The Santander Atlantic Time Series Station (SATS): A Time Series combination of a monthly hydrographic Station and the Biscay AGL oceanic observatory

A. Lavín, R. Somavilla, D. Cano, C. Rodríguez, C. González-Pola, A. Viloria, E. Tel and M. Ruiz-Villareal

Instituto Español de Oceanografía

Introduction

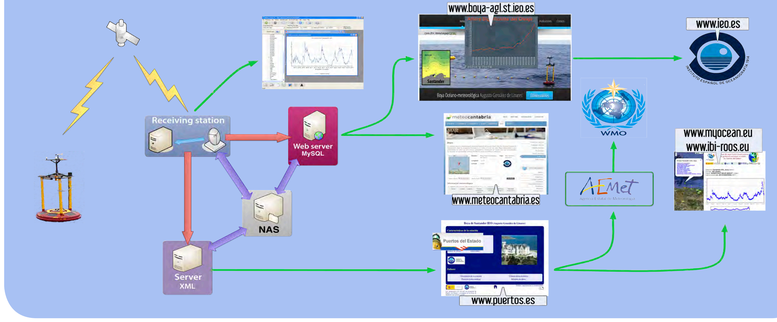
The expensive maintenance of ocean monitoring programs has an important aim: to detect long term trends and help oceanographers to fully understand how the ocean responds to global climate change. However, recent measurements, computer simulations and theoretical work indicate that physical processes at smaller temporal and spatial scales and their control on biogeochemistry can have a major impact on the global ocean state. The ephemeral nature of smallest scales of variability makes extremely difficult to sample them accurately, and new observational approaches to quantifying their contribution to the entire variability of the upper ocean should be considered.

In order to reinforce its contribution to ocean monitoring, the Spanish Institute of Oceanography (IEO) deployed in June 2007 an oceanic-meteorological buoy (AGL Buoy, 43°0.67' N; 003°46.20' W, and 40 km offshore, 2800 m depth, www.boya_agl.st.ieo.es/) in the southern Bay of Biscay. The AGL buoy mooring position was chosen to coincide with the position of a standard section- the Santander standard section - running since 1991 by the IEO as part of its coastal time-series project (http://www.seriestemporales-ieo.net/). Since its deployment, a new station was added to the monthly sampling of the water column hydrographic and biogeochemical parameters. The combined high frequency data at the air-sea interface including biogeochemical parameters from the AGL buoy data and subsurface data from the sea surface to the bottom from the CTD profiles conform the Santander Atlantic Time-Series.

They are presented here together with some of the oceanic products derived from these measurements. The complete data set will be made freely available soon, taking advantage that the data set will span 10 years of measurements becoming a very valuable data set for the scientific community involved in oceanic research.

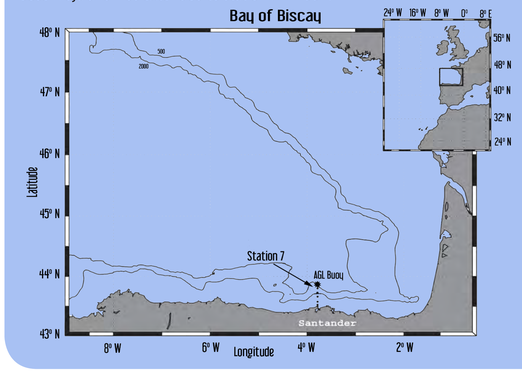
Figure on the right shows different type of data managed by Santander Atlantic Time Series (SATS). Data provided by AGL buoy and Santander monthly cruises, both specifying the type of date (real time or delayed) and their most common use.

Figure below, shows the automated process that data from AGL buoy follows, from reception to public display in several web portals of selected institutions

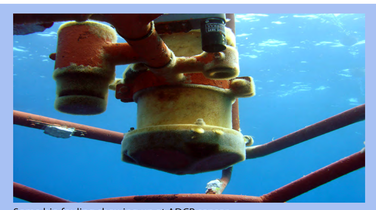


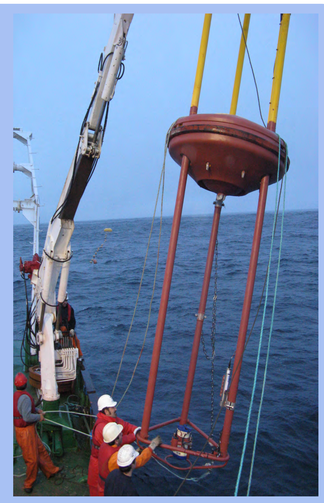
Location & Equipment

The map below, shows the position of AGL buoy and Station 7 in the Bay of Biscay. The Santander Standard Section (Radial de Santander) was iniciated in 1991 on a monthly basis covering the continental shelf and begining of the slope from station 2 to 6, on board 18m research vessel José Rioja and was extended to station 7 in 1994.




