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Large Eddy Simulation of Radiation Effects on Pollutant Emissions in Diluted Turbulent Premixed Flames A. CODY NUNNO, MICHAEL E. MUELLER, Princeton University — Radiation effects are examined in turbulent premixed flames using a detailed Large Eddy Simulation (LES) approach. The approach combines a tabulated premixed flamelet model (Flamelet Generated Manifolds) with an optically thin radiation model. Radiation heat loss is tracked using an enthalpy deficit coordinate. Heat loss in the flamelets is calculated by varying a coefficient on the radiation source term, ranging from zero (adiabatic) to unity (full optically thin heat loss). NOx emissions are modeled with an additional transport equation that is able to capture unsteady effects resulting from slow kinetics. The model is compared against experimental measurements of methane-air piloted turbulent premixed planar jet flames with increasing levels of water dilution that maintain a constant adiabatic flame temperature. The effects of water dilution on global flame structure and NO emissions resulting directly and indirectly from radiation are examined in detail.

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