Ridge: Their maps of the internal tides have high resolution and long-term records, and reveal where internal waves are generated around the Hawaiian Ridge and where the waves interfere with each other. The maps give us new insights into how internal tides transfer heat energy across the ocean. The technique could be used to monitor ocean currents globally.

Geological evidence for prior earthquakes near Tokyo

In 1923 a magnitude 7.3 earthquake devastated the Tokyo area, resulting in more than 100,000 deaths. About 200 years earlier, in 1703, a magnitude 8.2 earthquake struck the same region, causing more than 10,000 deaths. These earthquakes, which occurred just south of the area hit by the March 2011 Tohoku earthquake, were produced by slip on the boundary between the subducting Philippine Sea plate and the overriding plate.

To estimate the average recurrence time between earthquakes in this region, and thus learn more about earthquake hazard, scientists need to know when earthquakes occurred before 1703. There are few historical documents describing earlier earthquakes, though some records indicate that earthquakes occurred in 1225 and 1412.

To learn more about past earthquakes, Shimazaki et al. analyzed cores about 2 meters long from eight tidal flat sites on the Miura Peninsula in Japan. Their cores contained layers of shelly gravel, which the authors believe were deposited by tsunami-associated waves.

The authors used a technique called radiocarbon dating to determine the age of samples from the sediment cores. This method relies on measuring the amount of carbon-14, a radioactive isotope of carbon, in the samples.

By measuring the time it takes for the carbon-14 levels in the samples to decay, the authors were able to estimate the age of the sediments. They found that the sediments contained layers of sand and gravel that were deposited during events that occurred before 1703. These findings suggest that the area has experienced earthquakes in the past, and may be at risk of future seismic activity.

Central California’s warm waves a clue to earth’s major currents

A quarter of the way up the crest of the California coast, a giant L-shaped headland reaches out to a peak at Point Conception, about 80 miles north of Santa Barbara, Calif., are a key component of our understanding of how ocean currents move in a direction and with a speed that helps to ensure that the heat is distributed across the globe.

The researchers found that when the wind blows from the west it can create upwelling, which brings cold ocean water to the surface. This process is called “upwelling.” The warmest water on the west coast of the United States is pulled up from the ocean floor by the wind, creating a plume of warm water that can extend for hundreds of miles offshore.

These warm waves can be used as a proxy for changes in ocean currents, which in turn can provide information about climate change. For example, if the warm waves are stronger, it could indicate a stronger El Niño event, which is associated with higher temperatures and increased precipitation in parts of the northern United States and Canada.

Traveling supraglacial lakes observed on Antarctic ice shelf

A sequence of lakes on top of the George VI ice shelf in Antarctica has been observed to move along the boundary of the ice shelf with Alexander Island, a small peninsula of Antarctica. The team of researchers used data from radar and laser altimetry sensors on satellites to detect changes in the ice shelf’s surface.

They found that the supraglacial lakes move in a direction and with a speed that differs from their own. This behavior is consistent with the idea that the lakes are being dragged by the underlying ice. The researchers suggest that this behavior could be used to monitor changes in the ice shelf’s movement and to understand the dynamics of the ice shelf.

Combining information gathered from 130 warm-water waves from 2000 to 2006, the researchers found that the warming causes a shift in the direction and speed of the waves. This finding suggests that the warming could be affecting the movement of the ice shelf, which in turn could affect the amount of ice that is lost to the ocean.

Climate has minor influence on mountain river runoff ratios

Attempts to predict future water availability are muddied by the tendency of the hydrologic system’s key drivers, weather and watershed topography, to change across space and time. Interannual climate variability, land use change, and watershed shape alter how water moves through a catchment as it flows from rain to streamflow. For municipalities whose climate forecast includes a dramatic change in the quantity, distribution, or timing of precipitation, this uncertainty leads to worries about future water security.

The key to assuaging those fears lies in understanding how different physical and climate variables influence the watershed’s runoff ratio—the proportion of precipitation that makes it to the stream—according to the authors.

Climate variables influence the watershed’s runoff ratio through the hydrologic system’s key drivers, weather and watershed topography. The researchers note that the response of AMOC to global warming is uncertain—different models predict different rates of slowdown—and there have been few continuous observations of AMOC heat transport.

High-resolution seismic imagery studies of magma chamber

Researchers have used seismic tomography along with numerical models of magma chamber growth to get a better picture of the magma chamber beneath the active Soufrière Hills volcano on the island of Montserrat. Their approach reveals details of the magma system that have not been shown in previous studies. The authors’ analysis shows that the magma chamber contains about 13 cubic kilometers of magma, with more than 30% melt, between 5.5 and 7.3-kilometer depth. The research suggests that the magma chamber could have formed through sill intrusions over several thousand years. Geochemistry, Geophysics, Geosystems (G3), doi:10.1029/2011GC003892, 2012—EB

Continuous observations of the North Atlantic heat transport

The Atlantic meridional overturning circulation (AMOC), which transports warm water northward and cold water southward, is important in transporting heat to the North Atlantic Ocean. Some models predict that AMOC will slow down as Earth’s climate warms—some models predict different rates of slowdown—and there have been few continuous observations of AMOC heat transport.

The authors found that following the relaxation of the supraglacial lakes, the ice shelf did not move as predicted by the model. They suggest that the lakes are being dragged by the underlying ice, which could be used to monitor changes in the ice shelf’s movement and to understand the dynamics of the ice shelf.

The researchers note that the period of study was too short to infer any long-term trends, and they emphasize the need for continued monitoring of AMOC heat transport.

Hobbs and Willis used temperature, salinity, and displacement data measured from buoys in the Agulhas, combined with sea surface heights measured by satellites, to estimate a continuous time series of Atlantic meridional heat transport from 2002 to 2010 at 41°N latitude. They found that the mean heat transport was about 0.5 petawatt. The authors note that this estimate is consistent with previous studies in similar latitudes, based on atmospheric flux data but less certain than most hydrographic ocean observations. Heat transport fluctuated on an annual cycle as well as on shorter time scales, with atmospheric variability explaining most of the short-term variance. The researchers note that the period of study was too short to infer any long-term trends, and they emphasize the need for continued monitoring of AMOC heat transport.

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