IAFSS Working Group on Measurement and Computation of Fire Phenomena (*MaCFP*)

Call for Participation – January 28, 2016

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- **The MaCFP Working Group**
  - A new initiative endorsed by the International Association for Fire Safety Science (IAFSS, http://www.iafss.org)

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- **Motivation**
  - Fire modeling community (modelers and experimentalists) is small, fragmented, geographically dispersed, without a history of well-defined standards and without a consensus on well-defined objectives
  - There is a need for a coordinated effort to organize and strengthen the fire modeling community

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- **General objective**
  - A joint effort between experimentalists and modelers to develop a fundamental understanding of fire phenomena and to establish a common framework for fire modeling research

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- **Format**
  - A regular series of workshops, with a first workshop organized as a pre-event to the 12th IAFSS Symposium in Lund (June 2017) and subsequent workshops held every two years

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- **Brief history**
  - Pre-Symposium workshop "*Benchmarking/Data Sharing*" at the 11th IAFSS Symposium in Christchurch (February 2014)
  - Task group
    - A. Brown, S. Dorofeev, G. Jomaas, R. McDermott, B. Merci (*co-Chair*), V. Raman, A. Simeoni, J. Torero, A. Trouvé (*co-Chair*), P. van Hees, Y. Wang
    - White paper
    - Endorsement of IAFSS (March 2015)
  - Planning meeting (May 2015)
    - List of target experiments for first MaCFP Workshop (June 2017)
    - Organizing Committee

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- **Specific objectives/deliverables**
  - Develop a digital archive of well-documented target fire experiments that can be used for CFD model validation
  - Develop a digital archive of corresponding well-documented CFD-based numerical simulations
  - Develop protocols for detailed comparisons between computational results and experimental measurements
  - Identify key research topics and knowledge gaps in computational and experimental fire research
  - Develop best practices in both computational and experimental fire research (*e.g.*, quality control, UQ)
  - Establish a network between fire researchers and provide a community-wide forum for discussion

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- **First workshop**
  - Proposed dates: June 10-11 2017 (TBC)
  - Organizing Committee
    - A. Brown, M. Gollner, J. Hewson, A. Marshall, R. McDermott, B. Merci (*co-Chair*), J. Torero (*co-Chair*), A. Trouvé (*co-Chair*), Y. Wang, B. Weckman
  - Website: http://www.iafss.org/macfp/

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- **List of target experiments**:
  - ✓ Basic configurations (building blocks) with carefully-controlled conditions and quality instrumentation; and with available databases
  - ✓ Initial choices: simple flames (in most cases, with no/little soot); with gaseous/liquid fuel (no solid fuel); and with open burn conditions (no compartment)

  - *Category* 1: Turbulent buoyant plumes
  - *Category* 2: Turbulent pool fires with gaseous fuel
  - *Category* 3: Turbulent pool fires with liquid fuel
  - *Category* 4: Turbulent wall fires
  - *Category* 5: Flame extinction

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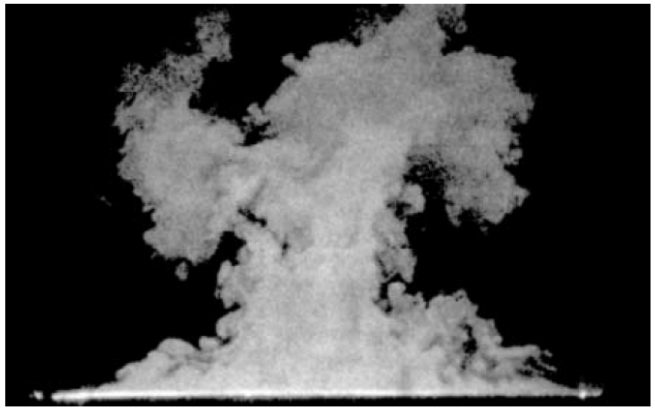

