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Prediction of TACOT Decomposition Using the Chaleur Code

5th Ablation Workshop

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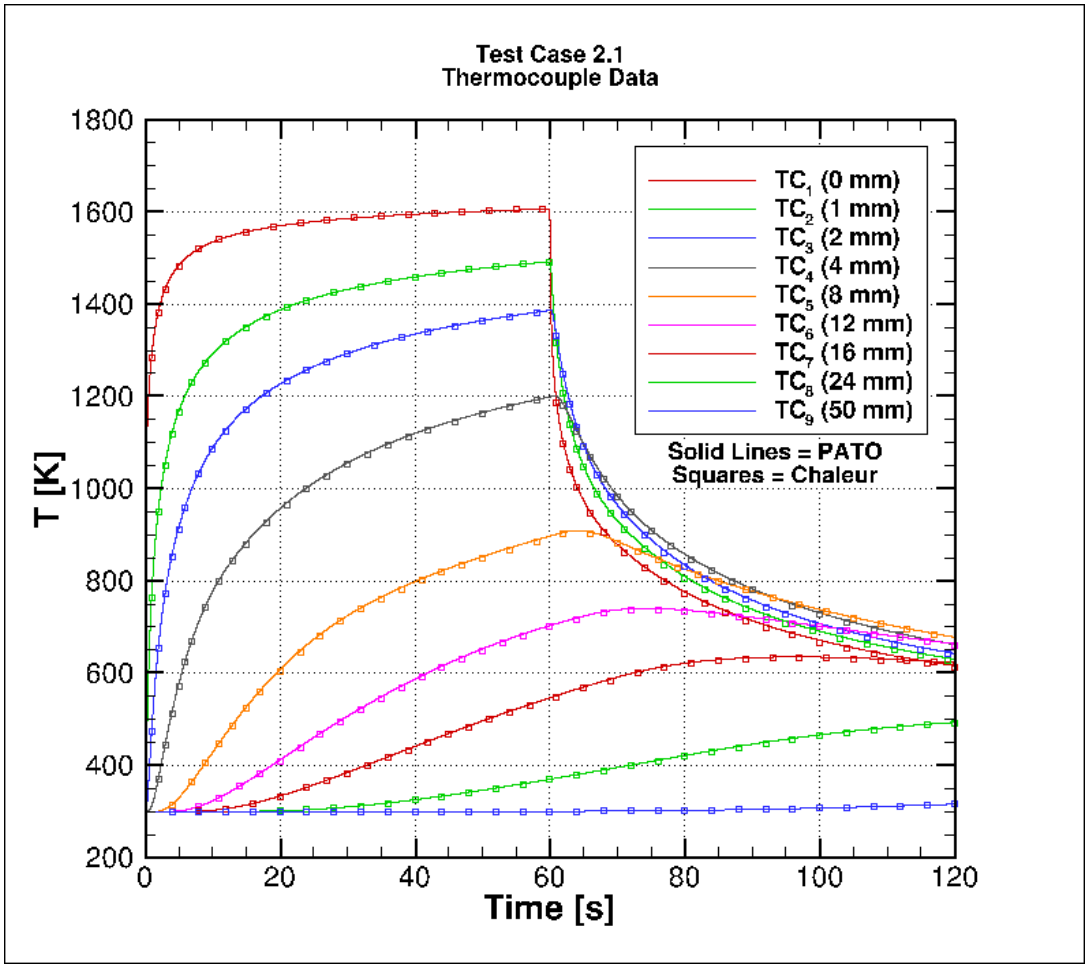
Chaleur

- 1-D control volume finite element discretization on contracting grid
- Full Newton iteration scheme
- 2^{nd} order spatial discretization
- 1^{st} and 2^{nd} order time integrator
- Updated thermal properties within iteration loop
- Segregated solution of energy (T) and gas phase continuity (ρ_g) on same grid
- Semi-analytical integration of decomposition kinetics

