

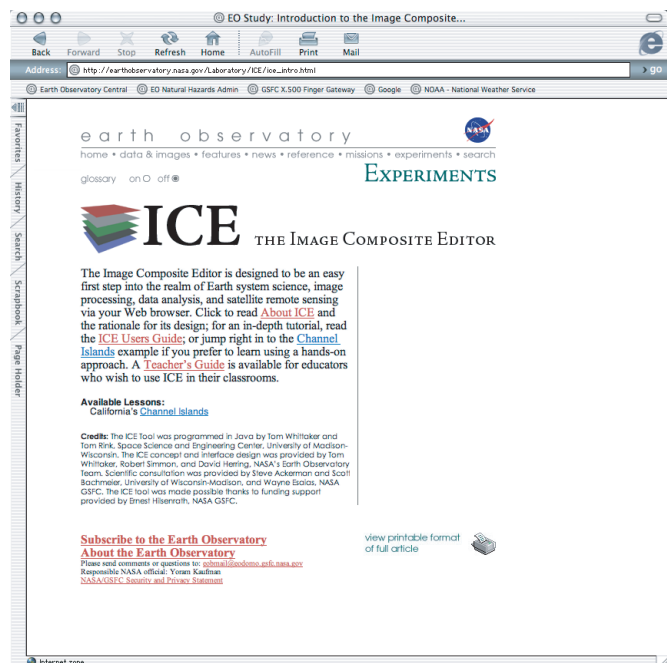
Simple Explorations of Complex Data: The Image Composite Editor

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What is the Image Composite Editor?

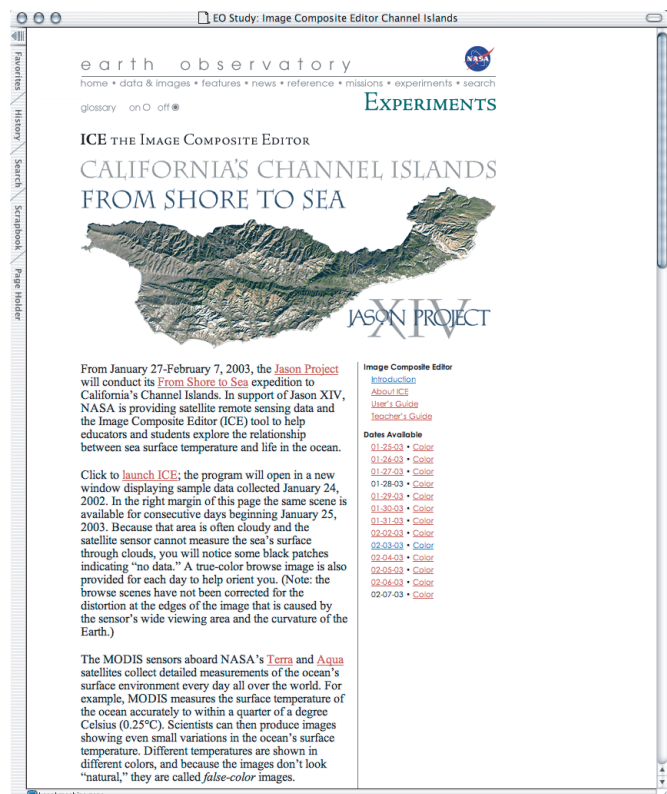
The Image Composite Editor (ICE) is a Web-based tool for viewing and analyzing spatial data. Hosted on NASA's Earth Observatory Web site, ICE data are presented along with a wealth of information about remote sensing and NASA's Earth science research. Different types of data are separated into individual lessons, which explore relationships between bands of multi-spectral data, geophysical parameters, and change over time. ICE's data-analysis tools include transects, histograms, scatter plots, multi-spectral image composites, math tools, and animation. ICE is an open-source JAVA application, allowing sophisticated users to tailor the tool to their own use. ICE is hosted at the following URL:

