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Spatial distribution of tides in the Strait of Gibraltar

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The Strait of Gibraltar connects the Atlantic Ocean and the Mediterranean Sea through a rather complicated system of sills and narrows being the transition area between the eastern North Atlantic coasts, where tidal ranges are > 2 m, and the Mediterranean Sea, where tidal range are < 1 m. Tides in the Strait have been extensively studied in the last decades thanks to data collected in the frame of projects such as the Gibraltar Experiment (1985-1986) or CANIGO (1996-1998) and more recently during the GIMIX (2002-2004) and INGRES (2004-2007) projects. All these projects focused on specific areas of the Strait where tidal currents have been described in detail, but an overall analysis still lackily.

In this work, ADCP and conventional currentmeter velocity data collected in projects carried out in the Strait during the last decade have been used to describe the behaviour of the tidal ellipses of the main diurnal (O1, K1) and semidiurnal (M2, S2) constituents. This data set allows for a detailed description of the along strait characteristics of the astronomical tide by giving an overview of the processes associated to them.

Due to the nature of the exchanged flows through the Strait, the mean depth of the interface between the Atlantic and Mediterranean waters is relevant in interpreting the spatial patterns of the tidal flow. This interface has been estimated via CEPOM numerical model, a modified version of the Princeton Ocean Model (POM) developed by the Ocean Modelling Unit of the ENEA, with the objective of giving a new vision of the processes associated to the tides from a hydraulic and hydrodynamic approach. The model outputs have been used (1) to complement the information provided by the

observation and (2) to compare predictions and observations, particularly in regard to the minor semiaxis of the tidal ellipses, whose magnitude is the same as the error associated to its determination.