TACOT Case 1 – Temperature History



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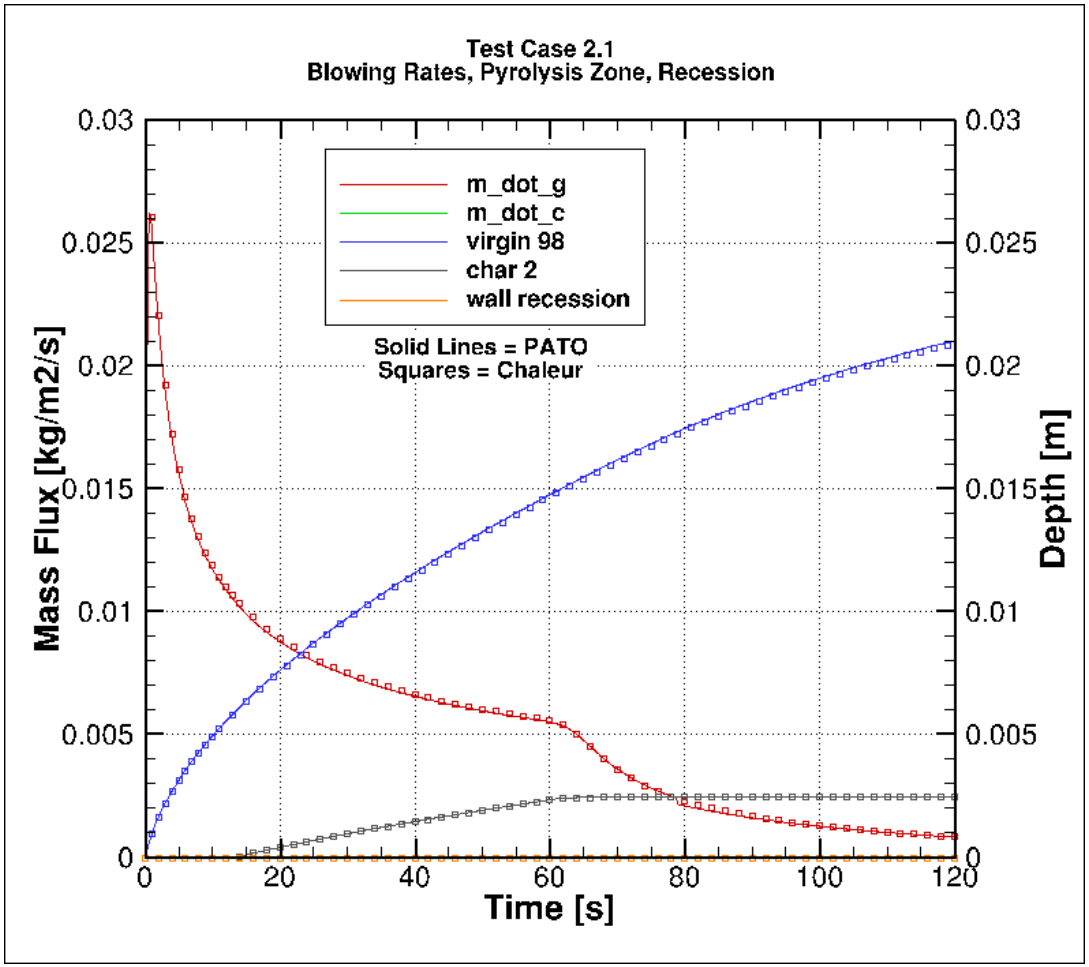
TACOT Case 1 – Blowing Rate, Pyrolysis Zones, Recession



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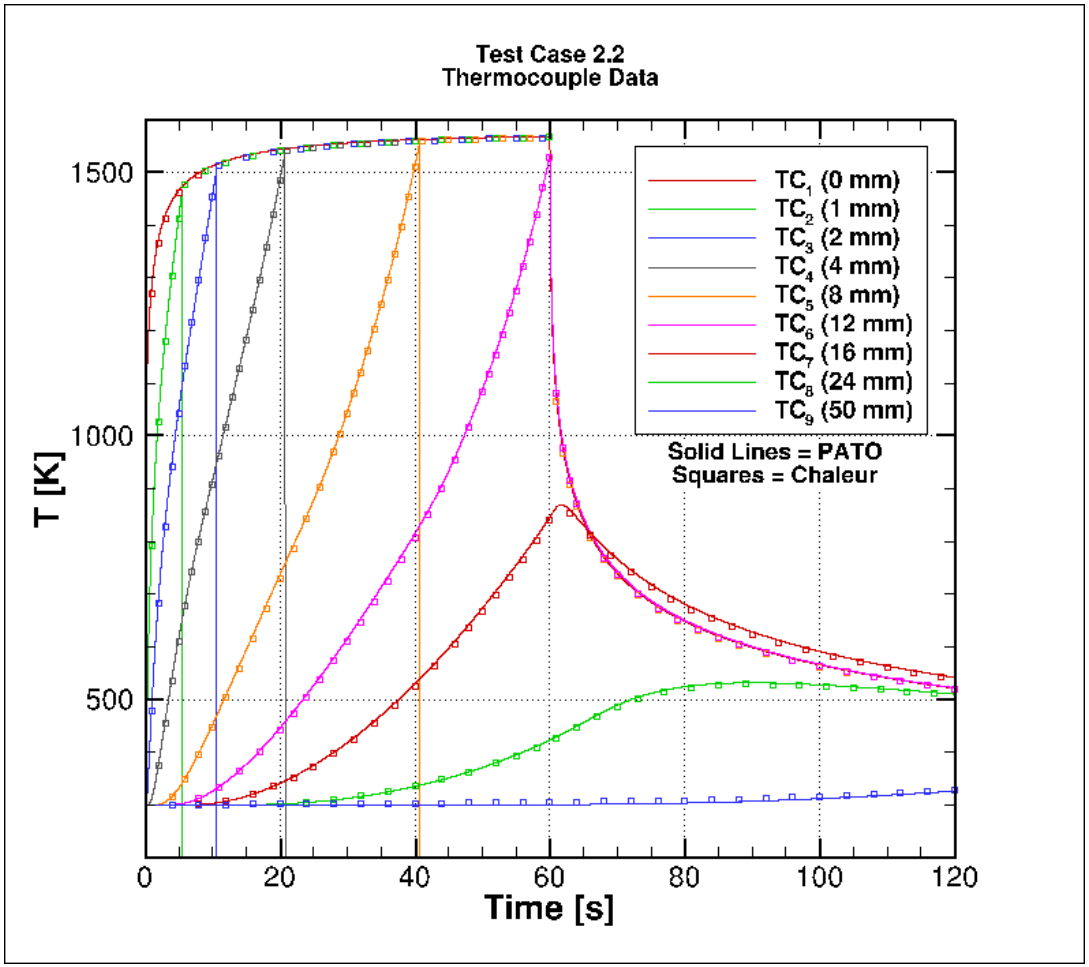
TACOT Case 2 – Temperature History



