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[Volume 13, Issue 11 \(November 1983\)](#)

Journal of Physical Oceanography

Article: pp. 1977–1987 | [Abstract](#) | [PDF \(865K\)](#)

Wave-Turbulence interactions in the Upper Ocean. Part I: The Energy Balance of the Interacting Fields of Surface Wind Waves and Wind-Induced Three-Dimensional Turbulence

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(Manuscript received January 24, 1983, in final form July 30, 1983)

DOI: 10.1175/1520-0485(1983)013<1977:WTITU>2.0.CO;2

ABSTRACT

We analyze in detail the budget of total and fluctuating energy in the surface layer of the ocean. We suggest a rational scheme for separating the budget of turbulence from that of random wind-generated surface waves, and suggest in particular a form for the interaction term appearing in the turbulent energy equation. This is derived from an analysis of the potential velocity field excited by surface motion, and its interaction with the turbulence. Finally, we explore some implications of the proposed interaction both for the surface wave energetics, as well as for the turbulence structure.

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