"Mini-Symposium on LES Modeling of Oxycoal Combustion"

at the

15th International Conference on Numerical Combustion

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organized by

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Abstract:

A major part of the carbon dioxide emissions due to human activities come from fossil fuels. Three main approaches are currently used to capture such undesirable carbon dioxide, namely, pre-combustion capture, post-combustion capture, and oxy-fuel combustion. Oxycoal combustion is energetically favorable, but features complex unsteady fluid flow, mass and heat transfer interaction processes along with heterogeneous combustion and radiation in an atmosphere that is not usually studied. In order to foster the understanding of these interacting processes and to support the exploration of design concepts for oxy-fuel burners, boilers and combustors while minimizing trial-and-error iterations, reliable CFD tools are essential.

The mini-symposium was a two-hour session devoted to well-focused subjects on numerical combustion. It intended to highlight some achievements accomplished around the world and to provide the state of the art in terms of (a) reliable modelling approaches for the simulation of oxy-fuel combustion systems, (b) appropriate numerical tools that incorporate validated sub-models and mechanisms into CFD, and (c) validation/uncertainty quantification issues for LES of oxy-fuel combustion. Especially efforts related to developing CFD for oxy-coal combustion have been reported and discussed with particular emphasis on CFD tools based on Large Eddy Simulation techniques. The mini-symposium consisted in four 25-min presentations, with additional 5 min for discussions.

Contributions:

(1) Developing and Validating an Oxy-Fuel CFD Modelling Methodology

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(2) LES and RANS of pulverized coal oxy-combustion in swirl burners

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(3) Oxy-coal power boiler simulation and validation through extreme computing

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(4) High-Fidelity Models for Coal Combustion: Towards High-Temperature Oxy-coal for direct power extraction

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