On the influence of surface waves on the turbulent character of the upper ocean

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As one of the activities of the Consortium for Oceanographic Research in the Gulf of Mexico, a pilot field experiment has been carried out in the Northwest of Baja California to determine the influence of the sea surface waves in the turbulent character of the very upper ocean layer. Measurements were obtained with a suite of instruments deployed in a spar buoy with approximately 14 m length, approximately 2 nm offshore Todos Santos Islands where the depth is about 110 m. We focus our attention therefore to the sea surface dynamics, momentum fluxes between the ocean and the atmosphere determined from eddy-covariance procedure, and water particle velocity field in the first few meters below the interface. Our measurements represent an on-going effort, and although the sea state has been low to moderate so far, a distinct influence of the wave field is detected in the turbulent velocity vertical profile. Estimates of the turbulent kinetic energy dissipation rate are attempted making use of the velocity profile as well as of point turbulent measurements at approximately 6 m below the sea surface. The subtle variations of the ocean surface wave field as determined accurately with the use of a wave staff array allowing us to obtain the directional wave energy spectrum, and the association with the variations in turbulence below the sea surface as well as in the turbulent kinetic energy dissipation rate is determined. Special attention is paid to the actual depth of point measurements when a proper phase average is performed taking into consideration the surface wave profile and the presence of crests and troughs.