Research Vessel Ramón Margalef approaching the AGL Buoy


Some bio fouling showing up at ADCP sensor

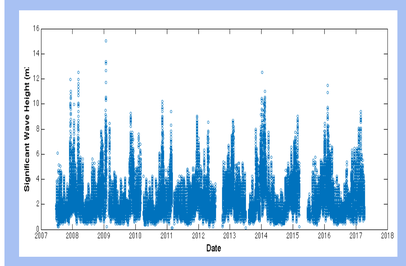

Deployment of th AGL Buoy after ordinary maintenance


Rossete deployment near the AGL buoy position

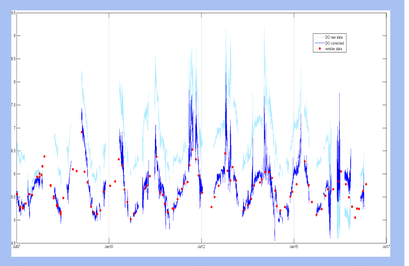

An operator recovers the rossete after sampling near AGL Buoy

Biscay AGL Buoy Data Series

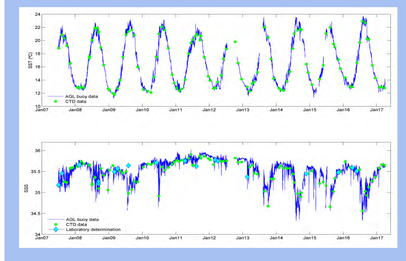
The following figures show some samples of data series obtained from the AGL Buoy [3,4].



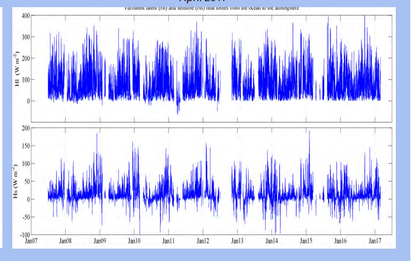
Significant wave height series from mooring to April 2017



Oxygen raw data, corrected data and Winker determination from July 2007 to April 2017



Sea surface temperature and salinity from mooring to autumm 2014. Dots show crosscheck from monthly cruises.

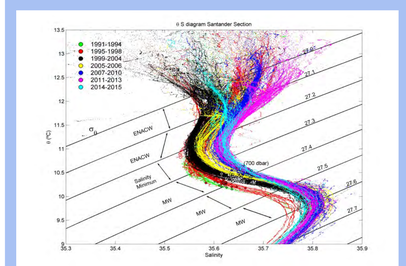


Turbulent ans sensible heat fluxes.

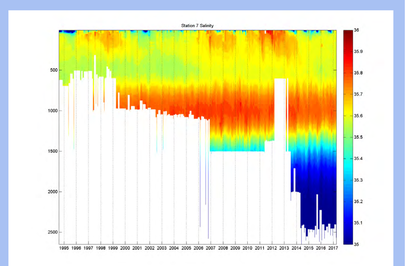
Besides the samples shown here there are also time series for air temperature, humidity, wind speed and direction, currents speed and direction up to 90 m deep, wave mean and peak period, chlorophyll and oxygen.

Santander Standar Section. Station 7

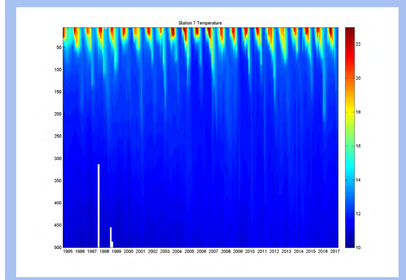
Station 7 is located at 43º 48' N, 3º 47' W at a depth of 2400m.



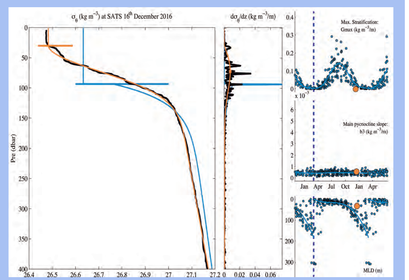
Potential temperature-salinity diagram from 1991to 2015



Salinity profile for station 7 from 1994 to 2017



Temperature profile for station 7 from 1994 to 2017



Climatological cycle of the indicated stratification parameters and mixed layer depth (right)from all data (blue) and the profile value shown on the left graph

Acknowledgements

The Biscay AGL buoy and the Santander Standard Section form part of the IEOOS, and are funded by the Spanish Institute of Oceanography and the EU Infrastructure Project FixO3 (Fixed Point Open Ocean Observatories) and the VACLAN/COVACLAN Projects of the Spanish Funding Agency . We want to thank the staff of the Santander, Gijón, A Coruña, IE O Centers and the crew of the IEO Oceanographic vessel Ramón Margalef.

References

[1] Somavilla,R.,González-Pola,C., Rodriguez,C, Josey,S.A., Sánchez, R.F.. and Lavín,A. 2009. Large changes in the hydrographic structure of the Bay of Biscay alter the extreme mixing of winter 2005 J. Geophys. Res., 114, C01001, doi:10.1029/2008JC004974. [2] Somavilla, R., González-Pola, C., Lavín, A. and Rodriguez, C. 2012.Temperature and salinity variability in the south-eastern corner of the Bay of Biscay (NE Atlantic), Journal of Marine Systems, doi: 10.1016/j.jmarsys.2012.02.010 [3] Oceano-meteorological conditions observed during severe storms in the southern Bay of Biscay. Cano, D. ;Arteche, J.L. ; Lavin, A. ; Rodriguez, C. ; Somavilla, R. ; Garcia, M.J., doi: 10.1109/Oceans-Spain.2011.6003466 [4] The Spanish Institute of Oceanography (IEO) Coastal Observing System at the southern Bay of Biscay, new real-time development: The ocean-meteorological AGL Buoy. Lavin, A. ; Somavilla, R. ; Arteche, J.L. ; Rodriguez, C. ; Cano, D. ; Ruiz-Villareal, M. [5] Gonzalez-Pola, C., Fernandez-Diaz, J. M., Lavin, A., 2007. Vertical structure of the upper ocean from profiles fitted to physically consistent functional forms. Deep-Sea Res. I 54 (11), 1985-2004. doi:10.1016/j.dsr.2007.08.007