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Swell and UVCN regimes - competing mechanisms influencing the exchange of scalars over the ocean

A.-S. Smedman and E. Sahlee
Uppsala University, Department of Earth Sciences, Uppsala, Sweden (ann-sofi.smedman@met.uu.se, +46 18 551124)

Swell and UVCN regimes – competing mechanisms influencing the exchange of scalars over the ocean.

Ann-Sofie Smedman and Erik Sahlee

In very slightly unstable conditions (UVCN regime), when the Obukhov length is much greater than the surface layer depth, it is observed that the structure of the surface layer turbulence does not accord with standard similarity theory. In particular the efficiency of the turbulent exchange of sensible and latent heat is observed to be more strongly enhanced than is consistent with the standard model. Also the profiles of dissipation of turbulent kinetic energy and temperature fluctuation variance are found to depend on the structure of the whole boundary layer (i.e. are non-local), indicating that a large-scale transport process is at work. All these features are found to be similar in measurements at flat land sites and at marine sites during growing sea conditions, indicating that they are determined by the dynamics of the whole boundary layer rather than being simply dependent on the surface boundary conditions.
However, at marine sites during strong swell the two regimes are interacting. The circulation in the boundary layer forced by swell waves will prevent the large scale eddies to reach the ground and thus scalar fluxes will be reduced.