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An implicit immersed boundary method for moving body problems in curvilinear coordinates LAURA NICOLAOU, SEO YOON JUNG, TAMER ZAKI, Imperial College London — A robust immersed boundary method for flow in complex geometries is presented. No-slip conditions are enforced via momentum forcing and mass conservation at the immersed boundary is satisfied via a mass source term developed for moving bodies. Stability is shown to depend on the temporal discretization of the momentum forcing, as inconsistencies between the forcing and the intermediate velocity equations introduce errors near the boundary. An iterative method to compute the forcing term implicitly is proposed, which reduces the errors at the boundary and enhances stability. The convergence of the iterative method, second-order accuracy and enhanced stability of the scheme are demonstrated in a number of test cases. In addition, the proposed mass source term accurately accounts for the movement of the boundary, and reduces the spurious force oscillations which arise in IB simulations of moving body problems. The method is developed for use in a generalised curvilinear system, which lends itself to a wide range of complex flow problems.

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