

Argo 2 Millionth Profile – an Argo Joint Press Release by the Argo Steering Team

“Silent sentinels” deliver their 2 millionth snapshot of our changing oceans

International effort delivering an unsurpassed look at changes occurring in the ocean worldwide

Last month a team of international scientists achieved a major milestone when the Argo programme delivered its two millionth profile of physical and chemical data from the world’s oceans, quadrupling the number collected by ships over the previous 100 years. Across the globe, about 4,000 Argo floats continuously collect data on the physical state of the ocean. The project has been revolutionising oceanography for nearly 20 years.

Argo floats are cylindrical free-floating devices that stand 5 feet tall on end. Once deployed, the floats dive 1,000 meters (1.2 miles) deep, drift with the ocean currents for several days, then sink an additional 1,000 meters before slowly rising to the surface while collecting temperature and salinity data. This vertical series of measurements is known as a “profile”. At the sea surface, they transmit the data via satellite before diving down again. Argo floats continuously cycle through these data dives every 10 days, operating autonomously for four to five years on battery power. Since the first float was deployed in 1999, the Argo Programme has produced nearly four times as many profiles as every other ocean observing tool combined.

The oceans cover 71 percent of the Earth’s surface and moderate the climate, impacting us greatly by influencing weather events such as hurricanes, floods, and droughts. Argo sheds light on very remote ocean regions where past ship-based and moored observations have been few, such as the vast oceans in the Southern Hemisphere. Temperature and salinity data from the global Argo array is helping scientists understand oceanic and atmospheric conditions as well as long-term climate trends. Two decades of Argo salinity data reveal that the wet (high rainfall) regions of the world are becoming wetter and the dry regions drier. The warming of subsurface layers of the ocean causes expansion of the water column that accounts for about one-third of global sea level rise. Argo data is also helping scientists describe the inter-annual El Niño Southern Oscillation global phenomenon, centred in the equatorial Pacific but with global impacts, and decadal variability including the North Atlantic and Pacific Decadal Oscillations.

“Argo floats have been out there for nearly two decades, quietly exploring our oceans’ changing temperature and salinity patterns,” said Susan Wijffels, Senior Scientist at the Woods Hole Oceanographic Institution (USA). “They are our ‘silent sentinels’ – letting us peer into the mysteries of our remote and hostile deep oceans, which are so important to our daily lives.”

Argo also exemplifies international collaboration on a scale rarely seen in the scientific community, with around 800 Argo floats are deployed each year by 26 countries. Many other nations contribute logistical support and ship access. “Strong international cooperation is the hallmark of Argo’s success. No nation could implement the global coverage of Argo on its own, and even the smallest of nations make critical contributions to the program,” stated Dean

Roemmich, Professor at the Scripps Institution of Oceanography, University of California, San Diego.

“Europe operates more than 20% of the Argo program. The European contribution to the network is coordinated through the Euro-Argo ERIC (European Research Infrastructure Consortium), a legal entity that ensures funding in the medium-term through commitments of its members and observers at state level” explained Sylvie Pouliquen, Euro-Argo ERIC programme manager. “The objectives of Euro-Argo are to sustain and optimise the European contribution to the global Argo network, with around 1000 European Argo floats operational at any time (1/4 of the network), through both national and European funds”.

The data that Argo provides make it possible for scientists to track changes occurring in the ocean across large distances and long periods of time. It is also helping improve operational weather forecasts, climate predictions, and is fuelling a revolution in ocean research.

All Argo data are freely available to anyone, and have been used for broad applications including aquaculture, pollution monitoring, ocean education, and national defence. Major ocean and climate assessments, such as the Intergovernmental Panel on Climate Change, rely on Argo. On average, a scientific paper using Argo data is published every day. Argo is now the key tool we use to track how fast the Earth’s climate system is warming, and can track marine heat waves as they form and dissipate.

The two-millionth Argo profile was acquired by an Italian float in the Mediterranean Sea. “Float 6903242 was deployed south of Malta Island in August 2018” declared Pierre-Marie Poulain, responsible of the Argo-Italy programme. “It was initially programmed to cycle at 3 hours intervals in the upper layer of the sea (down to about 200 m) in order to study the internal waves (oscillatory vertical motion in the water column) which are prominent in this area. We were fortunate that the currents kept the float in the same geographical area south of Malta for more than 3 months! When it will leave for the deeper Ionian Sea to the east, it will be re-programmed with the standard Argo settings”.

