Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Numerical and experimental study of disturbance wave development in vertical two-phase annular flow[1] GEOFFREY HEWITT, JUNFENG YANG, YUJIE ZHAO, CHRISTOS MARKIDES, OMAR MATAR, Imperial College London — The annular flow regime is characterized by the presence of a thin, wavy liquid film driven along the wall by the shear stress exerted by the gas phase. Under certain liquid film Reynolds numbers, large disturbance waves are observed to traverse the interface, whose length is typically on the order of 20 mm and whose height is typically on the order of 5 times the thickness of the thin (substrate) layer between the waves. Experimental wok has been conducted to study the disturbance wave onset by probing the local film thickness for different Reynolds numbers. It is observed the disturbance waves grow gradually from wavy initiation and form the ring-like structure. To predict the wavy flow field observed in the experiment, 3D CFD simulations are performed using different low Reynolds number turbulence models and Large Eddy Simulation. Modeling results confirm that there is recirculation within the waves, and that they as a packet of turbulence traveling over a laminar substrate film. We also predict the coalescence and the break-up of waves leading to liquid droplet entrainment into the gas core.

[1]Skolkovo Foundation, UNIHEAT project

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Date submitted: 30 Jul 2013 Electronic form version 1.4