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Elastocapillary waves on ultra-soft solids exhibit dispersion

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— Rayleigh waves are widely used in non-destructive testing and in the study of seismology. Generally, Rayleigh waves are non-dispersive, and surface tension is not considered since the surface energy is so much smaller than the elastic energy in most solids. Herein we explore surface waves on ultra-soft solids where surface tension forces are not insignificant and where dispersion may exist. Agarose gel was explored for a range of shear moduli. Faraday waves were created on the agarose gel surface by vibrating the gel on a shaker for frequencies ranging from 40Hz to 200Hz. It was observed that the surface waves are dispersive for a range of shear moduli, an observation that cannot be explained by Rayleigh wave theory. A new analytical model that incorporates the solid surface tension was developed and explains the experimental observations.

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