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Numerical study on influence of electric Reynolds and Peclet number's on electrohydrodynamic assisted atomization PATRICK SHEEHY[1], MARK OWKES[2], Montana State Univ — Electrohydrodynamics (EHD) has shown great potential for enhancing the atomization of liquid flows by decreasing droplet size and improving dispersion. For many fluid flows relevant to engineering, such as liquid fuel injection, two important fluid properties are the electric Reynolds and Peclet numbers (Re and Pe), which control how fast electric charges relax to the gas-liquid interface and the thickness of electric charge boundary layers. The effect of the numbers is not well understood due to the difficulty of measuring electric charges experimentally. Additionally, predicting the impact of electric charge distribution on atomization is difficult. For example, a smaller electric Re number causes a weaker electric field, higher charge concentrations at interface, and a non-trivial distribution of the Coulomb force. This work uses a numerical approach to simulate a two-phase EHD jet in order to examine the affect of these two non-dimensional numbers on atomization quality. The approach employed is second-order, conservative, and consistently transports the discontinuous electric charge density, momentum, and phase interface. Several three-dimensional test cases are simulated using this process for a range of Re and Pe numbers and comparisons are made.

[1]ME Master's Student
[2]Graduate Advisor

Patrick Sheehy
Montana State Univ

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