ASCENT Project: 071

Predictive Simulations of nvPM Aircraft Emissions

Georgia Institute of Technology

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Cost Share Partners: [1]Georgia Institute of Technology, [2]University of Michigan, and [3]Raytheon Technology Research Center.

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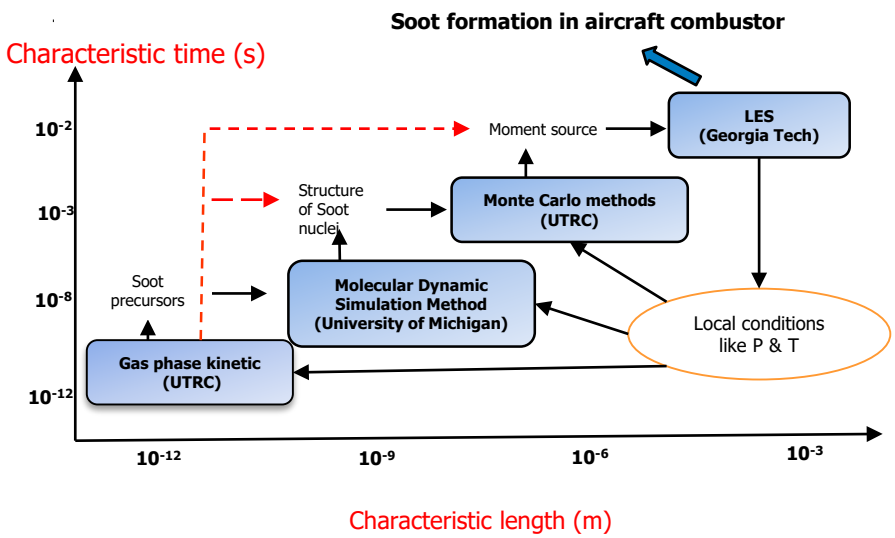
Objective:

- Reliable soot kinetics for jet-fuel systems
- Develop a new model for nanoparticle inception
- Link kinetics and particle inception to growth models
- Improve Method of Moments (MOM) within large-eddy simulations (LES) with physics sub-models

Project Benefits:

- Predictive jet-fuel kinetics model for aeroengine combustor emission
- New predictive inception and growth models for soot formation in PAHs dominated fuels using multi-scale analysis for coupling physics at disparate scales
- New CFD to simulate emission from turbulent flames using these multi-scale models
- Potential application of operational gas turbines



Major Accomplishments:

- Reduced order model for soot inception and surface growth with reduced kinetic mechanism for PAH species now being tested in LES
- Free energy calculations of PAH dimer stability as function of temperature – towards nucleation model
- Coupling between surface growth model and LES being tested for coupled analysis
- LES-Method of Moment for canonical turbulent combustion to evaluate new models operational

Future Work / Schedule (3rd-Year Plan):

- Complete assessment of PAH based soot kinetics
- Couple particle growth model with nucleation and inception-growth model for use in LES-MOMIC
- LES demo for Rich-Quench-Lean (RQL) combustor

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