



Extreme internal tides in the Strait of Gibraltar

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An analysis of moored current measurements in the Strait of Gibraltar is presented. Observed vertical internal displacements (double amplitudes) with a semidiurnal frequency are extremely large and sometimes exceed 200 m. These displacements are associated with tidal internal waves generated over the Camarinal Sill, which crosses the strait. The separation of tidal components showed that the amplitude of internal tide with M2 frequency is 60 m, while the amplitudes of other components of internal tide (S2, K1, O1) are two-three times smaller. The amplitudes of the waves decrease with the distance from the sill, and at a distance of 50 km from the sill, the amplitudes are three times smaller than over the sill. The energy of internal tides is transferred to internal bore and packets of short-period internal waves. The wavelength of internal tide was estimated on the basis of moored measurements. The wavelength of the eastwardly propagating wave is 110 km. The west-propagated wave is almost twice shorter. Numerical modeling demonstrates that the lower current in the strait directed from the Mediterranean Sea to the ocean, which occupies the major part of the water column, has a significant influence on internal tides. The shear formed by two opposite currents intensifies the bore in the upper layer.