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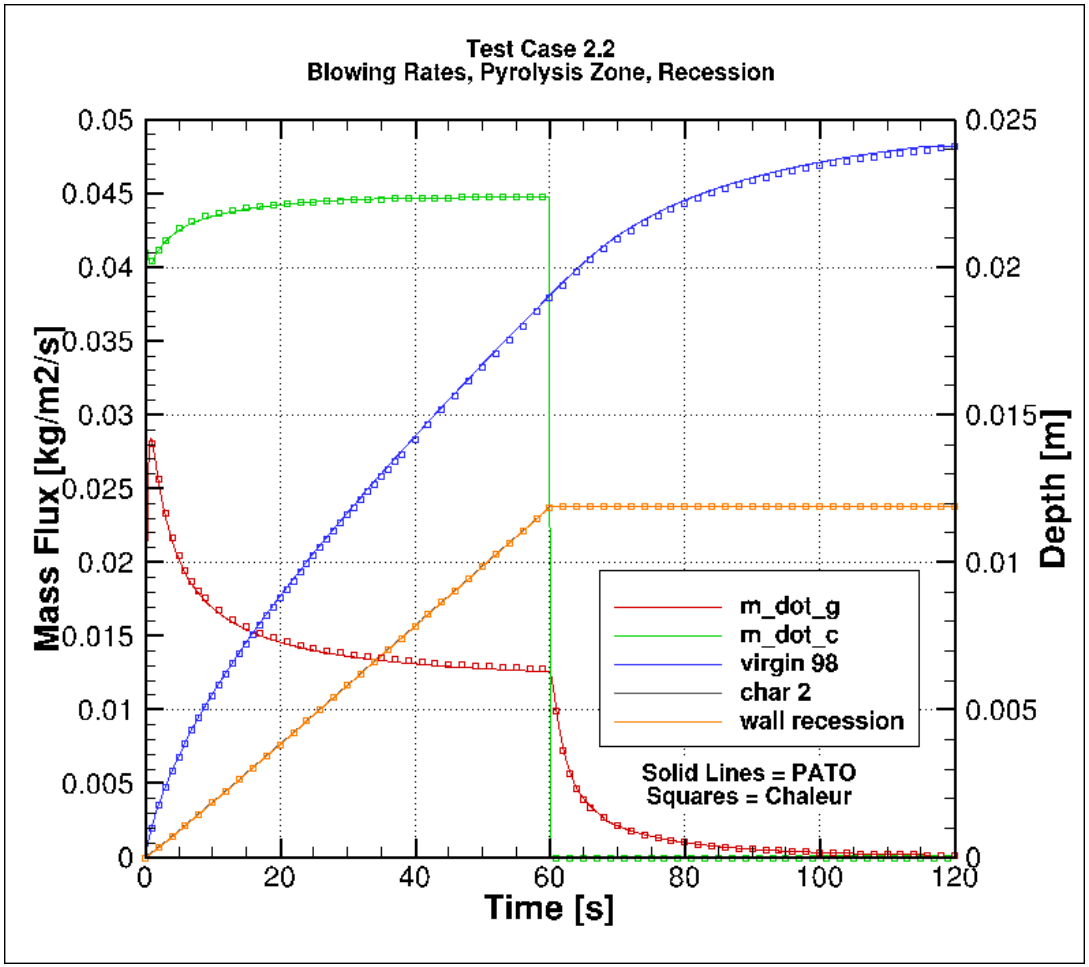
TACOT Case 2 – Blowing Rate, Pyrolysis Zones, Recession



