Geophysical Research Abstracts
Vol. 21, EGU2019-16793, 2019
EGU General Assembly 2019

HYDROBS: a versatile long-term data-logger with messengers for monitoring the water column

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Deploying sensors along mooring lines is the most common method to collect data in the water column; they are generally autonomous and accessing the data requires to recover the mooring line. HYDROBS is an improved and versatile data logger in the water column with a long-autonomy (up to 4 years) and messengers, filling a gap between real-time mooring systems and classical autonomous moorings. It is designed for long-term monitoring in geophysics, oceanography, or marine chemistry.

The system has two components: a data logger, able to communicate with a surface-ship, and three messengers, releasable on demand to retrieve the data. It is mounted on a classical mooring line, with an expandable weight at the sea-bottom to maintain the mooring, an acoustic release to free the mooring line for recovery, a line adjustable to the water depth, and an immerged buoy, holding the acquisition system and messengers. The buoy maintains all sensors at a constant depth and will bring the mooring line to the surface for recovery.

The data logger comprises a low-power microprocessor, A/D-32 bit convertors, a 10-8 real-time clock and large SD card storage. Lithium batteries provide 3-4 years of autonomy depending on the sampling rates. Acoustic communications with the surface-ship provide control over all functionalities at deployment and a health bulletin on demand. The 3 shuttles, encapsulated in 13” glass spheres, have the same CPU board and clock as the main station. Communications and data transfer from the data logger to the shuttles is wireless (1Mbit/s digital inductive through water). Data are duplicated once per day on shuttles N and N+1 for redundancy.

The data logger has 4 channels and can thus sample and digitize analog data from 4 sensors, or can log data from stand-alone sensors mounted on the mooring line through serial connections (CTD, ADCP, chemical analyses, . . .). HYDROBS was initially designed for long-term passive acoustic monitoring, but was successfully tested with a CTD logger. The data logger has also some internal sensors: humidity, temperature, pressure (depth), and tri-axial inclinometers.

For certain applications, like in hydroacoustics, the acquisition clock must be synchronized and its drift precisely measured. To this end, prior to their release by acoustic command, the shuttles synchronize with the master clock. When surfacing, they (as the main unit) automatically determine the clock drift from the GPS time. The master-clock drift since its synchronization at deployment can thus be monitored over time at every shuttle release until its final recovery.

Shuttles and main unit are located on the sea-surface by AIS. Iridium communications can also be set. Shuttles are switched off with an external magnet. A non-specialist can thus easily handle a shuttle recovery from a (small) ship of opportunity.