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High-order Two-Fluid Plasma Solver for Direct Numerical Simulations of Magnetic Flows with Realistic Transport Phenomena ZHAORUI LI, Texas AM University-Corpus Christi, DANIEL LIVESCU, Los Alamos National Laboratory — The two-fluid plasma equations with full transport terms, including temperature and magnetic field dependent ion and electron viscous stresses and heat fluxes, frictional drag force, and ohmic heating term have been solved by using the sixth-order non-dissipative compact scheme for plasma flows in several different regimes. In order to be able to fully resolve all the dynamically relevant time and length scales while maintaining computational feasibility, the assumptions of infinite speed of light and negligible electron inertia have been made. The accuracy and robustness of this two-fluid plasma solver in handling plasma flows have been tested against a series of canonical problems, such as Alfven-Whistler dispersion relation, electromagnetic plasma shock, magnetic reconnection, etc. For all test cases, grid convergence tests have been conducted to achieve fully resolved results. The roles of heat flux, viscosity, resistivity, Hall and Biermann battery effects, are investigated for the canonical flows studied.

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