- **List of target experiments**:
  - *Category* 1: Turbulent buoyant plumes
    - O'Hern, Weckman, Gerhart, Tieszen, Schefer, *J. Fluid Mech.*, **544** (2005) 143-171
      - *Configuration*: large (1-m diameter) helium plume
      - *Features*: Rayleigh-Taylor instabilities at both large-scales (puffing motion) and small-scales (bubble and spike structures)
      - *Data*: measurements of flow velocity (PIV) and helium mass fraction (PLIF) with both first- and second-order statistical moments

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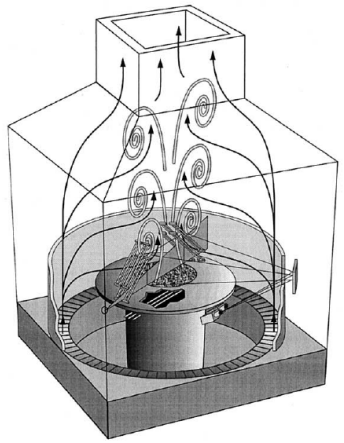

- **List of target experiments**:
  - *Category* 2: Turbulent pool fires with gaseous fuel (and prescribed fuel flow rate)
    - Tieszen, O'Hern, Schefer, Weckman, Blanchat, *Combust. Flame*, **129** (2002) 378-391
    - Tieszen, O'Hern, Weckman, Schefer, *Combust. Flame*, **139** (2004) 126-141
      - *Configuration*: large (1-m diameter) methane- or hydrogen-air flame
      - *Features*: Rayleigh-Taylor instabilities at large-scales (puffing motion)
      - *Data*: measurements of flow velocity (PIV) with both first- and second-order statistical moments. Data are limited to the flame base region (below 0.8 m elevation).

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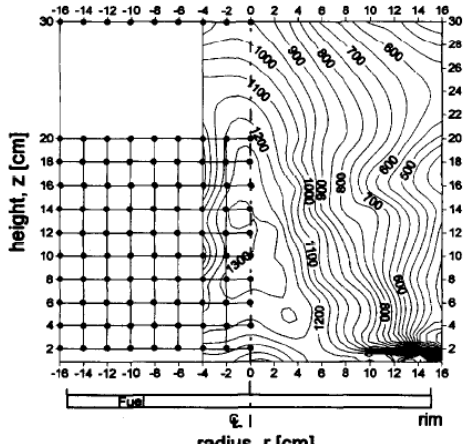

- **List of target experiments**:
  - *Category* 3: Turbulent pool fires with liquid fuel (and thermal-feedback-driven fuel flow rate)
    - Weckman, Strong, *Combust. Flame*, **105** (1996) 245-266
      - *Configuration*: medium-scale (31-cm diameter) methanol- or acetone-air (unpublished) flame
      - *Data*: simultaneous measurements of flow velocity (LDV) and temperature (fine wire thermocouples) with first- and second-order statistical moments

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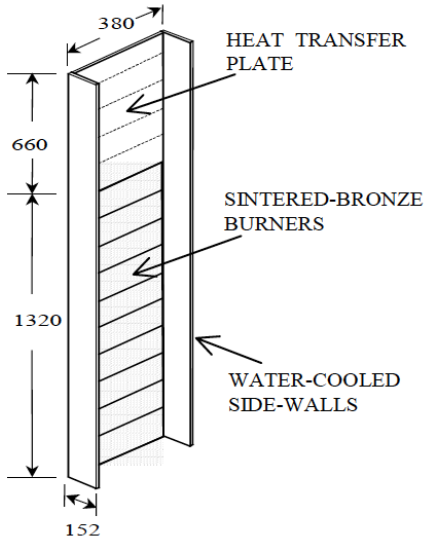
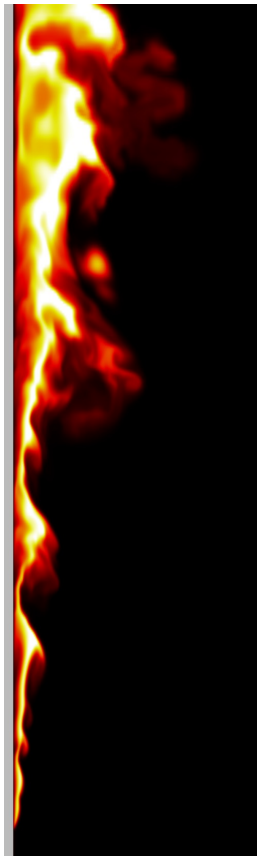


