Tsunami Hazard Information through the Integrated Ocean Observing System (IOOS)

How NANOOS is employing web-based, social networking and mobile application technologies in the Pacific Northwest

by Jan Newton, Ph.D.
NANOOS
Executive Director and
Capt. David Martin
NANOOS Board Chair

In the Dec. 2011 *Sidelights* issue, I introduced you to the U. S. Integrated Ocean Observing System (U.S. IOOS®) and Northwest Association of Networked Ocean Observing Systems (NANOOS). The U.S. IOOS® office within NOAA serves as the coordination office for federal ocean observing efforts and oversees regional efforts managed by eleven regional associations, including NANOOS, arrayed along the nation's ocean coasts and Great Lakes. As the Executive Director of NANOOS, it is my pleasure to continue to introduce CAMM members around the country to the capabilities that are being established under this system and some of the great products available to you. This month, our article is about NANOOS products focused on tsunami hazard information. I introduce David Martin, Chairman of the NANOOS Board, who has compiled this article with input from Jonathan Allan of the Oregon Department of Geology and Minerals Industries (DOGAMI).

At 9:46:23 pm Pacific Time on March 10, 2011 (05:46:23 UTC on March 11), a magnitude 9.0 earthquake occurred 129 km (80 miles) off the coast of Sendai, Japan. The Tōhoku earthquake triggered a catastrophic tsunami that produced an inundation wave height as high as 30 m that propagated throughout the entire Pacific Ocean basin. Deep-ocean Assessment and Reporting of Tsunamis (DART) buoys positioned around the Pacific Ocean provided real-time data of the impending tsunami as it travelled across the ocean towards the U.S. West Coast. Because of this warning, coastal communities in Washington and Oregon were on guard by the time the tsunami hit the West Coast almost 9 hours

Continued on page 18 >>>

NANOOS has developed a no-cost mobile application (app) for iPhone and Android devices that provide mobile equipment-specific access to NVS. This allows access to NVS by users in the field (e.g., scientists, fishers, boaters, first responders, etc.).

IOOS >>>Continued from page 17

after the earthquake occurred. Harbors along the Oregon coast, including Depoe Bay, Coos Bay, and Brookings, and in Crescent City, California reported damage to docks and boats in the harbor. In the Pacific Northwest, NANOOS provided extensive information to the public about the timing, severity, and government agency recommended actions to take as a result of this event.

NANOOS' services included

1) Providing users of the NANOOS Visualization System (NVS) online and on smart phones with easy access to near real-time current, water height, and other information for a wide variety of U.S. IOOS® assets, including NOAA National Data Buoy Center (NDBC), NOAA National Ocean Service (NOS), and NANOOS-supported and other assets in Washington, Oregon, and northern California;
2) Featuring "Tsunami Evacuation Zones for the Oregon Coast," a Google Maps-based application developed by DOGAMI for the public at the top of our NANOOS home page; and
3) Posting numerous NANOOS Facebook updates regarding the tsunami passage, including views of water levels at sites along the west coast.

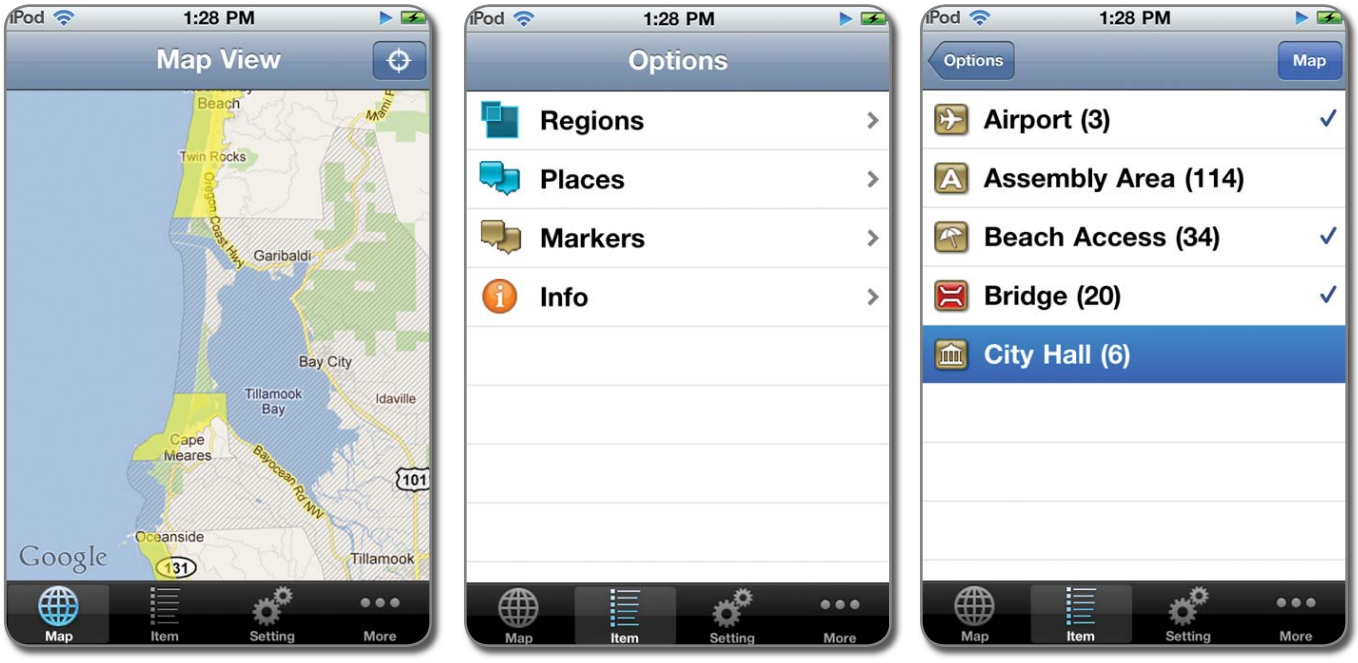
The NANOOS Visualization System (NVS), aggregates, displays and serves near real-time and forecast information from a host of providers. Of these, water level and wave height information measured by the NOS tide gauges at the time of the Tōhoku tsunami were disseminated through the NVS, mobile applications, and via NANOOS' Facebook.

