Lawrence Livermore National Laboratory







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Hypersonic Shock-Droplet Interactions

Calvin J. Young Texas A&M University, Dept. of Mechanical Engineering How rapidly will a hypersonic shock wave vaporize a water droplet?

Bottom: Artificial schlieren ($\exp|\nabla \mathbf{p}|$)



- predictions (Reinecke)
- evaporation behaviors

Conclusions / Future Work

- Multiphase flow capabilities tested in Miranda
- Numerical Experiments able to provide data on droplet behavior and survival times
- Possible Cavitation breakup mechanism observed

Future Work:

- Parameter study; varied droplet diameters, varied Mach number, initial P,T (atmospheric/flight conditions)
- Variable acceleration/ shock coupled with expansion wave (compression wave)
- Development of reduced order models

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Disagreement in droplet breakup/survival time with empirical

Models fail to capture coupled time-dependent breakup,



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