COMBUSTION WEBINAR

Intrinsic thermoacoustic feedback and its consequences for combustion noise and combustion dynamics

Speaker: Prof. Wolfgang Polifke , TU Munich

Time: April 30th 2022
10:00 NYC; 16:00 Paris; 22:00 Beijing.

Zoom Meeting ID: 959 5515 8623
Passcode: combustion
Check https://sun.ae.gatech.edu/combustion-webinar

COMBUSTION WEBINAR

Biography: Wolfgang Polifke studied physics at the University of Regensburg, the University of Colorado in Boulder and the City College of New York (1981-87). His doctoral thesis dealt with the helicity of turbulent flows (City University of New York, 1990). He then spent almost a decade at ABB's corporate research center in Baden-Dättwil, Switzerland, working on fundamental aspects of gas turbine combustion technology. In 1999, Prof. Polifke was appointed professor at TUM. His research areas include thermoacoustic combustion instabilities, aeroacoustics as well as mixing and reaction in turbulent flows. From 2016 to 2021 Prof. Polifke was Editor-in-Chief of the Int'l. J. for Spray and Combustion Dynamics. Since 2017 he has served as Associate Editor on the editorial board of Combustion and Flame. In 2021 he was elected as Fellow of the International Combustion Institute.

Abstract: Thermoacoustic combustion instabilities represent a severe challenge for the development and reliable operation of efficient, flexible and low-emission combustion technology in gas turbines and rocket engines as well as industrial or domestic burners. Traditionally, thermoacoustic modes were understood to be associated with acoustic cavity modes of the combustion system. The discovery of the intrinsic thermoacoustic (ITA) feedback loop and associated eigenmodes shattered this paradigm: the complete set of eigenmodes of a combustor is now understood to be the aggregate of acoustic and ITA modes.

In this talk I will first reminisce from a personal perspective about the studies that led to the discovery of ITA feedback and ITA modes. Then I will present the current understanding of the structure and characteristic properties of ITA modes before exploring consequences of ITA feedback, such as convective scaling of thermoacoustic eigenfrequencies, resonant amplification of combustion noise, clusters of modes in annular and can-annular combustors, and exceptional points.

Combustion Webinar Organizing 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 (Univ. 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