The online tsunami hazard portal *Tsunami Evacuation Zones for the Oregon Coast* displays evacuation maps depicted by the maximum extent of inundation associated with a locally generated great earthquake on the Cascadia Subduction Zone (CSZ), and accompanying tsunami for communities along the Oregon coast.

In addition to the above products, social networking, in the form of periodic information releases via Facebook, provided a new mechanism for broader dissemination of information to the public-at-large, and could become a critical mechanism for information sharing during times of crises in the future.

NANOOS also provided relevant information through a mobile application (app) it has developed for iPhone and Android mobile devices that provide mobile equipment-specific access to the NVS. During a tsunami event, particularly a distant event, having access to ongoing conditions is clearly important to emergency managers and the public-at-large. The NVS mobile application allows such access to users who do not have either a web browser or internet access. Such users could include scientists in the field, boaters on the water, fishers, and first responders. In addition to the NVS mobile app, the development of a PNW Tsunami Evacuation app for mobile devices was accelerated as a result of this event.

NANOOS joined Facebook in April 2010 to augment our traditional outreach methods (i.e., the NANOOS web site, printed and online newsletters), not-



The tsunami evacuation zone mobile app is the no-cost mobile version of our new and robust NANOOS tsunami web-based application much as NVS mobile is a mobile version of NVS.

ing the success of social networking for communication. The Tōhoku tsunami was unique as it gave NANOOS experience in using social network technology to provide important information about this profound event. Because it was such a media-intensive event, we gained experience in keeping our Facebook network updated with real-time or just-in-time information, a capability that is increasingly becoming expected by our society during such events. We believe social media technology will play an increasingly important role in this activity.

The global and coastal components of the U.S. IOOS® system demonstrated their utility in providing needed information to people impacted by this event. At the national or federal level DART buoys, numerical models, and an effective warning and dissemination system showed the importance of the U.S. IOOS®-derived information. Similarly, state and local agencies were prepared and were able to help coastal communities in the PNW be prepared. For NANOOS, responding to the information demands of this event demonstrated the resiliency of the regional system while also emphasizing the need to have adequate carrying capacity to handle increased demand for web-provided information. For the first time, NANOOS also explored the utility of social network technology (e.g., Facebook) to provide information to its stakeholders. Finally we note that a new tsunami evacuation mobile app "TsunamiEvac-NW" is now available and this interactive smartphone app provides information and resources that are of critical importance before, during, and following a tsunami event. ☆

We acknowledge the NANOOS members who made this project possible: J. Allan of DOGAMI, D.W. Jones, S. Mikulak, E. Mayorga, T. Tanner, N. Lederer, and A. Sprenger of the Applied Physics Laboratory, University of Washington, and R. Blair, and S.A. Uczekaj of The Boeing Company.

Dr. Jan Newton is a Principal Oceanographer with the Applied Physics Laboratory of the University of Washington and affiliate faculty with the UW School of Oceanography and the School of Marine Affairs, both in the new UW College of the Environment. She co-chairs NOAA's Alliance for Coastal Technologies Stakeholder Council and is involved with several regional and national coastal/estuarine assessment efforts. She is currently working with colleagues at UW and NOAA to assess the status of ocean acidification in Puget Sound and coastal Washington.

Dr. Martin is the Associate Director for Science and Technology Integration at the Applied Physics Laboratory at the University of Washington. He served for over 20 years in the U.S. Navy and retired at the rank of Captain. During his military career, he served in a number of senior leadership positions in the naval and national oceanographic community including being the Director of the Operational Oceanography Center at the Naval Oceanographic Office, the Director of the National Ice Center in Suitland, Maryland, the Assistant for Environmental Sciences for the Deputy Undersecretary of Defense for Science and Technology and, in the position he help immediately prior to assuming his present position as Associate Director at APL, serving as the first Director of Ocean U.S., the federal, interagency planning and coordination office for the national effort to develop and deploy an Integrated Ocean Observing System (IOOS).

Coast Survey *>>>Cont' d from pg. 16*

chart updates.

Five years ago, it could take four years to update a chart using new survey data. Today, thanks to new technology and processes, Coast Survey can process a survey and update the charts in less than a year; high priority surveys can be completed in 90 days.

If the teams find any immediate dangers to navigation, they won't wait for the chart updates – they will notify the public and appropriate officials.

Coast Survey issues updates through its newsletter and social media. Go to www.nauticalchart@noaa.gov to subscribe to the newsletter (see the sign up box in the lower right corner) and join Coast Survey on Twitter @nauticalcharts for the latest updates. ☆