<http://icetool.nasa.gov/>



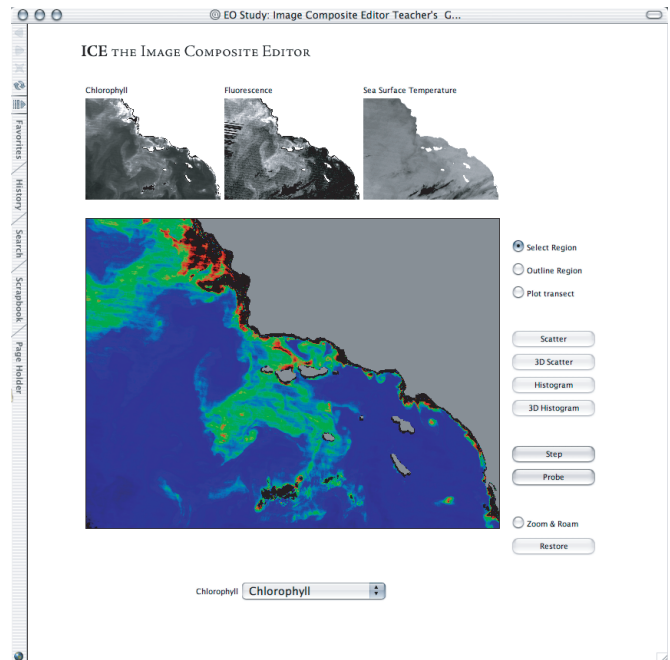
California's Channel Islands

ICE was used in winter of 2003 in support of JASON XIV, a national program involving middle-school students both on location off the coast of Santa Barbara, and in the classroom throughout the nation. Students compared *in-situ* and airborne observations of the ocean with measurements acquired by the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard the Terra Satellite. Students also studied the relationship between three MODIS datasets: chlorophyll concentration, chlorophyll fluorescence, and sea surface temperature. In addition, true-color browse images allowed students to check for cloud contamination. MODIS acquired data each day from January 25 until February 6.

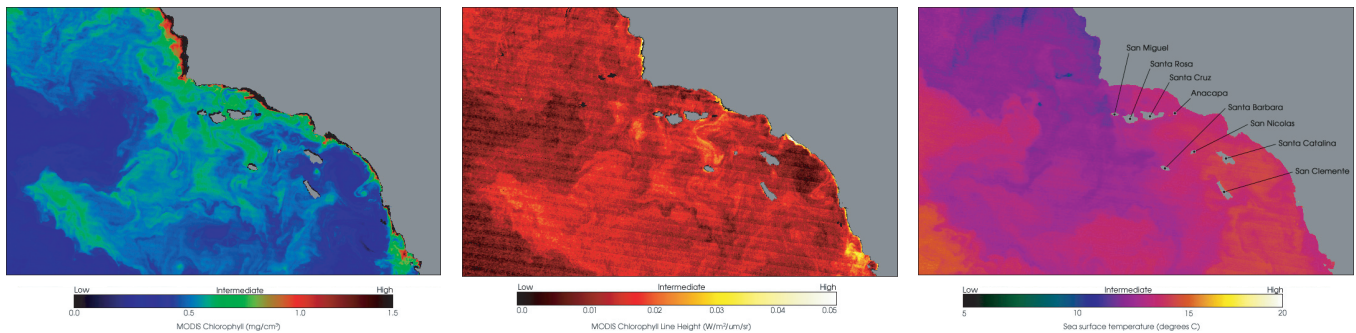


The ICE Interface

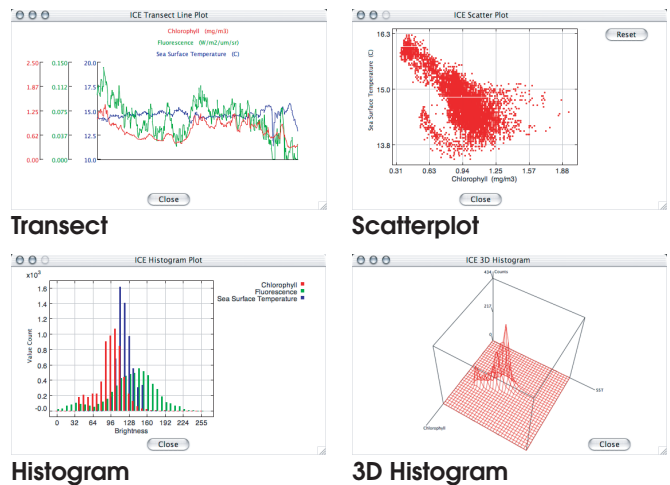
ICE simultaneously displays thumbnail views of three parameters, with a user-selected parameter displayed at full-resolution. A color palette applied to the full-resolution data is user-selectable. Zoom and pan tools are included to allow detailed inspection of the data, along with a probe tool to display exact values for individual pixels, including latitude and longitude. ICE also displays the area of a selected region.



