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Large Eddy Simulation of Disturbance Waves and Heat Transfer in Annular Flows[1] GEOFF HEWITT, JUNFENG YANG, OMAR MATAR, Imperial College London — A numerical method for forced convective boiling in an annulus needs to be developed in order to elucidate the reason for nucleation enhancement by disturbance waves. The benchmark test case is the experiment of Barbosa et al., in which nucleate boiling in a liquid film, droplet entrainment, disturbance waves of the liquid film, and their interaction were observed. We first develop a numerical strategy to model the development of disturbance waves in annular flows in which the highly turbulent gas core flow drives the laminar liquid flow upwards using advanced CFD tool TransAT. Then, the heat transfer process in the non-boiling annular flow was investigated to provide insight into the temperature gradient underneath the wave region. Agreement with experimental data for the temperature field could be improved by accounting for phase change in the models. However, the modelling results are still indicative and show that heat transfer is hindered in the wave region. The local overheat zones underneath the disturbance wave could play key roles activating the nucleation boiling sites.

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