APR08-2008-000122

Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

Turbulent shock processing, relevant to shock-cloud interactions[1]

J. FREDDY HANSEN, Lawrence Livermore National Laboratory, Livermore CA 94550, USA

The evolution of interstellar clouds following the passage of a supernova shock is an important astrophysical phenomenon; the shock passage may trigger star formation and the post-shock flow surrounding the clouds will strip them of material, effectively limiting cloud life times. Experiments conducted at the Omega laser attempt to (a) quantify the mass-stripping of a single cloud, and (b) simulate the effects of nearby clouds interacting with each other. A strong shock is driven (using 5 kJ of the 30 kJ Omega laser) into a cylinder filled with low-density foam with embedded 120 μm Al spheres simulating interstellar clouds. The density ratio between Al and foam is $\sim$9. Material is continuously being stripped from a cloud at a rate which is inconsistent with laminar models for mass-stripping; the cloud is fully stripped by 80 ns-100 ns, ten times faster than the laminar model. A new model for turbulent mass-stripping is developed [1,2] that agrees with the observed rate and which should scale to astrophysical conditions. Two interacting spherical clouds are observed to turn their upstream sections to face each other, a result that is completely opposite of earlier work [3] on two interacting cylinders. The difference between these two cases is explained by the relative strength of shocks reflected from the clouds. [1] J.F. Hansen et al, "Experiment on the Mass-Stripping of an Interstellar Cloud Following Shock Passage," *Astrophys. J.* **662,** 379-388 (2007). [2] J.F. Hansen et al, "Experiment on the mass-stripping of an interstellar cloud in a high Mach number post-shock flow," *Phys. Plasmas* **14,** 056505 (2007). [3] C. Tomkins et al, "A quantitative study of the interaction of two Richtmyer-Meshkov-unstable gas cylinders," *Phys. Fluids.* **15,** 986 (2003).

[1]LLNL-ABS-400167 prepared by LLNL under Contract DE-AC52-07NA27344. In collaboration with H. F. Robey, R. I. Klein, A. R. Miles, LLNL; C. F. McKee, University of California Berkeley.