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Optimization of Anguilliform Swimming STEFAN KERN, PETROS KOUMOUTSAKOS, ETH Zurich — Anguilliform swimming is investigated by 3D computer simulations coupling the dynamics of an undulating eel-like body with the surrounding viscous fluid flow. The body is self-propelled and, in contrast to previous computational studies of swimming, the motion pattern is not prescribed a priori but obtained by an evolutionary optimization procedure. Two different objective functions are used to characterize swimming efficiency and maximum swimming velocity with limited input power. The found optimal motion patterns represent two distinct swimming modes corresponding to migration, and burst swimming, respectively. The results support the hypothesis from observations of real animals that eels can modify their motion pattern generating wakes that reflect their propulsive mode. Unsteady drag and thrust production of the swimming body are thoroughly analyzed by recording the instantaneous fluid forces acting on partitions of the body surface.

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