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Bistability of flight states for heavy falling plates[1] EDWIN LAU[2], WEI-XI HUANG[3], Tsinghua University — Interactions of falling flat plates in two-dimensional flows is presented through direct numerical simulation and immersed boundary method. The transition from steady falling to tumbling flight for heavy plates is presented. At steep angles of release, the plates undergo a period of amplitude increasing fluttering motion before developing to tumble. For the same fluid-solid system of Reynolds number Re and moment of inertia I*, shallow angles of release develop to a state of steady falling after a period of diminishing fluttering amplitude. Simulations further construct a mapping of this bistable region. Relationships among Re, I*, and the critical angles of release separating the two flight states are also provided. The inclusion of this finding on the mapping of flight states suggests fluttering motion as a transitional state before the onset of tumble.

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