ePLAS modeling of laser induced lightning streamers[1] W. ATCHI-SON, R.J. MASON, Research Applications Corp, J. ZINN, Sumner Associates —
The ePLAS code is a derivative of ANTHEM[2] originally developed to model long pulse laser interactions. The code has been enhanced to treat opening switch plasmas, plasma jets, and short pulse laser interactions with cones and wires.[3] We address new features for application to lightning and guided arcs. ePLAS models collisional background plasma with cold electron and ion components. Self-consistent *E- and B*-fields are determined implicitly for time steps well beyond the plasma period; hybridization permits spatial scales exceeding the Debye length. For lightning studies an initial start-up potential in a strongly ionized region has been added, plus "air chemistry" to create additional plasma in intense, propagating $E-$field regions at the leading edge of "streamers." We discuss the motion of both positive and negative streamers in nitrogen on nanosecond time scales, showing streamer guidance in added plasma seeded by a laser. *B*-field inclusion permits the study of return strikes.

[2]R. J. Mason, J. Comp. Phys. 71, 429 (1987)
[3]R. J. Mason, et al., Bull. Am. Phys. Soc. 53, 152 (2008).

Rodney Mason
Research Applications Corp

Date submitted: 13 Jul 2009   Electronic form version 1.4