Abstract View

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Horizontal Surface Tension Gradients Induced in Monolayers by Gravity Water Wave Action

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ABSTRACT

Surface tension gradients have been measured for three different monolayers (oleyl alcohol, palmitic acid methyl ester and cetyl trimethyl ammonium bromide) spread on a wavy water surface (waves with 1-Hz frequency; 2 cm wave height). The wave-induced surface tension gradients were determined indirectly using 1) a wave-follower mounted surface-potential ionization probe and 2) a pulsating spreading oil patch. The films can sustain unexpectedly large surface tension variations of the order 12–14 ($\times 10^{-3}$) N m^{-1} and were found to experience a relaxation, i.e., a significant change of surface potential and surface tension variation with time (order of 1500 s) and with position on the wave (phase shift). The relaxation and phase shift are attributed to a reordering of the film molecules and the subsequent modification of the mutual interaction between the film molecules and the water molecules of the underlying water layer.