Even as it achieves its two millionth profile, Argo is on the cusp of a major expansion into new dimensions of the ocean. Large-scale projects are underway to test floats that can descend to a depth of 6,000 meters (3.7 miles), to add sensors that measure biogeochemical (BGC) variables like oxygen, pH, and nitrate, and to expand further into seasonally ice-covered seas. Ocean acidification, deoxygenation, and ecosystem health will come into Argo’s gaze through BGC Argo. Deep-diving floats will track changes in ocean properties between 2,000 meters and the sea floor, revealing, for example, the influence of abyssal ocean circulation in climate variability. Float operating in sea-ice zones will help us understand the fast-changing Arctic and detect ocean shifts around the Antarctic. The promise of the new Argo Programme is limitless as a global multidisciplinary ocean observing system serving science, education, and society.

“The international strategy for the future of Argo in all its emerging dimensions has been refined at European level, with enhancements planned to answer specific requirements of the

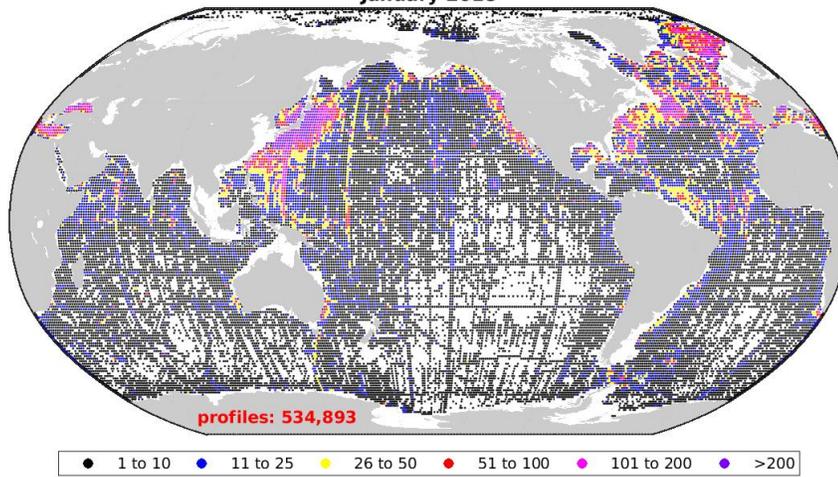
user community in Europe” says Birgit Klein, Senior Scientist at BSH, Germany, responsible of the Argo-Germany programme and chair of the Euro-Argo Management Board. “For instance, additional efforts will be made in the monitoring of European marginal seas, in technological developments to enable Argo float deployments in the high latitudes - a region of major importance to study the impact of the Ocean on climate, and to better serve the Copernicus Marine Environmental Monitoring Service, the European Union's Earth Observation Programme”.

For more information on the Argo programme see:
http://www.argo.ucsd.edu/About_Argo.html

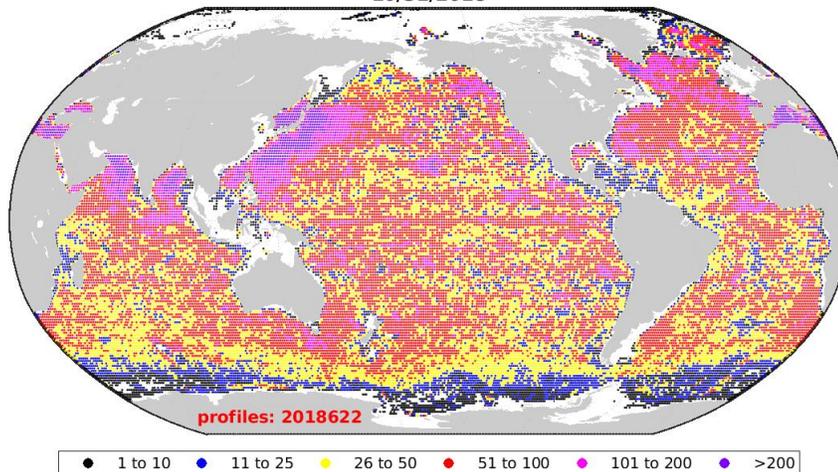
For more information on the Euro-Argo Research Infrastructure see: <https://www.euro-argo.eu>

For further comments please contact: euroargo@ifremer.fr

**World Ocean Database observation density
in profiles per 1 degree box
January 2018**



**Argo observation density
in profiles per 1 degree box
10/31/2018**



Argo has radically improved our ability to track ocean conditions. In the top plot are the number of profiles per 1 degree box collected by all national efforts over the past 100 years or so. The bottom plot shows how Argo has increased the observation count by a factor of 50 to 100 in many regions, especially the vast Southern Hemisphere oceans.