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Modeling of Optical Emissions from Red Sprites

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We have benchmarked our optical model (POEM, the Physics Based Optical Emission Model) with various laboratory air fluorescence experiments after making significant improvements to the model with regards to such issues as collisional quenching, thus increasing our level of confidence in the model. We have transferred features from our benchmarked air fluorescence model to a sprite modeling version of the POEM code. We will show results from a fully 2-D electromagnetic model known as UNIMAX (the Unified Maxwell code) and the improved POEM optical model to demonstrate the level of agreement between the simulations and several optical measurements (camera, photometer, and spectral measurements) of sprites, including those we believe to involve the phenomena of runaway electron breakdown. We model optical emissions across the spectral range from 300 – 1000 nm. We will distinguish which measurements and model results are indicative of conventional breakdown and which are indicative of runaway breakdown.