Channel Island Datasets & Analysis



ICE provides tools to analyze data over the web. These include graphing data values along a transect, scatter plots comparing two or three parameters, histograms of up to three parameters, and 3D histograms of the pixel counts of two parameters. These functions can be performed on the entire data set or selected regions. JASON students compared the relationship between chlorophyll concentration, chlorophyll fluorescence, and sea surface temperature.



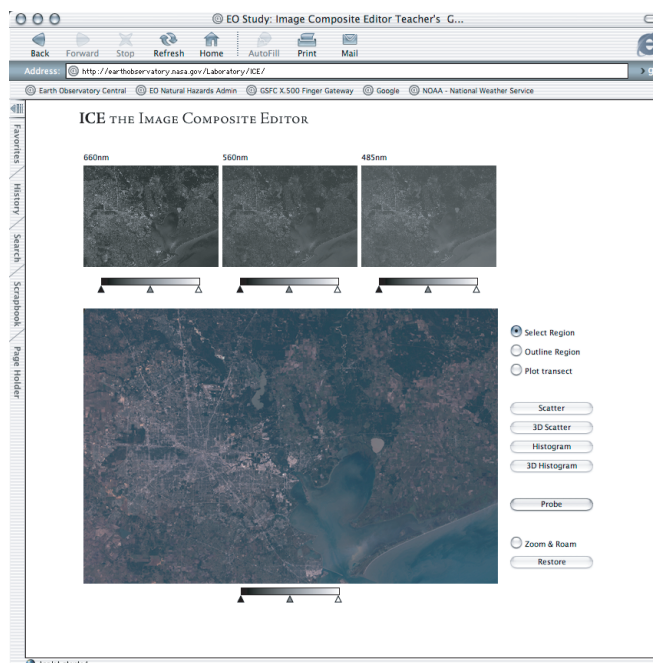
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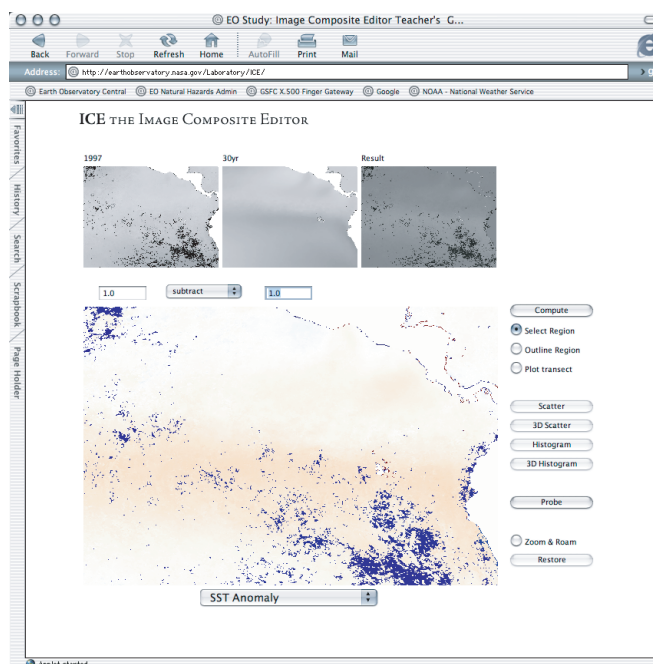
Multi-spectral Composites

ICE provides tools for creating composites (both true and false color) from multi-spectral imagery. Before entering into ICE itself, a user selects the desired band combination. (Any number of bands can be supported.) In ICE, independent control of black point, white point, and gamma is included for each band, as well as the composite image. The data analysis tools remain available to explore the relationship between different bands. A lesson in development explores the use of multi-spectral imagery with a Landsat 7 scene of Houston, Texas.



Mathematical Operations

Simple math functions between datasets can also be accomplished through ICE. Operations include: addition, subtraction, multiplication, division, and Normalized Difference Vegetation Index (NDVI) calculations. The mathematical operations are useful for calculating an anomaly by subtracting climatological data from a monthly or daily dataset, and exploring seasonal or inter-annual change. NDVI calculations can teach how algorithms are used to derive parameters from raw data. An upcoming lesson explores El Niño by looking at sea surface temperature in the eastern tropical Pacific.



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