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SYMPOSIUM KEYNOTE LECTURE

LASER DIAGNOSTICS FOR DETONATION STUDIES

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Abstract. *Compared to classical constant volume or constant pressure combustion, the detonation regime of combustion has the potential to increase the efficiency of engines and reduce carbon emission in the atmosphere. However, the development of efficient and reliable detonation engines is challenging, and several issues must be addressed. While the measurement of temperature and chemical species is of current practice in conventional combustion processes (laminar and turbulent flames), the experimental characterization of detonation historically relies on the determination of macroscopic parameters such as mean detonation velocity, global pressure, and density gradient structure. For example, concentration of hydroxyl radical (OH) fields in a detonation front have never been measured, probably due to three main difficulties: (i) the required spatial and temporal resolution, (ii) the potential thermal non-equilibrium conditions behind the shock, (ii) the lack of validated chemical kinetics and combined spectroscopic models. Such a lack of quantitative information hinders the validation of detailed numerical simulations of detonations, which are of primary importance for the development of industrial detonation engines for propulsion and energy production. In this lecture, I will present a brief review of recent results obtained with optical diagnostics applied to detonations, then I will introduce our effort in this field. More specifically, I will detail an optimization of OH laser induced fluorescence measurements for hydrogen-fueled detonations.*