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Interactions of Copepods with Fractal-Grid Generated Turbulence based on Tomo-PIV and 3D-PTV¹ ZHENGZHONG SUN, DANIEL KRIZAN, ELLEN LONGMIRE, University of Minnesota — A copepod escapes from predation by sensing fluid motion caused by the predator. It is thought that the escape reaction is elicited by a threshold value of the maximum principal strain rate (MPSR) in the flow. The present experimental work attempts to investigate and quantify the MPSR threshold value. In the experiment, copepods interact with turbulence generated by a fractal grid in a recirculating channel. The turbulent flow is measured by time-resolved Tomo-PIV, while the copepod motion is tracked simultaneously through 3D-PTV. Escape reactions are detected based on copepod trajectories and velocity vectors, while the surrounding hydrodynamic information is retrieved from the corresponding location in the 3D instantaneous flow field. Measurements are performed at three locations downstream of the fractal grid, such that various turbulence levels can be achieved. Preliminary results show that the number of escape reactions decreases at locations with reduced turbulence levels, where shorter jump distances and smaller change of swimming orientation are exhibited. Detailed quantitative results of MPSR threshold values and the dynamics of copepod escape will be presented.

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Zhengzhong Sun
University of Minnesota

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