Geophysical Research Abstracts
Vol. 20, EGU2018-2206, 2018
EGU General Assembly 2018

Water mass measurements around benthic cold water coral communities: a comparative study between Yo-Yo Conductivity-Temperature-Depth (CTD) casts and high-resolution time series data acquisition of bottom waters from the Pagès Escarpment in the southern Bay of Biscay

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We performed a comparative test study applying conventional Conductivity-Temperature-Depth (CTD) casts and a self designed mini lander system, which was deployed on the Pagès Escarpment on the Cantabrian Margin at 762 mbsl water depth for continuous bottom water measurements. Our lander data demonstrate that the mechanical movement of CTD gear disturbs the internal structure of the bottom water mass and extreme values are most likely to be missed. This questions the reliability of repeated CTD casts at the same site (yoyo-CTD) with respect to the detailed bottom water mass characteristics bathing the benthic communities. Although, repeated CTD casts may provide information about the amplitude in temperature and salinity variability, our data clearly exhibit that temperature and salinity maxima and minima respectively do not coincide only with the most obvious semi diurnal tidal dynamics but exhibit other tidal frequencies, maily M4, which are not captured by yoyo CTD analysis. The comprehensive data recorded by the lander reveal different tidal constituents among which the M4 is the most prominent one governing the salinity and temperature variability. So far, this tidal signal has not been described from other bottom water masses around benthic cold water coral communities. Although both physical parameters vary almost with the same amplitude, the water masses seem to be dominated by the variability in salinity, since it exactly parallels the variations in density (sigma-theta).
The tides migrate from the open Atlantic in the west towards the east in to the Bay of Biscay. A high tide signal at Ria de Camariñas (43°07.578’ North 009°10.934’ West) occurs 20 minutes later at Gijón (43° 34.002’ North 005° 41.00’ West) and 32 minutes later at Bayonne (43°31.812’ North 001°31.950’ West). This general W-E pattern is slightly deflected on the shelf break and the various escarpments along the Cantabrian Margin towards an ENE direction. This is clearly seen in the current pattern with ENE directions during rising tide and WNW directions during falling tide. These resolution lander based CTD measurements in combination with ADCP data reveal a comprehensive picture of bottom water mass dynamics