Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Simulation of uranium plasma plume dynamics in atmospheric oxygen produced via femtosecond laser ablation[1] MIKHAIL FINKO, DAVIDE CURRELI, Univ. of Illinois Urbana-Champaign, MAGDI AZER, Illinois Applied Research Institute, DAVID WEISZ, JONATHAN CROWHURST, TIMOTHY ROSE, BATIKAN KOROGLU, HARRY RADOUSKY, JOSEPH ZAUG, MIKE ARMSTRONG, Lawrence Livermore National Laboratory — The use of laser ablation for the study of uranium plasma chemistry in atmospheric ablation plumes is highly relevant for nuclear forensics and standoff detection, but the behavior of such systems is currently not well understood. One of the main difficulties with studying these systems is that the already considerable complexity of plume dynamics in vacuum conditions is further enhanced by shockwave formation and plasma-chemical behavior in reactive, atmospheric environments. In order to account for both the transport and kinetics of uranium in atmospheric oxygen, we have constructed a 2D compressible, reactive, multi-species fluid model of femtosecond laser ablation plumes. The model captures both the complex compressible dynamics of the ablation shockwave and the stratification of the ablation plume into regions of varying reactivity and molecular composition. The model allows for a detailed analysis of the spatial and temporal evolution of both the fluid moments and the major plasma-chemical species concentrations of the ablation plume.

[1]This project was sponsored by the DoD, Defense Threat Reduction Agency, grant HDTRA1-16- 1-0020. This work was performed in part under the auspices of the U.S. DoE by Lawrence Livermore National Laboratory under Contract DE-AC5207NA27344.

Mikhail Finko
Univ of Illinois - Urbana

Date submitted: 13 Jun 2018 Electronic form version 1.4