Unprecedented global measurement network achieves full coverage of oceans

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An array of instruments, many built at Scripps Institution of Oceanography at UC San Diego, that allows scientists to observe the basic physical state of all world oceans simultaneously is approaching its coverage goal after eight years of deployments.

The Argo network of sensor-bearing profiling floats measures ocean water temperature, salinity and velocity to a degree never before possible. The Argo Steering Committee, the international panel of scientists that manage the network, has designated Nov. 1 as the date on which it will reach its full deployment of 3,000 units. The deployment of these final floats will mean that data from every ocean region in the world will be available with average coverage of one sensor per 3 degrees latitude and longitude.

The launch will culminate one phase of a project that has witnessed the participation of 41 countries in roles ranging from the subsidizing of instrument manufacture to the volunteering of ships to deploy floats in remote ocean reaches. Several countries are contributing to the completion of the array as several deployment missions are taking place now.

Among the final deployment missions is that of R/V Kaharoa, a research vessel operated by New Zealand's National Institute of Water and Atmospheric Research. The ship departed Wellington on Oct. 2 with two Argo floats — one built at Scripps, the other at the University of Washington — both ceremonially marked as the 3,000th to acknowledge

the contributions of the two research centers to Argo. Kaharoa is expected to deploy these two floats in the southern Pacific Ocean at a latitude of 45 degrees south.

The panel of researchers guiding the science mission of Argo emphasize that the milestone merely marks the beginning of what is hoped to be a long history of comprehensive ocean records that will allow scientists to understand patterns of ocean dynamics that unfold over thousands of miles and dozens of years.

“The climate science objectives that drive the Argo array require that we observe the global oceans indefinitely,” said Dean Roemmich, a physical oceanographer at Scripps and co-chairman of the Argo program steering team, “so achieving the global array is merely the beginning of the observation period.

“It’s thought that the oceans have absorbed more than 80 percent of the excess heat in the air/sea/land climate system that constitutes global warming over the past 50 years. But there have not been enough measurements in the past to document these changes. Now we can accurately measure changing ocean temperatures globally for the first time.”

The data keeps improving as new floats are added to the array, sharpening the resolution of ocean data the way additional pixels sharpen the image on a television screen. Each float in the Argo array makes measurements of temperature and salinity, often called the “vital signs” of oceans. The units descend to depths up to 2,000 meters (6,600 feet), drifting on ocean currents for 10 days, then returning to the surface to beam results to passing satellites. The profile of ocean conditions they make is then processed and posted within 24 hours of transmission. The raw data as well as the position of the floats relative to where they were during their last transmission allow for a wide range of interpretive

study.

“The big impact of Argo is yet to come in the discovery of large-scale processes that happen in the oceans,” said Scripps research oceanographer Russ Davis, a co-inventor of one of the float designs employed by the network.

Though Argo scientists hope that the network of sensor-bearing floats provides data for decades, the program has already yielded valuable information that has been the basis or a major data source for 150 research papers since 2004. Using Argo data, scientists have been able to witness changes in the stratification of waters in the Gulf of Alaska with major food web implications. Others have concluded that global warming-caused ocean temperature increases are greatest in the Southern Ocean at the confluence of three major gyres, leading them to understand the influence of global winds on climate to a degree that would have been impossible before.

Source: University of California - San Diego