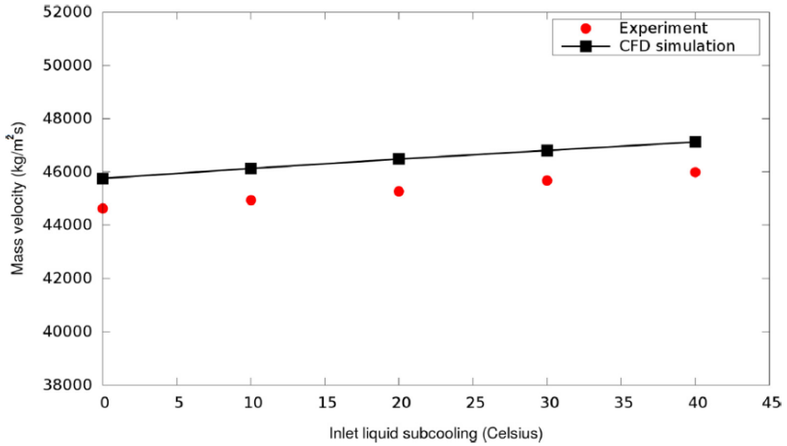
Cryogenic Hydrogen dispersion & Ignition Modelling

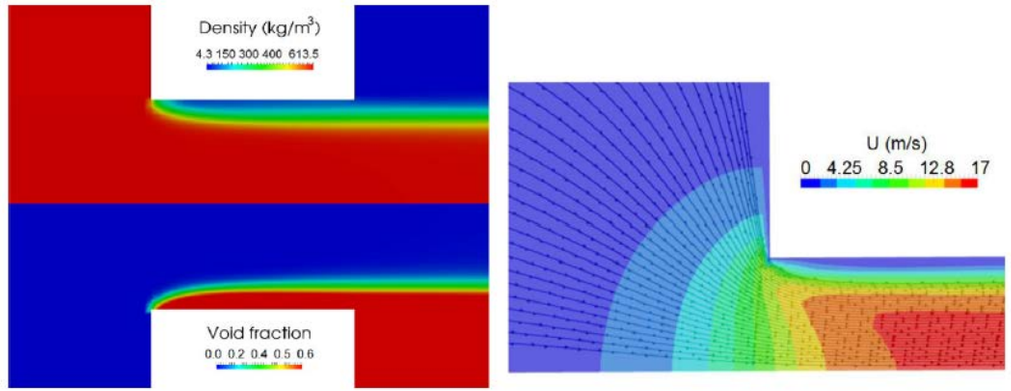
- OpenFOAM with Homogenous relaxation model (HRM) used as the basic framework
- Liquid-gas interface - Volume-of-fluid method
- Notional nozzle approach
- Integration is in progress with Eddy-dissipation-concept (EDC) model for ignited jet
  - Infinitely fast chemistry
  - Finite rate chemistry

1. Konstantinos Lyras a , Siaka Dembele a , David P. Schmidt c , Jennifer X. Wen, "Numerical simulation of subcooled and superheated jets under thermodynamic non-equilibrium", International Journal of Multiphase Flow, 102 (2018) 16–28.
2. Wang, C.J., Wen, J.X. , Chen, Z.B., Dembele, S.J, "Predicting radiative characteristics of hydrogen and hydrogen/methane jet fires using FireFOAM", International Journal of Hydrogen Energy, Volume 39, Issue 35, 3 December 2014, Pages 20560-20569

HRM & EDC sample results

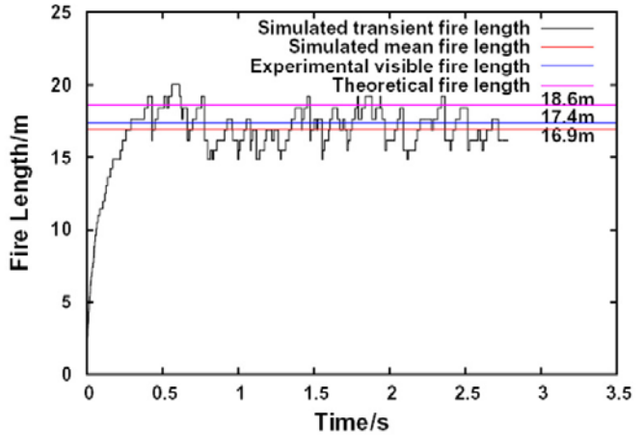
HRMFoam :

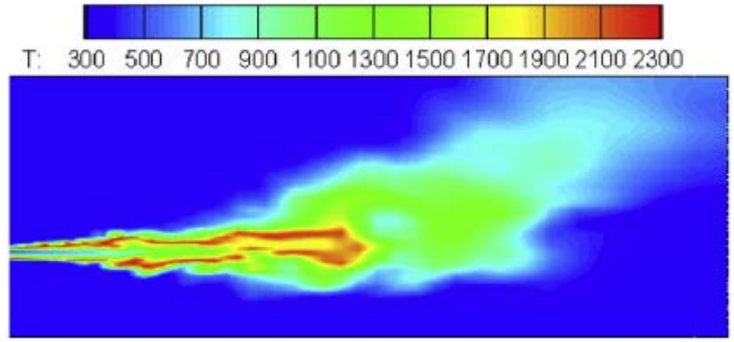




Predicted mass flow rates per area for initial pressure equal to 40 bar compared to experimental data of Xu et al. (1995)

EDCFoam :





Comparison of the predicted and measured flame length.