1023-35-1521 **Beyza Caliskan Aslan*** (aslan@math.ufl.edu), Department of Mathematics, 358 Little Hall, PO Box 118105, Gainesville, FL 32611-8105, and **William W Hager** (hager@math.ufl.edu), Department of Mathematics, 358 Little Hall, PO Box 118105, Gainesville, FL 32611-8105. *A continuous approach to the lightning discharge.* Preliminary report.

In earlier work W.W. Hager developed the following approach for modeling a lightning discharge: The continuous partial differential equation describing the electric potential was discretized, and integrated forward in time. Whenever the electric field reached the breakdown threshold in some region of the atmosphere, the associated conductivity parameter in the discrete equation was taken to infinity. An explicit formula for the limiting potential was obtained. In this talk, we continue our development of a continuous version of this model. Previously, we analyzed Maxwell's equations in one-dimension and obtained a formula for the limiting potential as conductivity tends to infinity on a line segment in the one-dimensional domain. Now we consider Maxwell's equations in three dimensions and obtain a formula for the limiting potential as conductivity tends to infinity in a three-dimensional subdomain (the lightning channel) of the modeled domain. The limit is expressed in terms of the eigenfunctions for a generalized eigenvalue problem for the Laplacian operator. The potential in the breakdown region can be expressed in terms of a harmonic function which is constant in the breakdown region. (Received September 26, 2006)