The Global Drifter Program

Drifter Measurements of Surface Velocity, SST, SSS, Winds and Air Pressure

Luca Centurioni
Cooperative Institute for Marine Ecosystems and Climate (CIMEC)
Scripps Institution of Oceanography, University of California, La Jolla CA

Project Summary

The Global Drifter Program (GDP) is the principal component of the Global Surface Drifting Buoy Array, a branch of NOAA's Global Ocean Observing System (GOOS) and a scientific project of the Data Buoy Cooperation Panel (DBCP). The DBCP is an international program coordinating the use of autonomous data buoys to observe atmospheric and oceanographic conditions, over ocean areas where few other measurements are taken and a joint body of the World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

The overall objectives of the GDP are to: 1) maintain a near-operational ocean-observing network of at least 1250 Lagrangian drifters that, through the Argos and Iridium satellite systems, returns data of meteo-marine variables including near-surface ocean currents, sea surface temperature (SST), sea surface salinity (SSS), sea-level atmospheric pressure (SLP), sea- level winds (SLW) and subsurface temperature (Tz) and 2) to provide a data processing system for the scientific use of the data.

Societal Rationale

Approximately 53% of the US population lives in coastal counties (estimated in 2003, source: NOAA http://oceanservice.noaa.gov/programs/mb/supp_cstl_population.html) and, globally, the density of the population is significantly higher in coastal areas than inland (Small; Nicholls
2003). The threats to coastal communities include a variety of short-term (severe weather, hurricanes, marine pollution) and long-term (climatic changes and coastal erosion) natural and anthropogenic conditions. The GDP array provides data which are readily available for direct analysis or to be assimilated by a variety of models designed to understand, forecast and mitigate the impact of the Earth system and of pollution on people's lives, including commercial and recreational activities. On short time scales, examples include measurements of ocean currents to track pollutants such as oil and marine debris, to support fisheries management, to aid commercial and Navy's ship operations, as well as measurements of SLP, SST and SSS to improve Numerical Weather Prediction and hurricane forecasts. On longer time scales, examples include climate records of ocean currents, SST, Tz, SLP and SLW. Accurate measurements of the global distribution of the SLP, which is the weight of the atmosphere over the ocean –also called the inverse barometer effect- are important to accurately determine the global sea-level which is measured by the altimeters that are carried by several satellites.

Scientific and Technical Rationale

a. Specific GDP Science Objectives

- Provide to the Global Telecommunication System (GTS) of the World Weather Watch (WWW) a near-real time data stream (it takes less than 2 hours with Argos and approximately 10 minutes with Iridium between transmission and delivery of measurements to the data center) of SST, SLP and near-surface currents for use in operational forecast and climate models.
- Measure the mixed layer currents on a global basis and provide colleagues at the Atlantic Oceanographic and Meteorological Laboratory (AOML) with data to produce maps of the World's ocean circulation able to resolve seasonal and inter-annual variations.
- Provide the scientific community and the public with enhanced, research-quality data sets of ocean currents that incorporate drifter data from individual research programs, including historical data from instruments that differ from the Surface Velocity Program (SVP) Lagrangian drifter design and are corrected for the wind-induced velocity bias (slip).
- Support programs of national interest, such as the recently launched Aquarius mission to measure SSS from space.
- Analyze the GDP drifter data and provide a scientific interpretation of the results. Publish our findings in peer-reviewed journals.

b. Specific Technical Objectives

- Monitor and evaluate the performances of the GDP drifters in order to identify and troubleshoot technical issues as soon as possible.
- Develop and introduce drifter' construction technological advances in sensors, electronics, power, methods of assembly and deployment packaging. Special emphasis is given to the implementation of new sensors and aerial deployment methods for hurricane observations and to SSS measurements.
- Share the technological advances with the drifter manufacturer community (both commercial and university based) in order to support a healthy GDP array.
- GDP drifter data and products vailability:
- Data and products are available from the GDP Data Assembly Center at AOML (http://www.aoml.noaa.gov/phod/dac/dacdata.php);
- Data and products, updated through September 30th, 2011, are updated approximately every three months, and are available from SIO upon request to Luca Centurioni (lcenturioni@ucsd.edu), Chris McCall (cmccall@ucsd.edu) or Lance Braasch (lbraasch@ucsd.edu). A SIO web page for data viewing is available at http://gdp.ucsd.edu/dashboard.html (password protected).

The main users of the GDP data include:

- ☐ ***Weather Services: (US, UK, Fr, Au, NZ, Br, Ca, In, RSA). Data used: Sea SST, SLP and SLW for weather and tropical cyclones forecast.***
- ☐ ***Climate research centers (US, UK, Br, Ca, Fr, NZ, RSA). Data used: SST for climate models.***
- ☐ ***National Climate Data Center (NCDC, US). Data used: SST for satellite data cal./val.***
- ☐ ***AOML (US). Near surface velocity (15 m depth) for annual and seasonal mean currents and anomalies.***
- ☐ ***Researchers (worldwide). Drifter velocity data for enhanced 15 m depth velocity dataset for oceanographic and climate research.***
- ☐ ***US Coast Guard. Near surface velocity data and sea surface temperature to aid commercial navigation in high latitude (icebergs drift).***
- ☐ ***Space Agencies (EU, US) Sea Surface Salinity to calibrate satellite data.***
- ☐ ***Satellite altimetry scientific community. The atmospheric pressure data from drifters contribute to the calculation of the inverted barometer effect needed to estimate sea- level rise from altimeter data. The drifter velocity data are also used for sea level computations.***

Drifter velocity data are also used by operational agencies (e.g. UK MetOffice) for ocean current models and by schools worldwide for outreach programs (see for example NOAA's "Adopt a Drifter Program" http://www.adp.noaa.gov/).