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High-Fidelity Simulations of Electrically-Charged Atomizing Diesel-Type Jets BENOIT GAILLARD, Ecoles de Saint-Cyr Coëtquidan, MARK OWKES, Montana State University, BRET VAN POPPEL, West Point Military Academy — Combustion of liquid fuels accounts for over a third of the energy usage today. Improving efficiency of combustion systems is critical to meet the energy needs while limiting environmental impacts. Additionally, a shift away from traditional fossil fuels to bio-derived alternatives requires fuel injection systems that can atomize fuels with a wide range of properties. In this work, the potential benefits of electrically-charged atomization is investigated using numerical simulations. Particularly, the electrostatic forces on the hydrodynamic jet are quantified and the impact of the forces is analyzed by comparing simulations of Diesel-type jets at realistic flow conditions. The simulations are performed using a state-of-the-art numerical framework that globally conserves mass, momentum, and the electric charge density even at the gas-liquid interface where discontinuities exist.

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