

COMBUSTION WEBINAR

Nonlinear and stochastic thermoacoustic dynamics in combustors during steady and transient operation

Speaker: Nicolas Noiray, ETH Zürich

Time: Sept. 11th 2021

10 am EST; 16:00 Paris; 22:00 Beijing.

Zoom Meeting ID: 959 5515 8623

Passcode: combustion

Check <https://sun.ae.gatech.edu/combustion-webinar>

for details or directly contact wenting.sun@aerospace.gatech.edu



COMBUSTION
WEBINAR



Abstract: This talk deals with thermoacoustic instabilities in gas turbine and aeroengine combustors. Several intriguing phenomena observed experimentally will be presented in order to illustrate the complexity of thermoacoustic dynamics in practical systems. We will discuss how low-order models based on stochastic differential equations and Fokker-Planck equations can reproduce the corresponding nonlinear and stochastic dynamics. The examples examined during this presentation include the thermoacoustic intermittency observed with a swirled turbulent flame for quasi-steady and fast changes of the equivalence ratio, the synchronization of two thermoacoustic eigenmodes in a sequential combustor, the active control of thermoacoustic instabilities using nanosecond plasma discharges, the thermoacoustic bursts occurring during the blow-off of the first-stage flame in a sequential combustor, and the beating azimuthal modes observed in an annular combustor.

Biography: Nicolas Noiray is Associate Professor at ETH Zürich, where he leads the laboratory of “Combustion and Acoustics for Power and Propulsion Systems” since August 2014. He obtained his Ph.D. from the Ecole Centrale Paris in 2007, and then worked in the Gas Turbine Research Division of Alstom until his appointment at ETH. His research focuses on the modeling and control of reacting and non-reacting flows, and on the development of new technologies for the energy and transport sectors. He has received the Silver Medal and the Hiroshi Tsuji Early Career Researcher Award of the International Combustion Institute, and he was awarded a Consolidator Grant by the European Research Council. A key theme of the experimental, theoretical and numerical research performed by his group is the study of flow instabilities at various time and length scales.

Combustion Webinar Organization Committees

Advisory Committee

Yiguang Ju (Princeton University)
Fei Qi (Shanghai Jiao Tong University)
Philippe Dagaut (CNRS-INSIS)
Gautam Kalghatgi (Univ of Oxford/Saudi Aramco)
Med Colket (RTRC, Retired)

Chung K. (Ed) Law (Princeton University)
Katharina Kohse-Höinghaus (University of Bielefeld)
Kaoru Maruta (Tohoku University)
Kelly Senecal (Convergent Science)
Toshiro Fujimori (IHI Inc.)

Technical Committee

Wenting Sun (Georgia Tech) **Co-Chair**
Lorenz R Boeck (FM global)
Liming Cai (Tongji University)
Zheng Chen (Peking University)
Matthew Cleary (The University of Sydney)
Stephen Dooley (Trinity College Dublin)
Tiegang Fang (North Carolina State University)
Aamir Farooq (KAUST)
Michael Gollner (UC Berkeley)
Wang Han (The University of Edinburgh)
Jean-Pierre Hickey (U. Waterloo)
Xinyan Huang (Hong Kong Polytech Univ.)
Tai Jin (Zhejiang University)
Tina Kasper (University Duisburg-Essen)

Isaac Boxx (DLR) **Co-Chair**
Deanna Lacoste (KAUST)
Davide Laera (CERFACS)
Joseph Lefkowitz (Technion)
Qili Liu (Purdue University)
Yushuai Liu (IET, CAS)
Zhandong Wang (USTC)
Nicolas Noiray (ETH Zurich)
Guillermo Rein (Imperial College London)
Xingjian Wang (Florida Institute of Technology)
Jun Xia (Brunel University London)
Huahua Xiao (USTC)
Dong Yang (SUSTech)
Suo Yang (University of Minnesota)
Peng Zhao (University of Tennessee, Knoxville)

Disclaimer

- The presentation materials and comments made by the lecturer and participants are only for research and education purposes.
- All presentation materials are the sole properties of the lecturer and the Combustion Webinar organizer, and cannot be published and disseminated without written approvals from both parties.
- This lecture may be recorded and released to public.
- **Please use Chat or Raise Hand to ask your questions.**
- **Please turnoff microphone. Webinar will be locked after 30 minutes.**
- **Recorded lectures are on *Combustion Webinar YouTube Channel***
https://www.youtube.com/channel/UCSsO7e9VIn__RejSiAPF0JA