

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Characterization of degeneration process in thermo-acoustic combustion instability using dynamical systems theory KENTA HAYASHI, Department of Mechanical Engineering, Ritsumeikan University, HIROSHI GOTODA, Department of Mechanical Engineering, Tokyo University of Science, YUTA OKUNO, Department of Mechanical Engineering, Ritsumeikan University, SHIGERU TACHIBANA, Institute of Aeronautical Technology, Japan Aerospace Exploration Agency, TOKYO UNIVERSITY OF SCIENCE COLLABORATION, JAPAN AEROSPACE EXPLORATION AGENCY COLLABORATION — We have experimentally investigated the degeneration process of combustion instability in a lean premixed gas-turbine model combustor on the basis of dynamical systems theory. Our previous study reported that with increasing the equivalence ratio, the dynamical behavior of combustion state close to lean blowout transits from stochastic fluctuations to periodic thermoacoustic combustion oscillations via low-dimensional chaotic oscillations (Gotoda et al., *Chaos*, 21, 013124 (2011) / Gotoda et al., *Chaos*, 22, 043128 (2012)). The further increase in the equivalence ratio gives rise to the quasi-periodic oscillations and the subsequent chaotic oscillations with small amplitudes. The route to chaotic oscillations is quantitatively shown by the use of nonlinear time series analysis involving the color recurrence plots, permutation entropy and local predictor.

Hiroshi Gotoda
Department of Mechanical Engineering, Tokyo University of Science

Date submitted: 01 Aug 2015

Electronic form version 1.4