

Seaglider data

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Seaglider

Seagliders are small, reusable, long-range autonomous underwater vehicles designed to glide from the ocean surface to as deep as 1000 m and back while collecting profiles of temperature, salinity, and other oceanic variables. Gliders steer through the water by controlling attitude (pitch and roll) and can thus navigate between waypoints to execute survey patterns. Typical horizontal speed is about 20 km per day. Mission durations depend largely on ambient stratification, profile depth, and instrument power, sometimes extending to nearly a year. Because the vehicles are relatively small and light, special handling gear is not required and field teams typically consist of one or, at most, two individuals. Standard sensor suites include pressure, temperature, and conductivity.

Seagliders surfaced at the end of every dive cycle, downloading new commands and uploading data to a base station located at the University of Washington via Iridium satellite telemetry. Initial processing is performed in near real-time. For all S-MODE deployments, all gliders were equipped with the regular SBE CTD sail. The different responses of temperature and conductivity sensors are accounted for and corrected through an analytical physical model (Charles Eriksen, personal communication; Morison et al., 1994; Lueck and Picklo, 1990) integrated into the base station.

A hydrodynamical flight model (Bennett et al., 2019) uses data from the glider's attitude sensors and from the environment to estimate glider speed through the water, and thus location during the dive. The hydrodynamical model provides an estimate of the horizontal distance travelled through water in an ocean at rest, which, when compared to the actual positions at the beginning and end of the dive, provides a good estimate of the depth-averaged current (or, more accurately, ocean current averaged along the underwater trajectory of the glider). Repeated GPS fixes obtained during the surface drift, before and after every call to the base station, provides an estimate of ocean surface velocity.

Processed data

Gliders record samples on a non-uniform time (and depth) grid, on both the down (dive) and up (climb) portion of a complete dive. Different sensors can be sampled at different intervals, adjustable with depth. In our typical processing, we generate time series data of all the sampled variables, in geophysical units. In our nomenclature, these are level 1 data.

Data on a regular grid are easier to interpret and analyze. Time series data are gridded on a regular depth and separated by profile in our level 2 data. Fill_Value is used if no observation is present in that depth bin.

Level 3 data is an interpolated version of Level 2 data, with the additional step of "despiking", where we remove data that are more than 2 standard deviations for a running mean. This is our best estimate to produce pretty figures.

Gliders sometime carry sensors that needs different processing. For example, optical and biophysical data needs further calibration and processing. Similarly, microstructure sensor, or ADCP data will be on a different grid and processed in parallel. We do not change the 'standard' glider files for these, and simply add them to archives as separate files (L4).

Data Description

For the submission to PODAAC, we include only the time series of the data from the different sensors mounted on the glider. Given the definitions used by NASA Earth data (<https://www.earthdata.nasa.gov/engage/open-data-services-and-software/data-information-policy/data-levels>), we label this as Data Level 2 in PODAAC (but in our own nomenclature they correspond to our L1). Variables included in this file are:

depth : depth [m]
time : date in seconds for every sample point [seconds since 1970-1-1T00:00:00Z]
temperature : in-situ temperature [degree C]
salinity : salinity [psu]
latitude : latitude of every sample point, from the flight model when underwater
longitude : longitude of every sample point, from the flight model when underwater
dissolved_oxygen: Dissolved oxygen recalculated from phase with salinity and pressure corrections [micromole per kg]
wlbb2fl_sig470nm_adjusted: backscattering at 470 nm using manufacturer-supplied dark counts [m-1 sr-1]
wlbb2fl_sig700nm_adjusted : backscattering at 700 nm using manufacturer-supplied dark counts [m-1 sr-1]
wlbb2fl_sig695nm_adjusted : chlorophyll-a concentration using manufacturer-supplied dark counts and scaling factor based on phytoplankton monoculture [ug-1 L-1]
wlbb2fl_time: date in for every sample point of the wetlab [seconds since 1970-1-1T00:00:00Z]
aa4831_time: date in for every sample point of the optode [seconds since 1970-1-1T00:00:00Z]
gps_start_time: Time of the GPS fix at the start of the dive [seconds since 1970-1-1T00:00:00Z]
gps_end_time: Time of the GPS fix at the end of the dive [seconds since 1970-1-1T00:00:00Z]
gps_start_lat: Latitude of GPS fix at start of the dive
gps_end_lat: Latitude of GPS fix at end of the dive

gps_start_lon: Longitude of GPS fix at start of the dive
gps_end_lon: Longitude of GPS fix at end of the dive
u_dive : depth-average current in the east direction from the flight model [m/s]
v_dive : depth-average current in the north direction from the flight model [m/s]
surface_curr_east : surface drift in the east direction from the time at surface [m/s]
surface_curr_north : surface drift in the north direction from the time at surface [m/s]
lat_dive : averaged latitude of the dive
lon_dive : averaged longitude of the dive

References

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