國立交通大學應用數學系
學術演講公告

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講　題：Resonance of Sessile Drops

時　間：105 年 10 月 11 日(星期二) 下午 2:00 –3:00

地　點：(光復校區) 科學一館 223 室

茶　會：當天下午 1:30 (科學一館 205 室)

Abstract

This study experimentally examines the resonance of mechanically vibrated sessile drops. Shape, frequency and amplitude responses of the drops are investigated for individual modes. The observations are characterized by relating to Rayleigh-Lamb (RL), Bostwick-Steen invisid (BS inviscid) and Bostwick-Steen viscous potential flow (VPF) theories. Observed mode shapes are compared to predictions from RL and BS inviscid theories via ray-tracing simulation. The comparison of frequency response suggests that VPF theory most adequately predicts resonance frequency of observed modes. The adequacy implies the necessity of considering both substrate constraint and viscosity, and hence distinguishes viscous sessile drops from and inviscid free spherical drops. The amplitude responses of modes are explored from the growth and decay of the lowest axisymmetric mode. Evident nonlinearity is observed. The amplitude study thus exposes the surprising extent to which our nonlinear observations can be understood in the context of linear theories. Further exploration reveals the interactions of modes such as spectral crossing and mode mixing. For subhemispherical drops, typical observations are mixtures of a half-frequency subharmonic non-zonal mixing a harmonic zonal mode. For superhemispherical drops, more diverse mixing phenomena are discovered. From the scientific perspective, the study reveals a rich collection of resonance modes catagorized according to shapes and harmonic types for future investigation. From engineers, the study provides guidelines for applications relevant to pattern selection of surface waves, such as ordered self-assembly of particles, droplet transport, drop atomization, enhanced mixing, and suspension collection.

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