A model for bubbling dynamics

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We have studied air bubbles formation in water/glycerol solution with the bubbles generated in a nozzle at the bottom of a cylindrical container. For narrow metallic nozzle (seringe needle) the system presents period adding cascade and bistability having the air flux as a control parameter. The maximum periodicity depends also on the hose length that connects the nozzle to the air supplier (See [1]). We have obtained three different type of simultaneous data: a) the time between successive bubbles (T_n) by detecting the pulses induced in a photo-transistor when the bubble is crossing a laser beam placed a little above the nozzle; b) the pressure wave in the hose conection with microphones placed close to the nozzle; c) the evolution of the bubble profiles by recording the images with a high speed camera. Therefore, these data allowed us to develop a model based on physical principles that reproduces the period adding cascade and bistability, and also explains why the hose length and the nozzle width are essential parameters.

References

1. E. Colli, V. S. M. Piassi, A. Tufaile, J. C. Sartorelli, *Bistability in bubble formation*, Phys. Rev. E 70, 066215, 2004.