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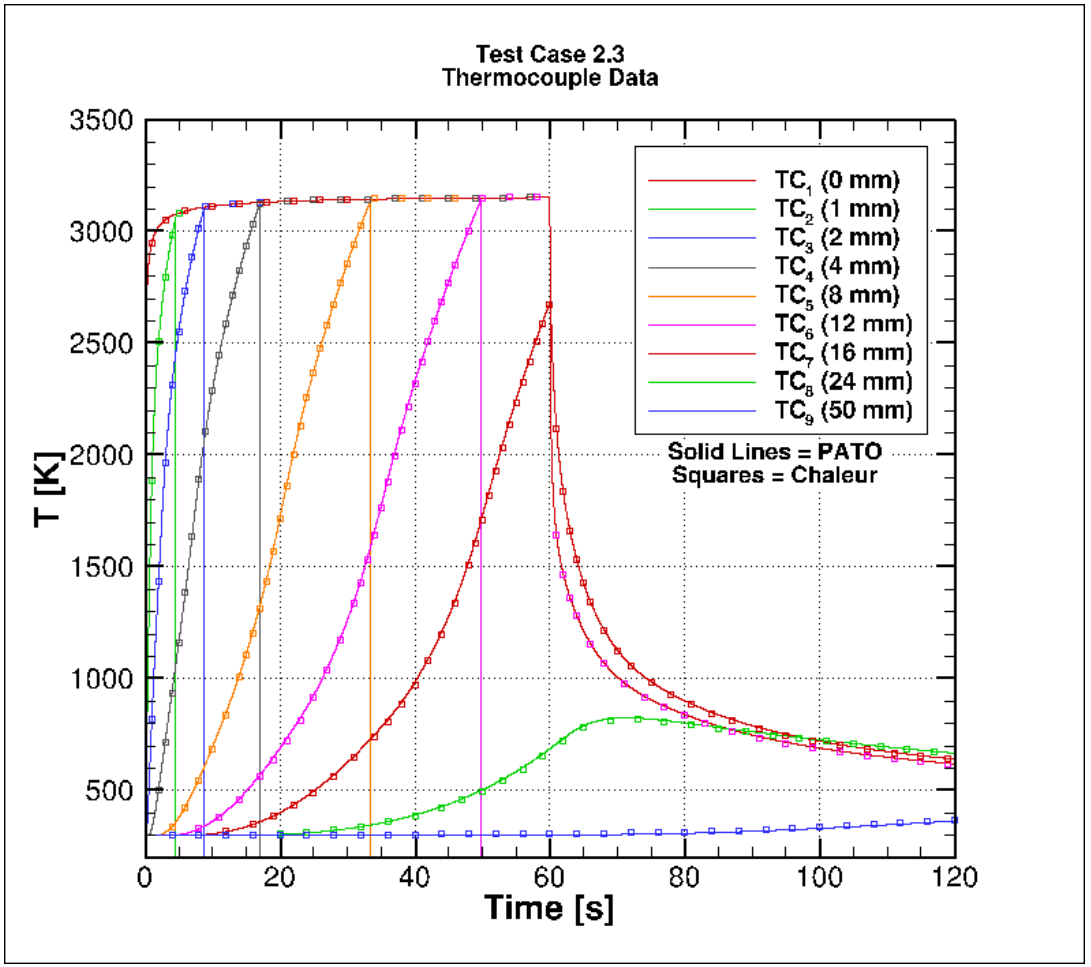
TACOT Case 3 – Temperature History



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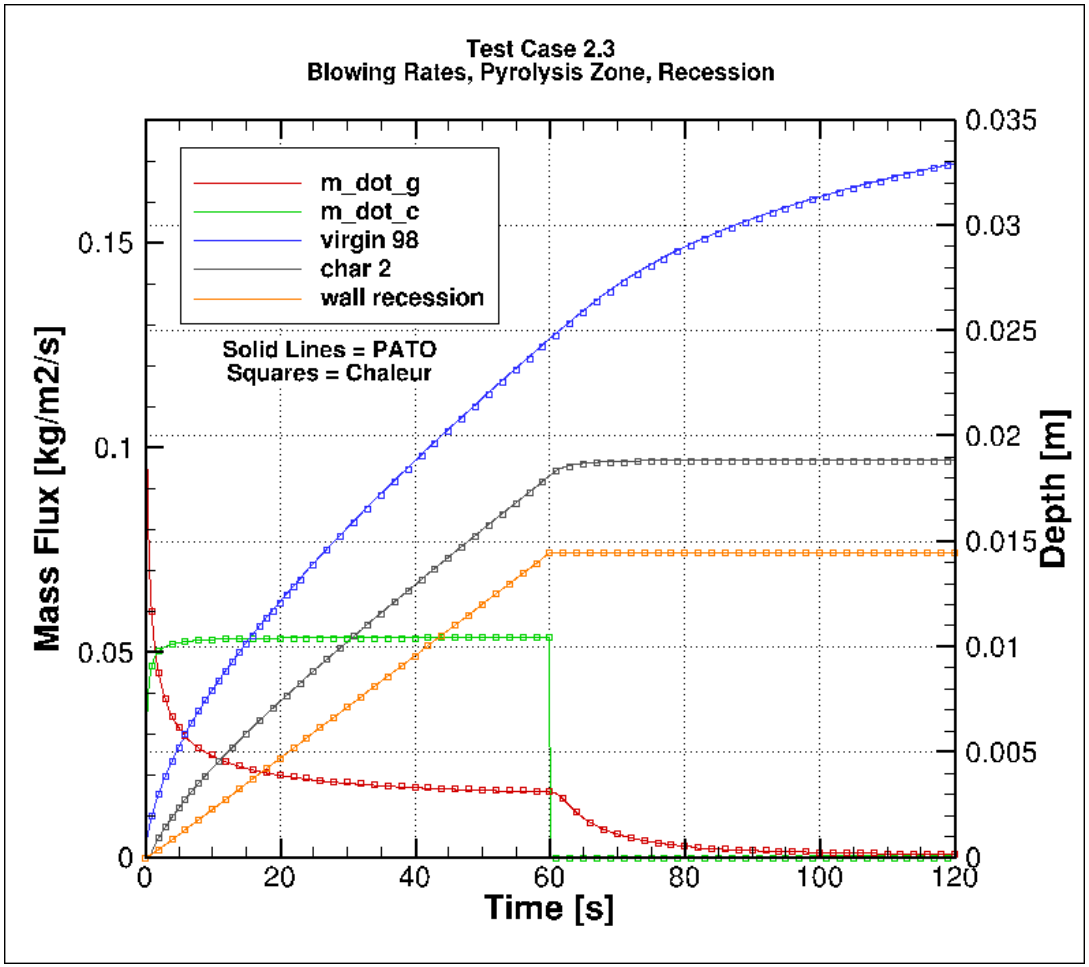
TACOT Case 3 – Blowing Rate, Pyrolysis Zones, Recession



