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A fluid mechanical model for current-generating-feeding jellyfish

JIFENG PENG, JOHN DABIRI, California Institute of Technology — Many jellyfish species, e.g. moon jellyfish *Aurelia aurita,* use body motion to generate fluid currents which carry their prey to the vicinity of their capture appendages. In this study, a model was developed to understand the fluid mechanics for this current-generating-feeding mode of jellyfish. The flow generated by free-swimming *Aurelia aurita* was measured using digital particle image velocimetry. The dynamics of prey (e.g., brine shrimp *Artemia*) in the flow field were described by a modified Maxey-Riley equation which takes into consideration the inertia of prey and the escape forces, which prey exert in the presence of predator. A Lagrangian analysis was used to identify the region of the flow in which prey can be captured by the jellyfish and the clearance rate was quantified. The study provides a new methodology to study biological current-generating-feeding and the transport and mixing of particles in fluid flow in general.

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