|  |  |  |
| --- | --- | --- |
|  |  |  הטכניון - מכון טכנולוגי לישראל TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY  |
| הפקולטה להנדסה כימיתע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Monday, April 15th, 2024 at 13:30**

**Zoom: https://technion.zoom.us/j/96298325147**

**Evaluation of the prediction capability of mesoscale CFD models on velocity fluctuations in dense liquid-solid flows**

**Haotong Xin**

**MSc Seminar**

Advisor: Prof. Bo Kong (GTIIT), Prof. Raphael Semiat (Technion)

Department of Chemical Engineering, Technion-Israel Institute for Technology

 Fluid-particle flow is ubiquitous in natural and industrial processes such as chemical, oil-gas, environmental, pharmaceutical, etc. A better understanding and modeling of fluid-particle flow physics is essential for further improvement in related industrial practices. Computational Fluid Dynamics (CFD) of fluid-particle flow is becoming a useful tool for designing and optimizing industrial devices and processes, such as fluidized beds and risers. However, accurate closure models to simulate such flows are still challenging to develop. So far, it is important to evaluate the prediction capability of mesoscale models to determine whether they can generate reliable data to study and inform fluid-particle flow on the macroscale. In this study, an evaluation of the predictive capability of current mesoscale CFD models on velocity fluctuations in dense liquid-solid flows is presented. Numerical simulations have been carried out with both the Eulerian-Eulerian Two-Fluid Model (TFM) and the Eulerian-Lagrangian Discrete Phase Model (DPM). A diffusion-based coupling method is implemented in the DPM solver to mitigate its grid-dependent problem. It has been shown that with the appropriate closures, the TFM could predict the velocity fluctuation for both phases quite well. The diffusion-based method greatly improves the predictive fidelity of the particle volume fraction for DPM. However, the modified DPM fails to predict both the particle- and fluid-phase velocity fluctuations, which could be caused by the variance in particle volume fraction within local cells which affects the two-phase momentum coupling.

Refreshments will be served at 13:15.