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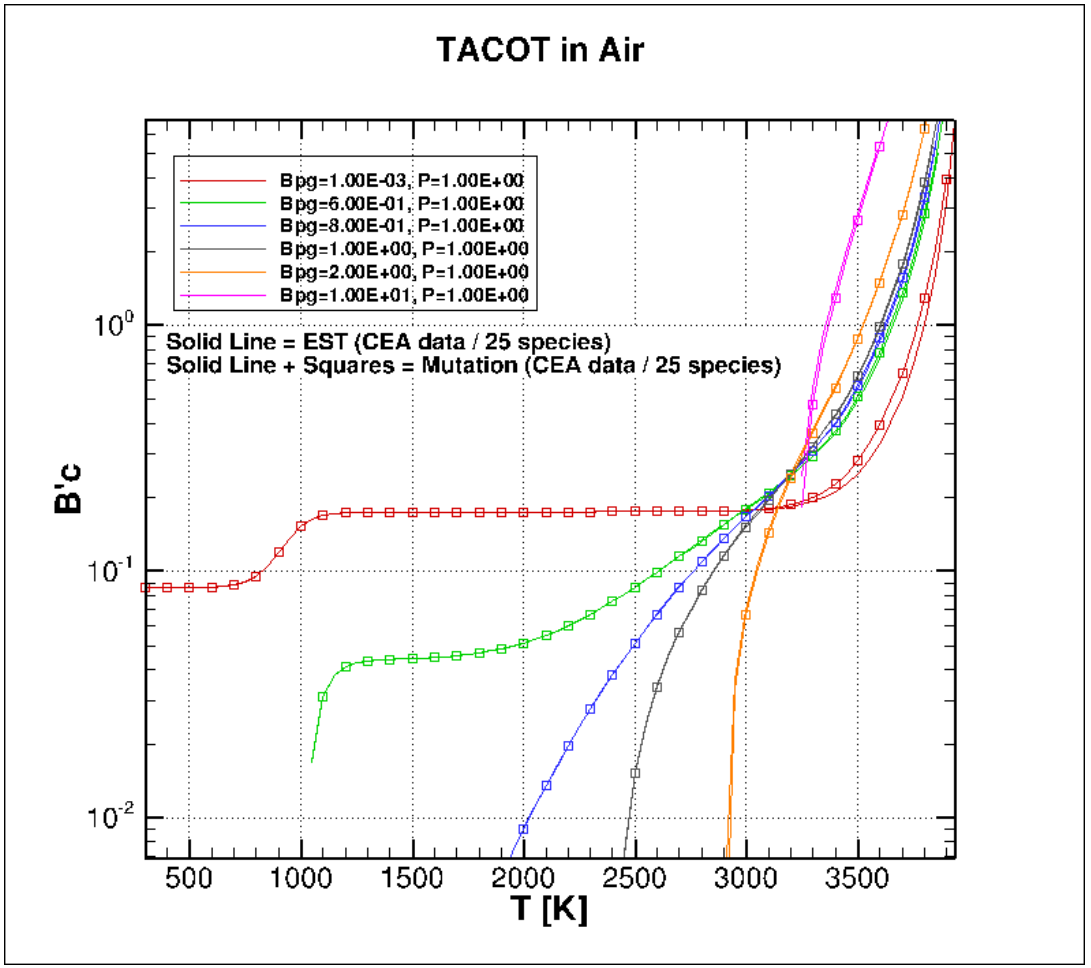
EST

- Element potential based equilibrium surface thermochemistry solver
- Currently being developed for solving ablation thermochemistry problems
- Can be used in two modes
  - Stand-alone to generate B' tables
  - Coupled with Chaleur to generate B' on-the-fly

