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Observations of wave-induced mixing

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Near-surface turbulence plays an important role in linking the atmosphere and the ocean through exchange processes, and affects a variety of additional topics ranging from the dispersion of nutrients and pollutants to the optical and acoustical properties of the ocean. However, the turbulence field beneath surface waves is rather complex and provides great challenges for detailed observations.
In a recent experiment in the subtropical Pacific we obtained high resolution near-surface velocity profiles, bubble cloud measurements and video recordings of the wave-breaking activity, under conditions of moderate wind forcing and varying stratification. Estimates of the dissipation rates of turbulence kinetic energy are calculated from the in-situ velocity measurements as well as the Duncan-Phillips formulation for spectral energy dissipation. Dissipation rates, fluctuating by more than two orders of magnitude, are closely linked to the stratification, and may also be affected by the concentration of surfactants. Combining these turbulence estimates and the bubble cloud characteristics we infer differences in the strength of wave breaking and its effect on wave-induced mixing.