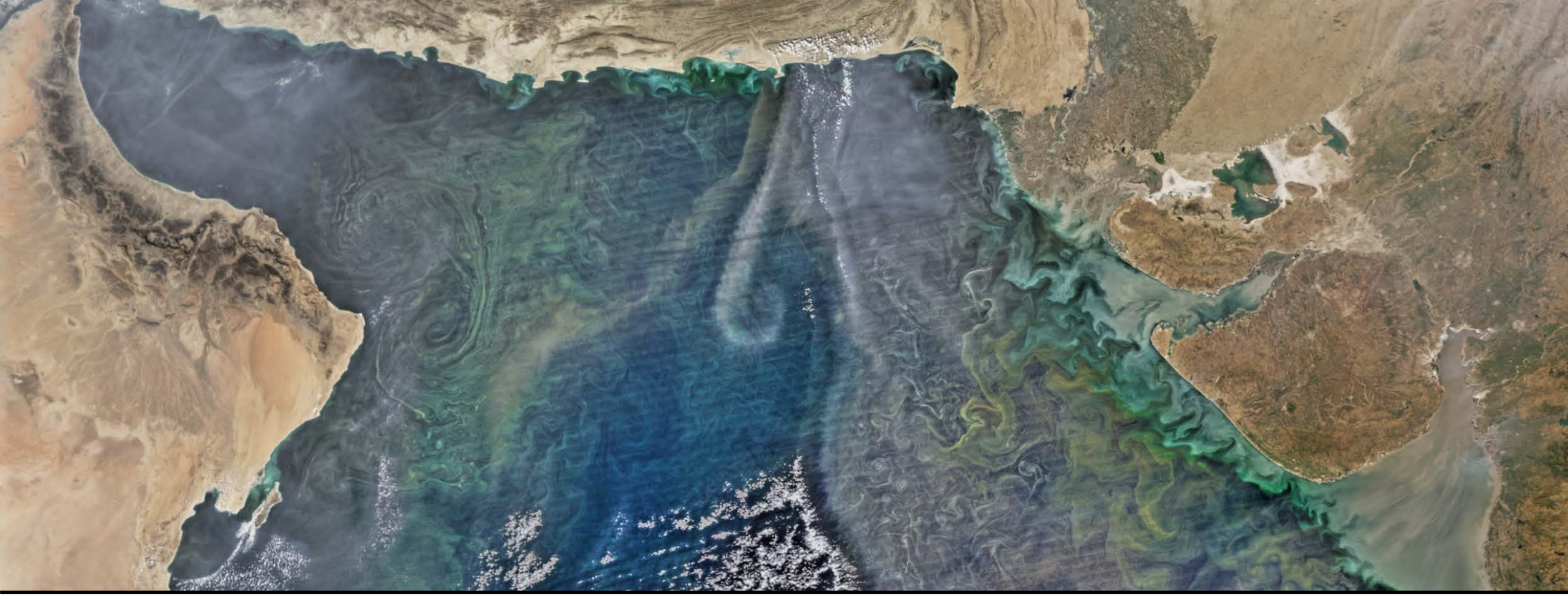
# Case Study: Chesapeake Bay Spring Algal Bloom 2018

<http://eyesonthebay.dnr.maryland.gov/eyesonthebay/habs.cfm>

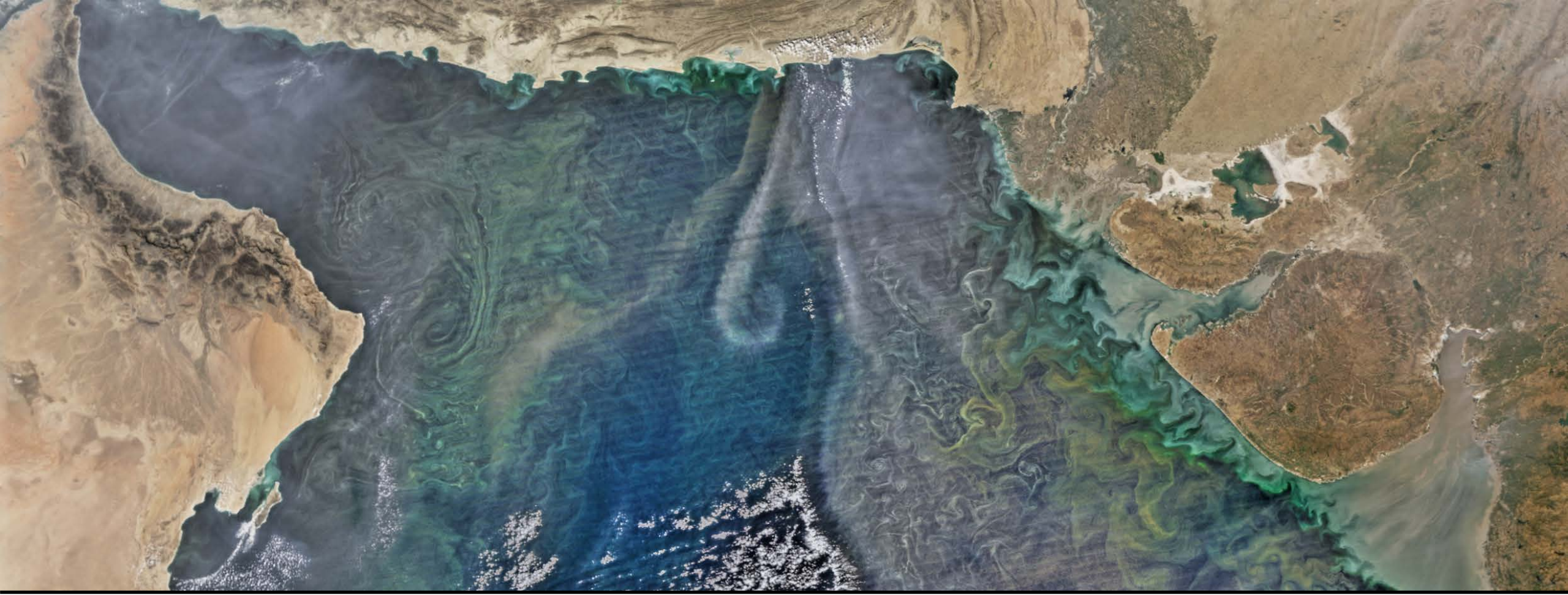


Satellite detection of algal bloom in the Chesapeake Bay on May 1, 2018. Source NOAA, Sentinel 3





Download Landsat Images for Lake Victoria



Exercise: MODIS Image Analysis for Lake  
Victoria Using SeaDAS



Thank You