Contribution ID: **13** Type: **Short Talk**

NUMERICAL INVESTIGATION OF SOOT FORMATION IN A LABORATORY-SCALE RICH-QUENCH-LEAN SWIRL BURNER USING NEK5000

Tuesday, July 30, 2024 2:00 PM (20 minutes)

The primary objective of this study is to employ a DNS framework to replicate the intricate phenomena of a laboratory-scale soot configuration, specifically the UCAM RQL (Rich-burn Quick-quench Lean-burn) Burner . The moment-based soot model MOMIC was integrated into the high-order CFD code Nek5000 with the development of an in-house plugin, establishing a framework to assess the accuracy and predictive capabilities of the code in adequately evaluating parameters strongly related with the formation of soot particles and delve into the underlying turbulence-chemistry-soot interactions. The inlet of the laboratory scale aero-engine UCAM RQL burner is composed of two concentric pipes, where ethylene flows through the inner pipe and the primary air flows through the outer pipe in a swirling motion imposed by an axial swirler, resulting in intense turbulent mixing inside the burning chamber. The reactive Navier-Stokes equations in the formulation of low-Mach number regime and Nek5000's reactive plug-in was employed to calculate the thermal and transport properties along the chemical source terms. A 62-species reduced version of the ABF mechanism was utilized as the chemical mechanism in order to incorporate large soot PAH precursors up to A4.

Relevance for Nek [100 words max]

Soot with nek5000.

Primary author: PAPAGEORGIOU, Dimitris (Aristotle University of Thessaloniki)

Co-authors: TOMBOULIDES, Ananias (Aristotle University of Thessaloniki); FROUZAKIS, Christos E. (ETH Zürich); KAVROULAKIS, Ioannis (Aristotle University of Thessaloniki)

Presenter: PAPAGEORGIOU, Dimitris (Aristotle University of Thessaloniki)