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Plasma Generated and Sustained in Air by the Double Laser Pulses MIKHAIL SHNEIDER, Princeton University, Princeton, NJ, ALEXEI ZHELTIKOV, Texas A&M University, College Station, TX, RICHARD MILES, Princeton University — Sequences of laser pulses offer an advantageous tool providing access to the control of air-plasma dynamics and optical interactions. A detailed 1D model of plasma dynamics, which self-consistently integrates plasma-kinetic, Navier-Stokes, electron heat conduction, and electron-vibration energy transfer equations is developed to quantify the plasma filaments induced in the atmosphere through filamentation with high-intensity ultrashort laser pulses further sustained by long laser pulses. It is shown that near- and mid-infrared laser pulses can tailor plasma decay in the wake of a filament, efficiently suppressing the attachment of electrons to neutral species and dissociative recombination. Laser pulses with higher intensities can give rise to efficient ionization and heating of the postfilament plasma, eventually inducing a highly conductive arc discharge. However, the plasma-filament-heating-pulse longitudinally uniform interaction length is limited due to the self-defocusing of the heating beam. This effect becomes important when subsequent heating laser pulse is focused to values close to breakdown, and it depends on the laser wavelength.

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