

Letter to the Editor

IAFSS Working Group on Measurement and Computation of Fire Phenomena

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A new initiative, endorsed and supported by the International Association for Fire Safety Science (IAFSS) [1], has been launched: “the IAFSS Working Group on Measurement and Computation of Fire Phenomena” (or the MaCFP Working Group). The primary objective of this letter is to engage the members of the fire research community to participate in the first workshop organized by the MaCFP Working Group and which is scheduled as a pre-event to the 12th IAFSS Symposium in Lund, Sweden, in June 2017 [2]. Constantly updated information on the MaCFP Working Group effort is found in [3].

1. Background and Motivation

The general objective of the MaCFP Working Group is to establish a structured effort in the fire research community to make significant and systematic progress in fire modeling, based on a fundamental understanding of fire phenomena. This is to be achieved as a joint effort between experimentalists and modelers, identifying key research topics of interest as well as knowledge gaps, and thereby establishing a common framework for fire modeling research. The MaCFP Working Group is intended as an open, community-wide, international collaboration between fire scientists. It is also intended to become a regular series of workshops, with workshops held every 2 years.

The MaCFP Working Group is modeled after the successful example of the TNF Workshop [4] and is tailored to the needs of fire modeling. The TNF Workshop was established approximately 20 years ago in the combustion science community and has since then emerged as an exceptionally effective framework for the collaborative development and promotion of the field of turbulent combustion. The TNF Workshop offers: (1) a digital library of well-documented target flame experiments; (2) examples of comparisons between experimental measurements

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and simulation results; and (3) the active participation and support of the entire turbulent combustion scientific community in the data collection and analysis. The MaCFP Working Group aims to achieve similar benefits.

The MaCFP initiative was started following discussions that took place in February 2014 at the 11th IAFSS Symposium [5], in particular during a pre-Symposium workshop entitled “Benchmarking/Data Sharing” with the participation of Prof. Assaad Masri (University of Sydney, Australia, and co-founding member of the TNF Workshop) as guest speaker. These discussions led to the formation of a Task Group of fire researchers (both modelers and experimentalists) on the topic of the experimental validation of CFD-based fire models. The Task Group produced a white paper [6] and subsequently received the endorsement of IAFSS in March 2015. This was followed by a planning meeting in May 2015 during which a list of target experimental databases was produced, deemed suitable for validation of fire models. This list brings structure and focus to the MaCFP effort for the coming 18 months and essentially defines the bulk of the program of the upcoming first MaCFP workshop.

2. Objectives

As mentioned, the central objective of the MaCFP Working Group is to develop a fundamental understanding of fire phenomena and to advance predictive fire modeling. The strategy is based on the study of elementary academic problems and a gradual move towards complexity and realism by following a building block approach to model development. The new MaCFP workshop series is intended to be complementary to both the existing Verification and Validation guides developed in support of the FDS fire modeling software [7] and the FM Global Open Source Fire Modeling Workshop series [8].

The specific objectives of the MaCFP Working Group are to:

- Develop a digital archive of well-documented fire experiments that can be used as targets for CFD model validation;
- Develop a digital archive of well-documented CFD-based numerical simulations corresponding to the selected target experiments;
- 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 (including quality control and quantification of uncertainties);
- Establish a network between fire researchers and provide a community-wide forum for discussion and exchange of information.

The initial list of target experiments identified by the MaCFP Working Group includes five categories:

- *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.

These target experiments correspond to basic configurations (building blocks) with carefully-controlled conditions and quality instrumentation and diagnostics. They also correspond to available open databases. This list will be enhanced after the first workshop.

3. MaCFP Repository

The MaCFP repository is hosted on GitHub [9] and is under development. The repository already contains or will soon contain:

- A description of each selected target experiment (organized according to the categories (1) to (5) mentioned above), including a description of the experimental configuration and a description of measured quantities and measurement uncertainties (if known);
- An electronic copy 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.

Furthermore, the repository is meant to host the contributions submitted by different modelers in preparation of the first MaCFP workshop. It will therefore also contain an electronic copy of computational results submitted by researchers, also organized in simple comma-delimited ASCII files.

The repository was created and is managed by Dr. Randy McDermott (National Institute of Standards and Technology, USA).

4. June 2017 Workshop

The first MaCFP workshop will be organized immediately before the 12th IAFSS Symposium, on June 10 to 11 2017 (dates may be subject to change).

The organizing committee for the first MaCFP workshop is composed of:

- Alexander Brown Sandia National Laboratories, USA
- Michael Gollner University of Maryland, USA
- John Hewson Sandia National Laboratories, USA
- Andre Marshall University of Maryland, USA
- Randy McDermott National Institute of Standards and Technology, USA
- Bart Merci (*Co-Chair*) Ghent University, Belgium
- Jose Torero (*Co-Chair*) University of Queensland, Australia

- Arnaud Trouvé (*Co-Chair*) University of Maryland, USA
- Yi Wang FM Global, USA
- Beth Weckman University of Waterloo, Canada

The exact format of the workshop is yet to be determined but is likely to be a mix of poster/oral presentations by researchers, one or two plenary talks by invited keynote speakers and group/panel discussions, guided by plenary introductions and concluded by reports of main outcomes. It is intended to be centered on in-depth topical discussions. Proceedings will be edited and put online on the MaCFP website [3]. The proceedings are intended to review progress, summarize accomplishments of the workshop and provide guidance with clear objectives for the next workshop.

5. Call for Participation

The MaCFP Working Group is inviting the members of the entire fire research community to participate in the first workshop. While the workshop topic is of direct interest to experimental and computational fire researchers, the workshop should also be of broad interest to the community at large. Registration to the June 2017 workshop will be fully open.

Members of the fire research community can participate in one or both of the following ways. From now until June 2017, interested individuals/organizations can participate in the planning of the workshop by interacting with the organizing committee and generating/contributing simulation results to be discussed at the workshop. On June 10 to 11, 2017, interested individuals/organizations can attend and participate in the discussions at the workshop.

Important issues like membership to the organizing committee of the MaCFP Working Group and the selection of new target experiments for the second MaCFP workshop will also be discussed at the first workshop. Suggestions on these topics are also welcome anytime.

The organizing committee of the MaCFP Working Group is looking forward to welcoming many of you in its effort and to holding its first workshop at the 12th IAFSS Symposium in June 2017.

References

1. <http://www.iafss.org>
2. <http://www.iafss.org/save-the-date-12th-iafss-symposium/>
3. <http://www.iafss.org/macfp/>
4. <http://www.sandia.gov/TNF/abstract.html>
5. <http://www.iafss.org/symposium/11th-symposium/>
6. http://www.iafss.org/portal/wp-content/uploads/MaCFP-white_paper.pdf
7. <http://firemodels.github.io/fds-smv/>
8. <https://sites.google.com/site/firemodelingworkshop/>
9. <https://github.com/MaCFP>