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Short (ns) and Medium (s) Time Scale Plasma Induced Changes in Refractive Index of Atmospheric Air CHRIS CAMPBELL, KENNETH EVANS, DAVID STAACK, Texas A&M University — Evidence of changes in the refractive index of air caused by pulsed atmospheric glow discharges induced by an applied electric field is presented and discussed. These are due to both thermodynamic and electron density effects. This variable refractive index can theoretically be used to create a method of atmospheric disturbance correction, by affecting the wave fronts of incident laser light. This investigation focused on determining the magnitude and rise time of this effect, which are of interest to the above application. A raytracing model through a plasma disturbance was used to predict the refractive index change, in parallel with experimental measurement. In experiment, an atmospheric glow discharge with a gap width of 2 mm gave rise to a maximum optical path length difference (OPD) of 0.15 μm. This change occurred within 1 ms, which is in agreement with prediction for thermal modes. In addition at shorter time scales due to a combination of shock wave, thermal and electron density effects of a transient discharge initiation larger OPD changes with a rise time of approximately 100 ns is observed.

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