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Mixing dynamics within a turbid bottom boundary layer

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Mixing dynamics within a turbid bottom boundary layer in a littoral zone of the Mediterranean Sea is analyzed. Data were taken in June 2004 with a free falling microstructure profiler. Mesoscale dynamics in the region was influenced by the outflow of the Ebre River and by the southwestern Catalan Current originating in the Gulf of Genoa. The magnitude of the near bottom current was 5-8 cm/s and the flow was affected by inertial oscillations. During the entire field campaign, the wind of $\sim$ 6 m/s was from the northeast. The mean depth of the upper mixed layer was about 15 m, the thermocline occupied the depth range between 15 and 30 m, and the thickness of the turbid bottom boundary layer varied from 8 to 12 m. Different stations ranged from 15 to 60 m depth.

Thorpe displacement, *Th,* was used to determine the turbulent patches and, in general, *Thmax* within the patches and the Thorpe scale, *LTh,* were found to be highly correlated and linearly dependent: *Tmax*= 2.6*LTh*. If *Thmax and LTh* were calculated at equidistant segments of the profiles, then $Thmax \sim LTh^{0.85}$. Within the bottom layer turbulent patches were found to affect 35% of the total depth of the layer. The median size of the patches was 41 cm and their median buoyancy Reynolds number was 252.

State of the turbulence within the bottom layer is discussed based on the turbulent Reynolds and the turbulent Froude numbers. According to the hydrodynamic diagram and the vertical profiles of the turbulent kinetic energy dissipation rate, different zones are identified, including an upper interface where Kelvin-Helmholtz instability develop. The different station-dependent structure of the turbidity profiles is related to the different mixing dynamics. Mean turbulent diffusivity of the turbid layer was obtained following the Osborn approach and found to be 2 x 10^{-5} m^2/s.