ORAL PRESENTATION

Large Eddy Simulation and 1D/2D Engineering Models for Rayleigh-Taylor Mixing

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Rayleigh–Taylor (RT) instability occurs when a dense fluid rests on top of a light fluid in a gravitational field. It also occurs in an equivalent situation (in the absence of gravity) when an interface between fluids of different density is accelerated by a pressure gradient, e.g. in inertial confinement fusion implosions. Engineering models (Reynolds averaged Navier–Stokes models) are needed to represent the effect of mixing in complex applications. However, large eddy simulation (LES) currently makes an essential contribution to understanding the mixing process and calibration or validation of the engineering models and the role of LES in the validation of a 1D model was discussed in [1]. More recently a series of high-resolution RT simulations at a range of Atwood numbers (described at a poster paper at the workshop) has been used for more precise calibration of the 1D model. The main focus of the present paper is the validation of the extension of the model to 2D i.e. the modelling of situations where the ensemble average depends of two space variables. Progress in this area will be reported. Various forms of long wavelength 2D perturbations are added to the high-resolution LES and then distributions of line-averaged quantities are compared to the 2D model simulations. The paper will address various concerns about 2D models, such as (i) do 2D models give the correct results? (ii) if so, is the quality of the results sensitive to the type of model? (iii) is double-counting an issue? (iv) does the validity of 2D modelling depend on the form of the initial perturbations?

1. D. L. Youngs, “Application of monotone integrated large eddy simulation to Rayleigh–Taylor mixing”, *Phil. Trans. R. Soc. A* (2009) **367**, 2971–2983.