Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Numerical investigations on some lightning phenomena JEAN-FRANCOIS RIPOLL, CHRISTOFFER JEFFERY, PATRICK COLESTOCK, JOHN ZINN, ISR-2, Los Alamos National Laboratory — We currently use and develop a cylindrical coupled radiation-hydrodynamic code which contains over 600 chemical reaction and ionization equations that are essential for the detailed multi-spectral predication of air opacity. These hydrodynamic methods and detailed chemistry allow us simulating the lightning return stroke, which is the radiating shock wave of hot ionized air produced by the electrical discharge. Our longterm goals are (i) the understanding the complex chemical reactions (e.g. formation of NOx, destruction of ozone, etc.) that occur during a lightning discharge and their cumulative effect on atmospheric chemistry and composition, and (ii) determining the multi-spectral radiation signature of a lightning discharge for different altitudes. We will discuss some of the lightning signatures we simulate. In addition, we have coupled to our code a simplified Maxwell system which allows resolving the discharge growth and the air plasma formation in the return stroke. We will show how we simulate the creation of the lightning channel followed by its expansion.

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Date submitted: 04 Aug 2006 Electronic form version 1.4