



TREND
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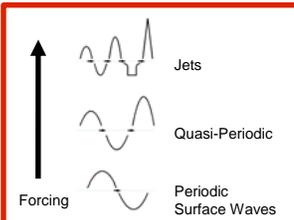
Driven Surface Waves in Three Environments

Mariya Dryga, Doug Kelley, Professor Daniel P. Lathrop

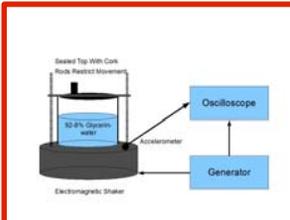
Introduction

Vertically driven surface waves (Faraday waves) can cause singularities in the form of jets. With diverging velocity gradients, jets are ideal for modeling nonlinear surfaces.

States At Constant Frequency

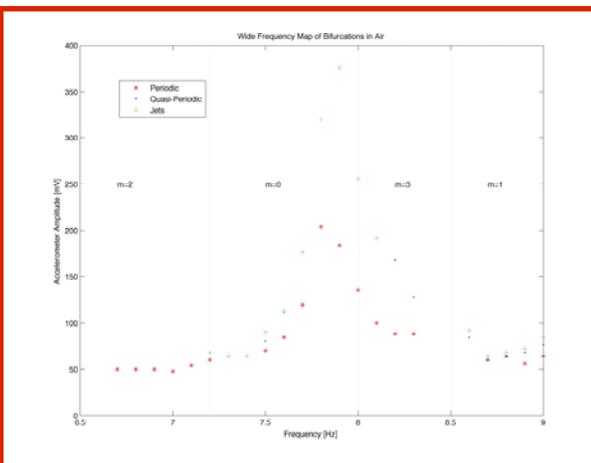


Setup



Resonant Frequency

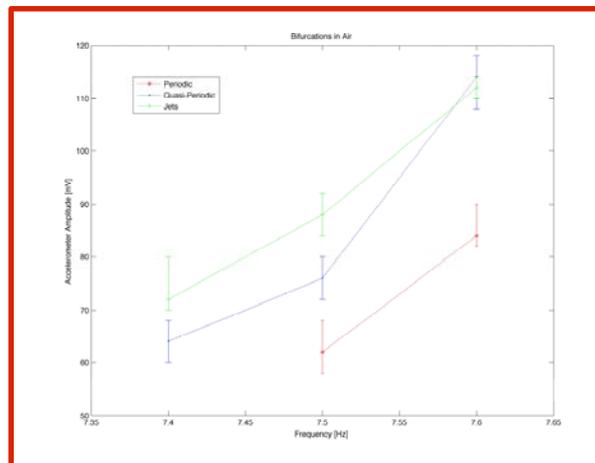
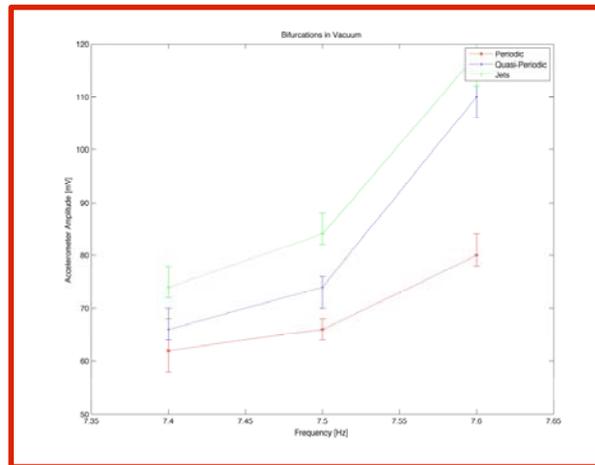
Each wave mode has a resonant frequency where the amplitude thresholds are minimized.



Four wave modes are seen, each showing amplitude threshold minima for the three states.

Thresholds of m=0 mode

Resonant frequency is approximately 7.4 Hz. We chose to investigate slightly higher frequencies where thresholds were more distinct. Starting at lowest amplitude to not create Faraday waves, amplitude was increased by 2 mV in 1 min increments.

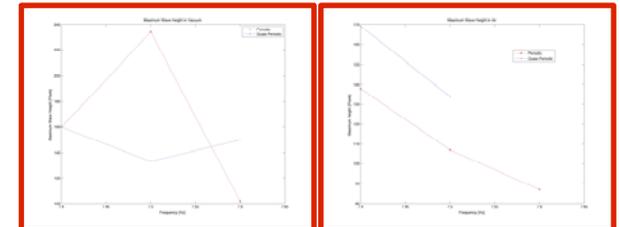


Thresholds are more distinct in vacuum than in air. Each threshold per state per frequency in vacuum differs from threshold in air by less than 8%.

Max Heights in Two States

The difference between the maximum wave heights above and below the surface is calculated for periodic and quasi-periodic states in air and in vacuum.

Maximum Wave Heights in Two States



Higher maximum wave heights are observed in vacuum than in air. Although higher maximum heights are expected in a quasi-periodic state than a periodic state, this is not consistently observed.

States in Oil

At driving frequencies 7.4, 7.5, 7.6 Hz, the maximum amplitude safely provided by the electromagnetic shaker are not enough to produce any significant surface deformation.

No surface waves were observed!

Conclusions

- Periodic, Quasi-Periodic, and Jet states observed in vacuum, but not in oil
- Amplitude thresholds more distinct in vacuum than in air
- Further experiments in oil or other highly viscous fluid may determine impact of surface tension on amplitude thresholds