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Using Sensitivity Derivatives for Design and Computing Error Bounds in an Atmospheric Plasma Discharge Simulation[1] KYLE LANGE, W. KYLE ANDERSON, SimCenter: National Center for Computational Engineering - University of Tennessee at Chattanooga — The problem of applying sensitivity analysis to a one-dimensional atmospheric radio frequency plasma discharge simulation is considered. The derivations of forward mode direct differentiation and the reverse mode adjoint method are presented. Sensitivity derivatives computed from these methods are then shown to match derivatives computed using finite differences. It is then demonstrated how sensitivity derivatives can be used within a design cycle to change experimentally variable quantities so as to increase or decrease a given cost function. It is also shown how sensitivity derivatives of rate and transport parameters can be used to compute error bounds for the computation of a given cost function. Finally, it is described how sensitivity analysis could be used in conjunction with experimental data to obtain better estimates for rate and transport parameters.

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