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JANNAF
PIB / 11th MSS / 9th LPS / 8th SPS
Joint Subcommittee Meeting
5 – 9 December 2016

Abstract Due Date: Monday, 11 July 2016

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* **Title:** Assessing Spontaneous Combustion Instability with Recurrence Quantification Analysis

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Spontaneous instabilities can pose a significant challenge to verification of combustion stability, and characterizing its onset is an important avenue of improvement for stability assessments of liquid propellant rocket engines. Recurrence Quantification Analysis (RQA) is used here to explore nonlinear combustion dynamics that might give insight into instability. Multiple types of patterns representative of different dynamical states are identified within fluctuating chamber pressure data, and markers for impending instability are found. A class of metrics which describe these patterns is also calculated. RQA metrics are compared with and interpreted against another metric from nonlinear time series analysis, the Hurst exponent, to help better distinguish between stable and unstable operation.

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