B'_c for TACOT in Air – Mutation vs. EST

Considering 25 specie reduced set



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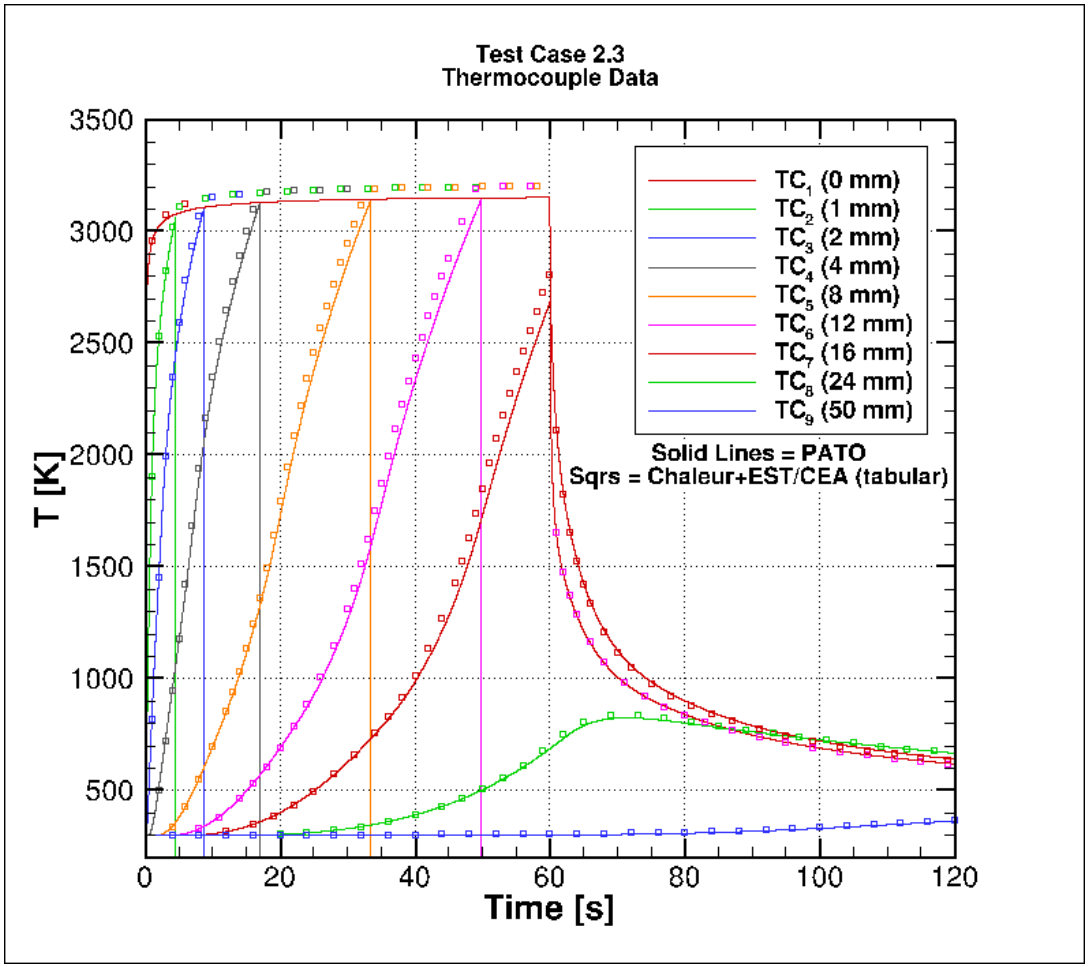
TACOT Case 4 – Temperature History



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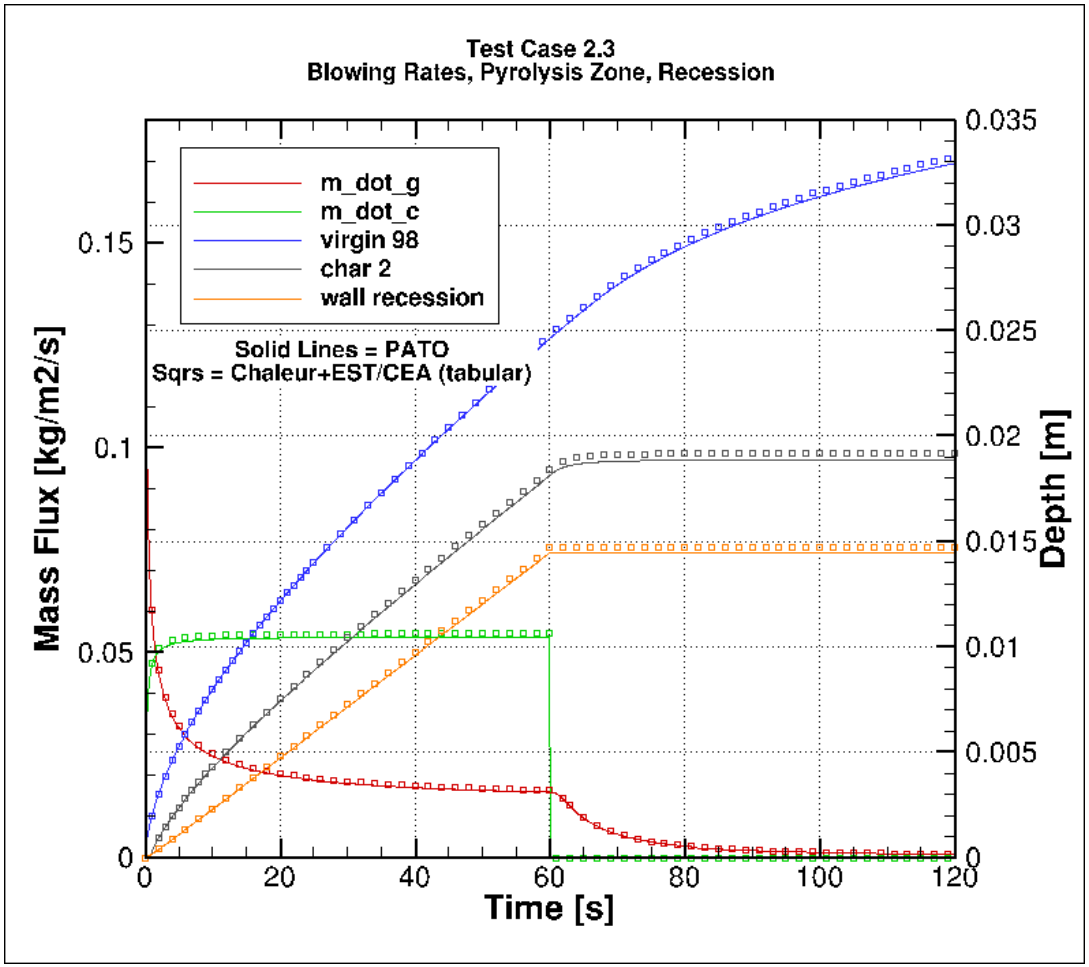
TACOT Case 4 – Blowing Rate, Pyrolysis Zones, Recession



