

# An existence result and simulations of a space charges problem applied to HVDC transmission lines

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The large-scale development of renewable energies induces new challenges for the transmission of electricity over high-voltage lines. In this context, it makes sense to use direct current instead of alternative current, as is the case nowadays. However, not only does direct current transmission increase air ionization, but the constant polarisation also generates space charges. Our aim is to study the system of non-linear partial differential equations modelling this phenomenon. In this work, we will present an existence result obtained by adding a viscosity term to the so-called continuity equation and passing to the limit in the viscosity coefficient. We will also propose a numerical method, based on a least-squares minimization algorithm. Numerical results will be validated by comparison with analytical solutions on a simple geometry. Results on more realistic geometries will also be presented.