Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Transient High-Pressure Fuel Injection Processes DORRIN JARRAHBASHI, WILLIAM A. SIRIGNANO, University of California — The transient behavior of the jet emerging from the orifice during the start-up and shut-down portion of the injection is addressed. Use has been made of an unsteady axisymmetric code with a finite-volume solver of the Navier-Stokes equations for liquid streams and adjacent gas and a level-set method for liquid/gas interface tracking. The acceleration of the liquid during start-up is about 10^6 m/s^2 at the orifice exit. When the jet emerges from the orifice, drag forces due to the dense ambient air cause a deceleration. Also, the dynamic protrusions from the jet surface created by Kelvin-Helmholtz instability are subject to local accelerations that lead to Rayleigh-Taylor instability. The higher the Weber and the Reynolds numbers, the shorter the unstable surface wavelengths which appear; so, the more challenging is the resolution problem. Where resolving the entire jet becomes computationally expensive, we examine stream-wise segments of the jet, treating these segments as ballistic slugs coming from the orifice. This reduction of the computational domain is designed to give the required resolution to characterize the physics through our computations.

Dorrin Jarrahbashi
University of California

Date submitted: 10 Aug 2012 Electronic form version 1.4