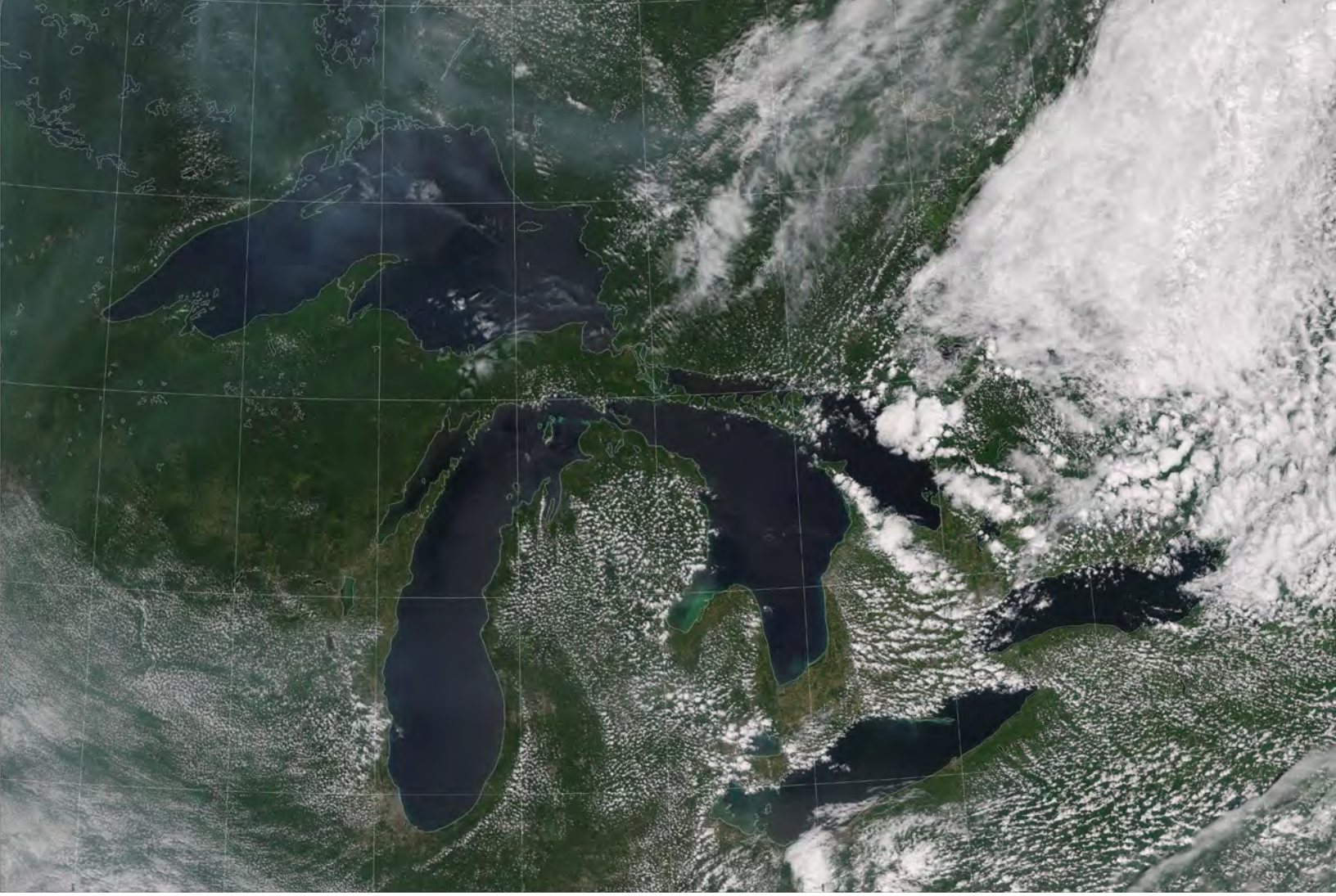

The NOAA Visible Infrared Imaging Radiometer Suite satellite images the Great Lakes on a daily, and sometimes twice daily, basis. This is called a true-color image, typically what your eye would see of the Great Lakes from space. This image was acquired on July 25, 2024, and, together with the cover image captured last February, shows the contrast between the winter and summer months. These data are hosted on NOAA's Great Lakes CoastWatch node and are free to users.

Emerging technologies for remote sensing of the Great Lakes

by ANDREA VANDER WOUDE

Remote sensing offers an unprecedented perspective of our Great Lakes. Whether from a buoy, drone, plane, or satellite far above in space, the information available to us from remote sensing affords us the opportunity to track and monitor the health of the Great Lakes. These types of remote observations include the extent of harmful algal blooms, the dispersion of extreme lake surface temperatures, ice coverage, and oil spill response efforts among other actions that are hard to capture otherwise.

NOAA's Great Lakes Environmental Research Laboratory (GLERL) is a leader in innovative research using multiple remote sensing platforms that individuals, communities, resource managers, and decision-makers use every day. One example is GLERL's Great Lakes CoastWatch, which hosts a repository of satellite data and in the near future will add information derived from aircraft and drones. These data, photos, and visualizations are free, and new satellite products are being added regularly.

Some of the most widely used data and informational graphics include true-color imagery, which looks like a photograph that one would typically take from a camera, but with the broad perspective of each lake on cloud-free days (see images on cover and preceding page). GLERL also delivers satellite imagery that can see through the clouds when prevalent cloudy days roll through the Great Lakes region. This imagery is referred to as synthetic aperture radar (SAR). Other products are in development that will add important new information to the SAR imagery, such as lake winds and environmental pollutants called surfactants that disrupt surface tension of the lake surface.

One of the most popular data sets visualized on the CoastWatch site includes maps of refined sea surface temperature that delineate fronts of different water masses and their location (pictured at bottom right). This is a significant update that is in addition to the sea/lake surface temperature contour maps that anglers and other recreational users have been using for decades to plan their voyages with contour maps that are currently mapped by port region for all of the Great Lakes (top right).

CoastWatch is continually working with stakeholders in the region as part of NOAA's mission to develop technology to improve science, service, and stewardship, to ensure that we are fulfilling users' needs in the Great Lakes for a wide range of recreational, commercial, and academic applications.

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Remote sensing and lake temperatures

Satellites measure lake surface temperatures, and the Great Lakes CoastWatch node at NOAA provides contoured temperature data for all of the major ports in the Great Lakes, like the image of northern Lake Michigan shown in the first image below.

The CoastWatch node is also moving toward offering a product that shows *thermal fronts*, where different water masses meet that have drastically different temperatures. In the bottom image of Lake Michigan's central region, these fronts are shown by the thick black lines with the colors representing the temperature of the water.

