



## Abstract View

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# On Phillips' Theory of Equilibrium Range in the Spectra of Wind-Generated Gravity Waves

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### ABSTRACT

Phillips' hypothesis concerning the equilibrium range in the spectrum of wind-generated surface waves in deep water can be expressed either in the frequency form  $S(\omega) \propto \omega^{-5}$  or the wavenumber form  $\Psi(k)k^{-4}$ . If one adopts the wavenumber form as universal, it can then be shown that for shallow water  $S(\omega) \propto \omega^{-3}$ , a relation supported by observations.

It is noted that deviations from the  $S(\omega) \propto \omega^{-5}$  relation can be introduced not only by finite depth but also by permanent currents, as well as by the presence of long-wave components in the sea wave spectrum. In the latter case determination of  $S(\omega)$  has to include both the Doppler effect, due to orbital displacements of liquid particles in long waves, as well as the effect of additional vertical acceleration in short waves propagating along the surface of the long-wave field. The article also gives calculations that illustrate the significance of the foregoing effects on deviations from the Phillips  $-5$  power law in the frequency spectrum  $S(\omega)$ .

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