OpenFOAM & Combustion Simulation

LES of spray atomisation by using an explicit volume diffusion (EVD) method

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Host: Prof. Huangwei Zhang (National University of Singapore)

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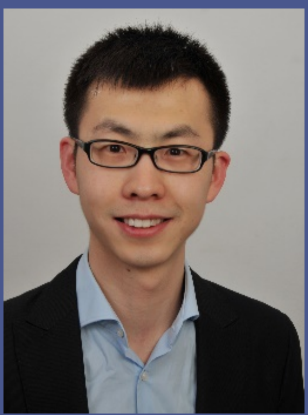
Abstract

Spray atomisation is an important interfacial physical process in many engineering applications. The primary stage is characterised by growth of interfacial instabilities followed by the disintegration of the continuous liquid stream into discrete ligaments and blobs. These processes have a wide range of length scales ranging from the zero-thickness sharp interface, micron size droplets, to the milli-metre scale in the liquid core. Turbulence imposes an additional spectrum of large and small scale motions. This wide range of scales with interface discontinuities set up obstacles to establishing a numerically converged and computationally efficient approach with acceptable accuracy. A novel volume of fluid (VoF) based model called explicit volume diffusion (EVD) has been developed to achieve this goal. The EVD method was implemented in a new solver called *evdFoam* that was incorporated into OpenFOAM. The numerical convergence and accuracy of the EVD model were validated against various computational configurations including the experimental airblast ethanol spray jets on Sydney Needle Spray Burner. The work ongoing is to extend the EVD model to a stochastic particle framework for computations of the sub-volume distributions of liquid structures. The long-term scope is to unify the modelling framework for multiple two-phase gas-liquid flow regimes.

About the Speaker



Dr.-Ing. Bosen Wang has been appointed as an Associate Professor in the Institute for Aero Engine at Beihang University (BUAA) since November 2021. Prior to the academic career at BUAA, he served as a Postdoctoral Research Associate in the Clean Combustion Lab at The University of Sydney since the beginning of 2020 and in the Institute of Combustion Technology at University of Stuttgart in 2019. He started to pursue his PhD at University of Stuttgart in 2014 and received a Summa Cum Laude doctoral degree in 2018. His main area of expertise lies in theoretical modelling of turbulent multiphase flows and combustion, and its application to combustion chambers by supercomputing techniques. Currently, his research is mainly funded by the Aero Engine Corporation of China (AECC).