Special CEAFM Seminar: Spring 2017

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Tuesday, April 4, 2017** (Special Date)

Time: 2:00 p.m. (Special Time)

Location: Latrobe Hall 106 (Special Location)

Speaker: **Prof. César Dopazo** (University of Zaragoza, Spain)

Title: ***"Premixed Turbulent Combustion: Some Unsettled Issues"***

Abstract

Premixed combustion is the cornerstone of advanced, efficient and low emission propulsion and energy generation technologies. Experimental and modeling activities, driven by the need to predict the behavior of commercial systems, are intense. Although, in the 1980's the USA-NSF considered the combustion discipline to be a "mature subject", uncertainties in modeling still hamper the use of CFD as a design tool. Direct numerical simulation (DNS) tools, complemented with rigorous theoretical analyses, allow the development of physical insight into combustion/flow processes.

A kinematic analysis of premixed flame non-material elements (lines, surfaces and volumes) leads the way to the formulation of some important questions:

- How does the flame displacement speed, relative to the fluid, influence its absolute local motion, flow and scalar structures?
- What is the relative importance of flow strain and rotation rates compared to their "added" counterparts due to the flame displacement speed?
- Can a highly unsteady flow velocity normal to a flame significantly modify its internal structure?
- How does the vorticity evolve across a flame?

Several DNS data sets of turbulent premixed combustion are used to answer these issues.