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[Volume 12, Issue 11 \(November 1982\)](#)

Journal of Physical Oceanography

Article: pp. 1245–1259 | [Abstract](#) | [PDF \(860K\)](#)

Statistics of Richardson Number and Instability in Oceanic Internal Waves

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(Manuscript received February 25, 1982, in final form July 16, 1982)

DOI: 10.1175/1520-0485(1982)012<1245:SORNAI>2.0.CO;2

ABSTRACT

The probability density function (pdf) of Richardson number in a Gaussian internal-wave field is derived. It is found to compare well with available data. The pdf depends on only parameter λ , the rms strain in the field, which is very weakly dependent on depth if at all. The probability $Ri < 0.25$ is a very sensitive function of λ , which is about $\lambda \approx 0.5$ in the ocean. Numerical simulations of vertical profiles $Ri(z)$ are calculated based on a set of stochastic differential equations. The statistics of the vertical distributions of regions where $Ri < 0.25$ is investigated and a simplified mixing model based on the stochastic differential equations is derived. We conclude that shear instability is a significant factor in the dissipation of internal waves.

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