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Observation of internal solitary waves on the northern continental shelf of the Strait of Gibraltar

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Internal solitary waves are mainly generated by the interaction between the barotropic tide and topography. In the Strait of Gibraltar, their origin is the internal bore formed downstream of Camarinal Sill (the main sill of the Strait) during the flood tide, when the entire water column moves into the Atlantic Ocean. When the tidal current reverses the internal bore is released, this producing internal wave trains that propagate into the Mediterranean Sea and constitutes one of the most spectacular phenomenon occurring in the oceans.

In this work, ADCP data collected at Tarifa Narrows (36.012°N / 05.525°W) in the frame of the FLEGER project (RNM-3738) have been used to investigate the propagation of internal solitary waves along the Spanish continental shelf of the Strait of Gibraltar. During spring tides, solitons present semidiurnal character according to their tidal nature with amplitudes around 60 meters, this producing strong vertical mixing that displaces nutrients from bottom to the photic zone, making them available for primary production. On the other hand, weaker oscillations are observed during alternative tidal cycles in neap tides due to the influence of the diurnal tide, this inducing a remarkable diurnal inequality. Moreover, a CT probe installed a few meters above the seafloor to analyse the temperature and salinity gradients associated to the vertical mixing of the water column during the events shows an increase in temperature around 4 °C and a decrease in salinity of 2 psu in spring tides.