- **List of target experiments**:
  - *Category* 4: Turbulent wall fires
    - de Ris, Markstein, Orloff, Beaulieu, Factory Mutual Research Tech. Report J.I. 0D0J9.MT (1999)
    - de Ris, Markstein, Orloff, Beaulieu, *Fire Safety Science – Proc. Seventh Intl. Symposium*, *IAFSS,* (2002) 259-270
      - *Configuration*: large (meter-scale) turbulent vertical wall flames in configurations with a prescribed gaseous fuel flow rate; different fuels (methane, ethane, ethylene, propylene) and different fuel flow rates
      - *Data*: measurements of the total wall heat flux and temperature (thermocouples). For some cases, the experimental database also includes measurements of the flow velocity (LDV)



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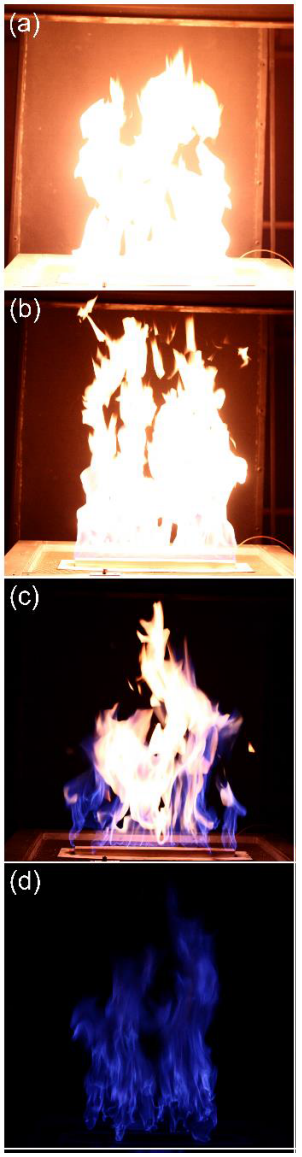
- **List of target experiments**:
  - *Category* 5: Flame extinction
    - White, Link, Trouvé, Sunderland, Marshall, Sheffel, Corn, Colket, Chaos, Yu, *Fire Safety J.*, **76** (2015) 74-84
      - *Configuration*: medium-scale methane- or propane-air flames (Wolfhard-Parker slot burner); prescribed co-flow of variable oxygen strength (mixture of air and nitrogen)
      - *Features*: oxygen extinction limit
      - *Data*: measurements of the global radiative loss fraction (single-point heat flux sensor combined with a weighted multipoint radiation source model), the global combustion efficiency (O_2 and CO_2 calorimetry), temperature (micro-thermocouples)



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- **Repository**
  - Hosted on GitHub (https://github.com/MaCFP)
  - Descriptions of each selected target experiment
  - Electronic copies of experimental data organized in simple comma-delimited ASCII files
  - Protocols to perform comparisons between experimental data and simulation results based on (provided) MATLAB-based post-processing tools
  - Electronic copies of computational results submitted by researchers, also organized in simple comma-delimited ASCII files

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Call for Participation

- Invitation to the members of the entire fire research community to participate in the first MaCFP workshop
- You can participate in one or both of the following ways:
  - From now until June 2017: participate in the planning of the workshop by interacting with the organizing committee and generating/contributing simulation results to be discussed at the workshop (http://www.iafss.org/macfp/)
  - June 10-11, 2017: attend and participate in the workshop
- Additional issues (to be discussed at the first workshop)
  - Composition of the MaCFP Working Group
  - Selection of new target experiments for the 2nd workshop