

Prediction of Combustion Dynamics through Computational Modeling

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Greenville, South Carolina

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imagination at work



Gas Turbine Need

- Improve dynamic stability of combustion systems under lean operation
- Improve upon computational methods which predict acoustic response of combustor
- Increase understanding of the interaction of heat release, pressure fluctuation, fuel/air distribution, and associated boundary conditions
- Overall goal to reduce emissions, improve efficiency, expand operability

Project Objectives

- Apply a GE-developed computational package, Combustion Dynamics Analysis (CDA), to simulate acoustic response of various combustor geometries
- Within this package, determine the role and influence various mechanisms, modeled mathematically, have on the final computational results
- Student Objectives
 - Enhance understanding of combustion systems
 - Gain exposure to design methodologies
 - Assist with other areas related to gas turbine systems

Project Approach

- Run iterative cases to characterize combustor response trends for a range of boundary conditions
- Compare CDA predictions with experimental test rig results to improve algorithm accuracy
- Work with GE experts to guide further algorithm development and product design

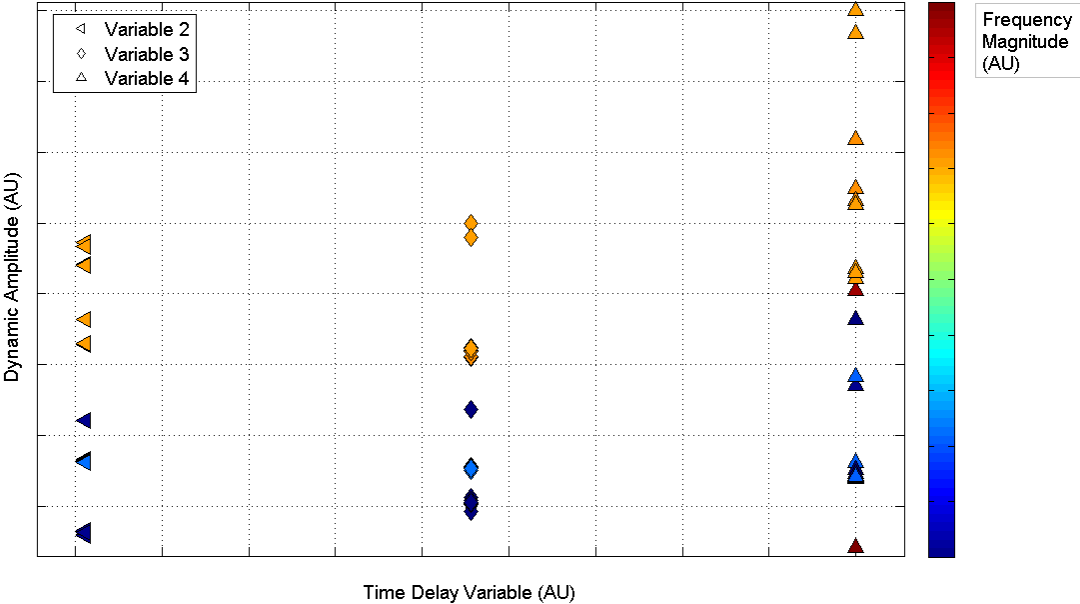
Project Results

- Fellowship period through November 30th
- Obtained results detailing varying fuel/air conditions, the effect of geometry variations, and boundary conditions on combustor dynamic response
- Continue to look at such variations and improve understanding of combustion physics and combustor design
- Find optimal operating regime for future designs

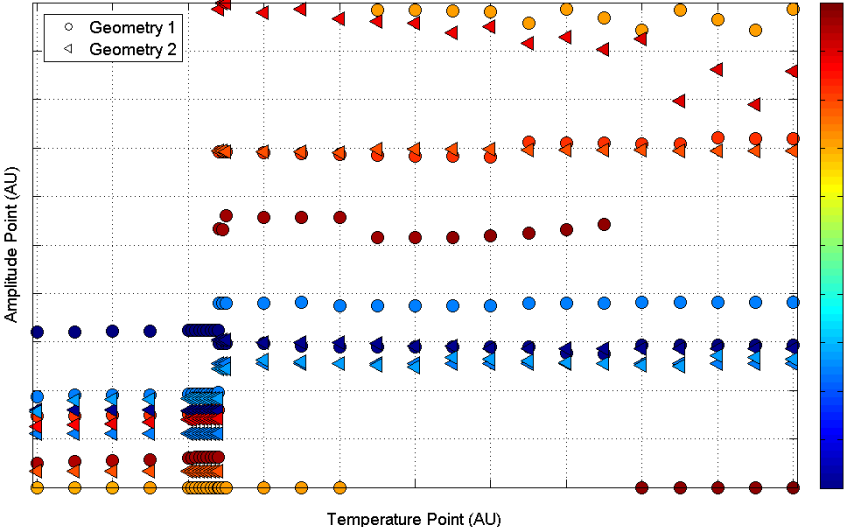
Project Results

Boundary Condition Variation

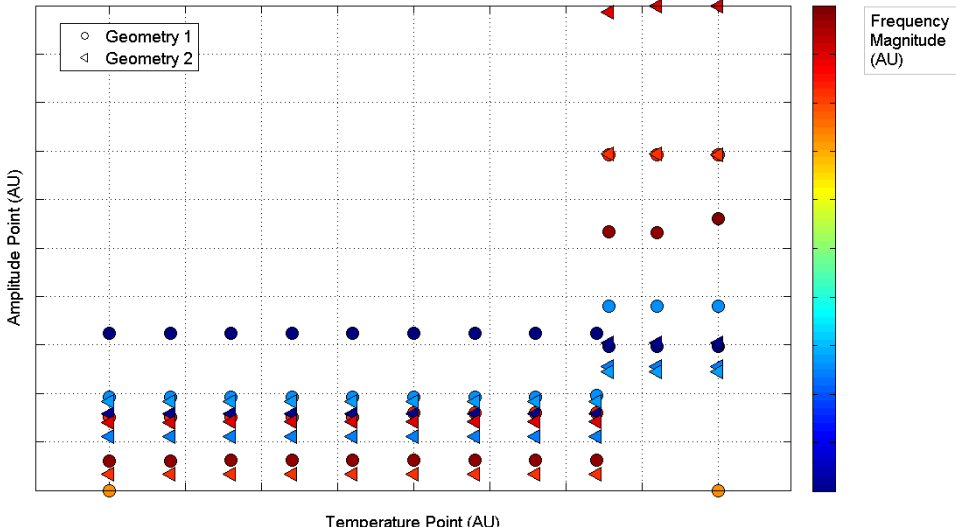
Dynamic Combustor Response for Boundary Condition 1



Dynamic Combustor Response



Dynamic Combustor Response



Project Summary

- Working with GE-developed combustion dynamic algorithm
- Improving understanding of combustion physics
- Improving combustor design and tuning operational conditions for optimal performance
- Thank You
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