

Materials Sciences in Space (G)
Gravitational Effects on Physico-Chemical Processes (G01)

**EXPERIMENTAL ANALYSIS OF THE VIBRATION OF A LIQUID BRIDGE
UNDER MICROGRAVITY CONDITIONS**

Jose M. Perales, jose.m.perales@upm.es
Universidad Politécnica de Madrid, Madrid, Spain
Isidoro Martinez, isidoro.martinez@upm.es
Universidad Politécnica de Madrid, Madrid, Spain

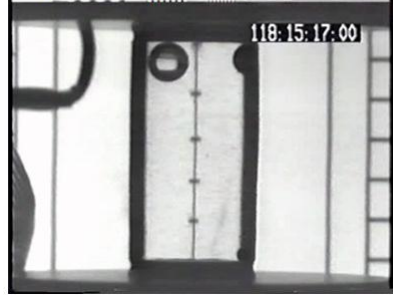
The experimental results obtained of the experiment “LICOR” made on board the Spacelab D-2 Mission are analyzed. The configuration consisted of a liquid bridge where one of the supporting disks was vibrated. The recorded images are analyzed and the measured behaviour compared with the results of one dimensional models. The results of two pressure sensors located in each of the supporting disks are also analyzed.

Experimental analysis of the vibration of a liquid bridge under microgravity conditions

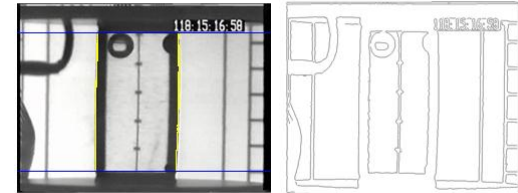
J.M. Perales and I. Martínez
Universidad Politécnica de Madrid, Spain

- Experiment performed on board Spacelab D-2 with AFPM
- Two different fluids used: silicone oil of 10 cSt and 5 cSt
- 30 mm diameter circular coaxial disks
- Front disk (bottom) fixed
- Rear disk (top) oscillating with either 2 mm or 1 mm peak-to-peak amplitude
- Linear ramp in oscillation frequency, from 0 to 5 Hz at 90 s/Hz
- Pressure transducer on rear disk

Liquid bridge idle (no excitation)



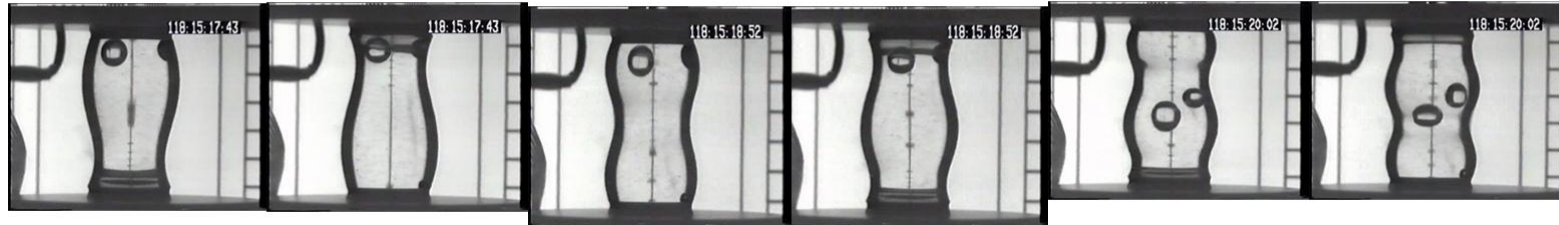
Edge detection



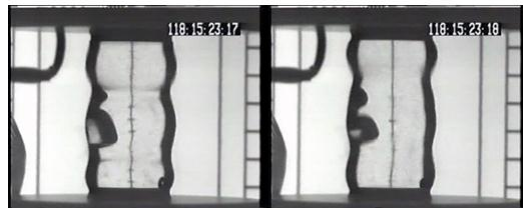
First mode

Second mode

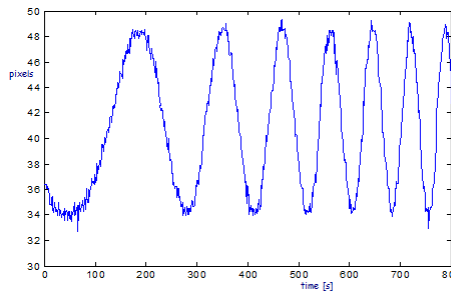
Third mode



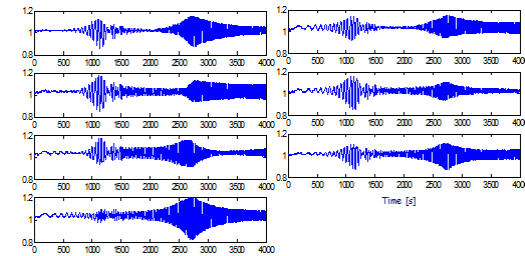
Higher Frequencies



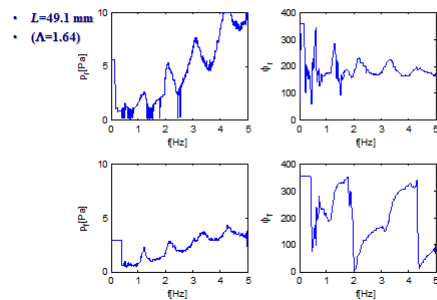
Oscillating disk displacement (from images)



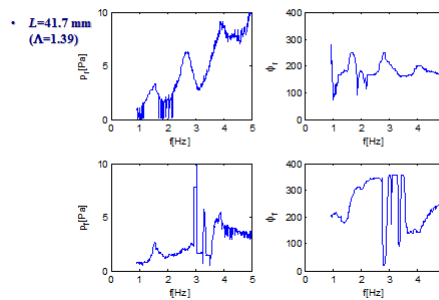
Diameter evolution (7 slices) (nondim)



Measurements: Ramp A



Measurements: Ramp B



Configurations tested

Conf.	L [mm]	L/D	V [cm ³]	$V/\pi R^2 L$	ν [cSt]	A [mm]
1	49.1	1.64	35.5	1.02	10	2
2	41.7	1.39	23.4	0.79	10	2
3	39.7	1.32	27.7	0.99	5	1

Results Configuration 1

Eigenmode	1	2	3	4	5
Frequency sweep [Hz]	0.53	1.20	2.13	3.12	4.28
Fixed frequency [Hz]	0.53	1.21	2.19	3.38	4.30
Image analysis [Hz]	0.48	1.20	2.04	3.40	4.31
Theoretical [Hz]	0.48	1.27	2.28	3.44	4.72

Results Configuration 2

Eigenmode	1	2	3	4	5
Frequency sweep [Hz]		1.53	2.70	3.96	
Fixed frequency [Hz]		1.58	-		
Image analysis [Hz]	0.64	1.53	2.70	3.96	4.9
Theoretical [Hz]	0.69	1.72	3.02	4.50	6.15

Results Configuration 3

Eigenmode	1	2	3
Frequency sweep [Hz]	0.80	1.77	3.00
Fixed frequency [Hz]	0.80	1.78	-
Image analysis [Hz]	0.78	1.77	3.00
Theoretical [Hz]	0.76	1.89	3.29