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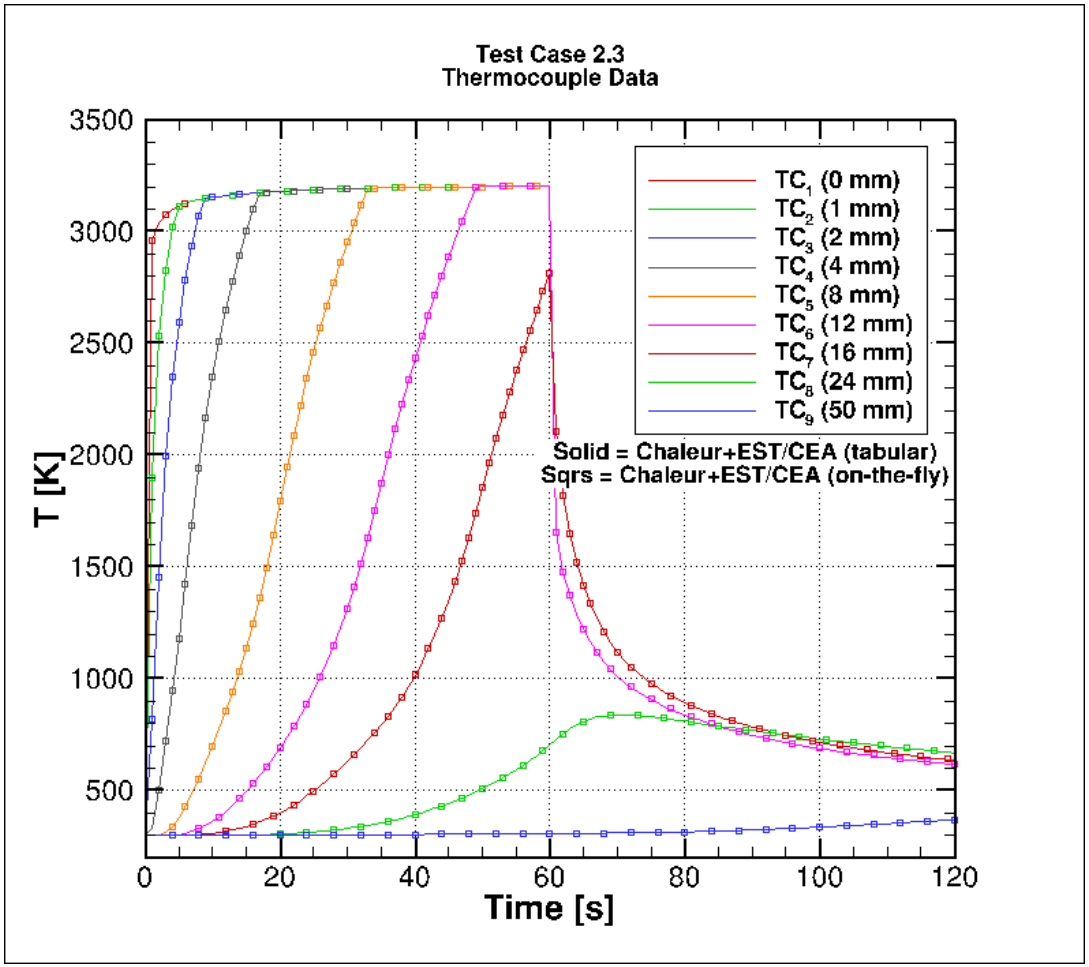

