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Modelling of upper ocean mixing by wave-induced turbulence

Malek Ghantous and Alexander Babanin
Centre for Ocean Engineering, Science and Technology, Swinburne University of Technology, Melbourne, Australia

Mixing of the upper ocean affects the sea surface temperature by bringing deeper, colder water to the surface. Because even small changes in the surface temperature can have a large impact on weather and climate, accurately determining the rate of mixing is of central importance for forecasting. Although there are several mixing mechanisms, one that has until recently been overlooked is the effect of turbulence generated by non-breaking, wind-generated surface waves.

Lately there has been a lot of interest in introducing this mechanism into models, and real gains have been made in terms of increased fidelity to observational data. However our knowledge of the mechanism is still incomplete. We indicate areas where we believe the existing models need refinement and propose an alternative model.

We use two of the models to demonstrate the effect on the mixed layer of wave-induced turbulence by applying them to a one-dimensional mixing model and a stable temperature profile. Our modelling experiment suggests a strong effect on sea surface temperature due to non-breaking wave-induced turbulent mixing.