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TWO DEGREE OF FREEDOM MODEL OF CHAOTIC DRIPPING IN REDUCED GRAVITY

Abstract

Low Reynolds Number liquid jet break-up in a gravitational field occurs in one of three modes; periodic dripping, chaotic dripping and jetting. These break-up modes have been studied extensively with a variety of theoretical, numerical and experimental techniques. The break-up modes of a liquid jet not influenced by a gravitational field have not been investigated thoroughly. This paper considers a low Reynolds Number liquid jet in reduced gravity. The jet breaks up into drops with an irregular mean diameters and time of formation. Experimental results of the time of formation and drop size data exist from previous drop tower tests. The preliminary analysis of this experimental data suggest strongly that the formation of the drops is a chaotic process. To further analyse this system a two degree of freedom mass-spring-damper model of the fluid system has been developed. This paper presents the model, the results of the model and a comparison against the reduced gravity results for the chaotic dripping mode of drop formation in reduced gravity. Results of this model help to further confirm the underlying dynamics in this system and provide a predictive tool for further investigation of the domain.