RAFOS and RAFOS-equipped APEX Trajectory Data Notes.

10 November 2015.

In the ***rfc*** folder, RFC format data files for all surfaced APEX and RAFOS deployed in A Lagrangian Study of the Deep Circulation in the Gulf of Mexico project. There are 169 RFC files in this directory in total: 186 RAFOS and 8 APEX instruments were deployed, and 162 RAFOS and 7 APEX returned drift data. There are eleven RFC files (10 RAFOS [1033 1051 1076 1077 1082 1089 1090 1091 1116 1228] and 1 APEX [7544]) which contain temperature and pressure data only: in these cases, the float was either grounded for its entire trackable mission, or only the drift data (temperature and pressure) were 'good' data, and the receiver data (times of arrival and correlations) were 'bad'. The file 'rafosMetadata.dat' included in this directory describes all launch, surface, and clock offset data associated with each instrument.

In one instance, a float, RAFOS s/n 1070, was deployed twice. This float was found drifting after it had completed its mission, was salvaged and returned to WHOI, refurbished at Seascan, and re-deployed on the final deployment cruise. In this case, the RFC file for the first deployment is named 'rfc1070.rfc' and for the second deployment the file is named 'rfc9999.rfc'. S/N 9999 is not an actual serial number. This number will be the identifier for this second deployment float in the metadata file.

The floats were tracked with the sound sources described in the 'soso_gom.all' file. Where possible, the sound source clock drift rate (assumed constant for the source deployment period) was derived from on-deck clock checks at deployment and at recovery. Two sources had no final clock check. In these cases, source clock drift rate was estimated by fitting a line to the difference between expected arrival time (based on float launch or surface position), and measured arrival time just after/before float launch/surface. These details are noted in the sound source file.

The sound velocity was estimated using the Del Grosso method, described in the data report 'WHOI-2005-02.pdf', which uses the float's measured temperature and pressure in the sound velocity estimate.

Once tracked, the float trajectory data were put through two quality control checks, speed and a comparison of float depth to bottom depth. Data with speeds over 50 cm/s were visually inspected to make sure that the associated times-of-arrival and resultant track supported the speed of the float. Was the float in a fast swirling eddy or fast-moving boundary current? Was the float speed data point part of an accelerating and then decelerating group of points, or an isolated bad point? This check yielded a few TOA corrections and a few 'cuts' where calculated float track were affected by baseline issues. A 'cut' is defined here as points deleted from the trajectory.

The second quality control step on the trajectory data compared float depth to seafloor depth to make sure the trajectory was not located in water significantly shallower than the float depth. First, float pressure was converted to depth using 'sw_dpth.m' from the MATLAB SEAWATER toolbox. Float depths were then compared to water depth (linearly interpolated GEBCO30ARCSEC gridded bathymetry to the float position). Any obvious infractions due to possible bad TOAs, or interpolation of TOA data, or grounded float segments, were cut. A float was considered to be grounded if the times of arrival data showed 'flat' character for greater than ~10 days, and trajectory did not move freely over bathymetry.

More subtle were float trajectories that were clearly not grounded, yet registered as deeper than local bottom depth. This usually occurred near the Florida Escarpment, where the continental slope, particularly between the 2000- and 3000-m isobaths, is exceptionally steep, and small changes in horizontal position yield large changes in water depth. Because there is some uncertainty associated with the bathymetry data set, and also some inherent uncertainty associated with float tracking, in these cases the float track was retained "as-is", rather than cut the track segments.

Leidos Netcdf Files

The ***leidos*** folder contains netcdf trajectory files processed from the rfc files discussed above. The differences are that the trajectories are continuous and a float may be broken into several segments. The criterium for breaking a file was a gap of greater than five (5) days between location measurements. The trajectory data is also provided as smoothed regularly spaced (8 hour) locations. The smoothing is essential a 30-hour low pass filter that removes noise and inertial oscillations from the trajectories. Not all the segments were filtered: if the continuous trajectory length was less than ~ one-month, it was not included in the smoothed, regularly spaced data. The unfiltered and filtered data are in the sub-folders ***raw*** and ***smooth***, respectively. A description of Leidos processing is given in the document: *leidos_drifter_netcdf.pdf*.