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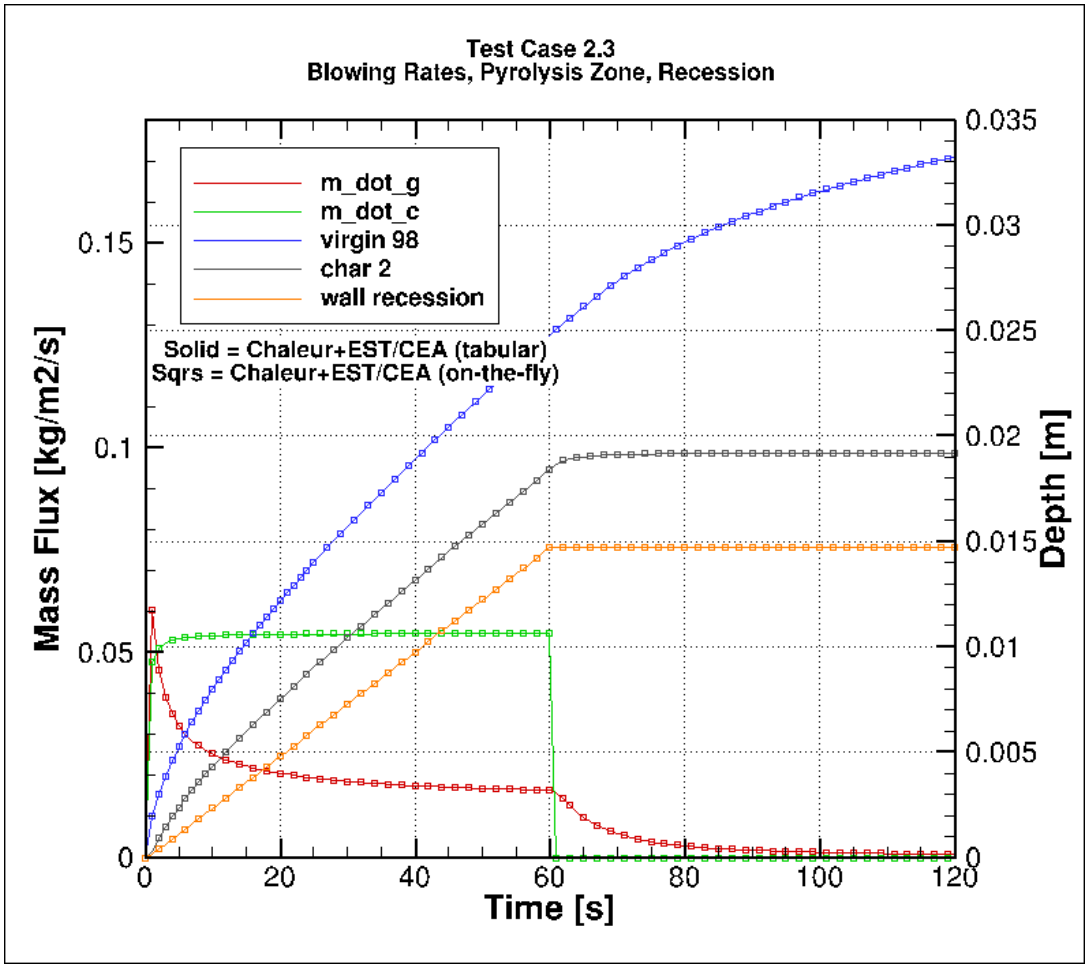

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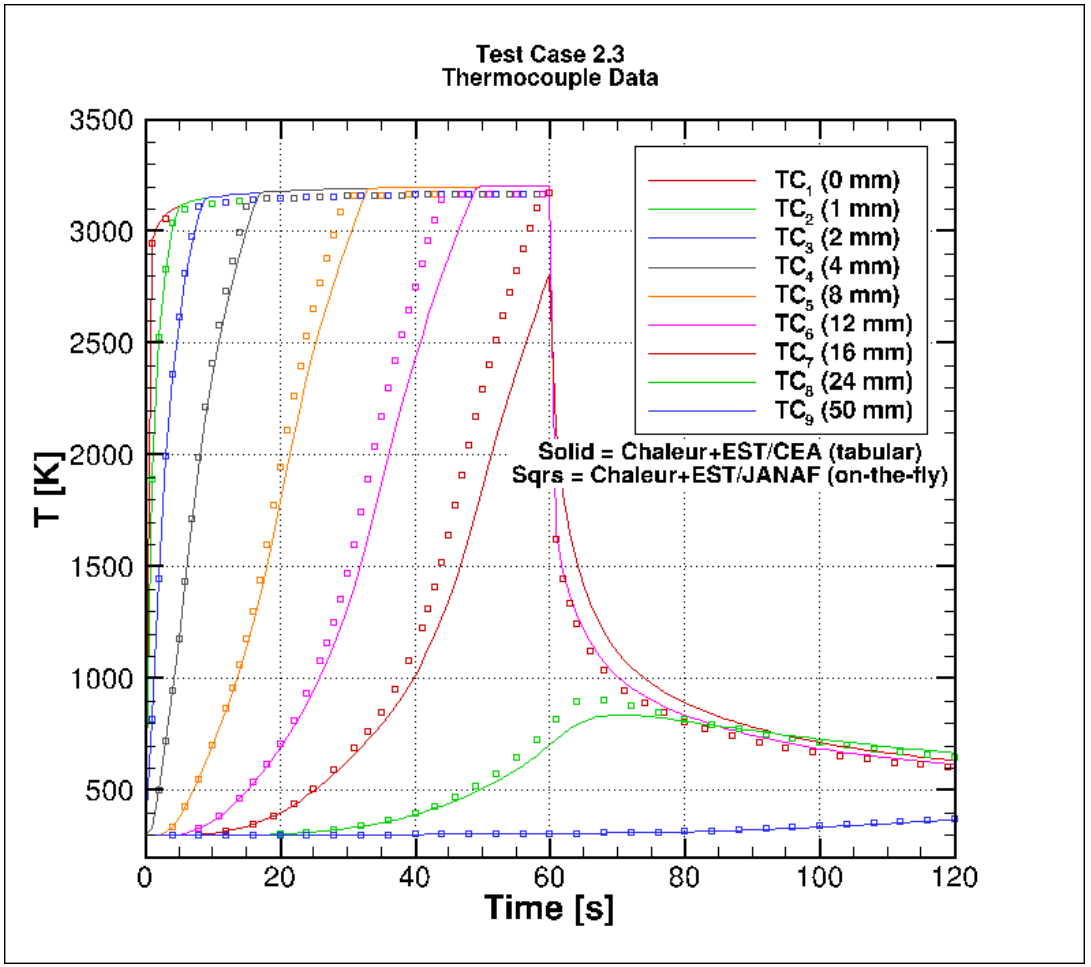

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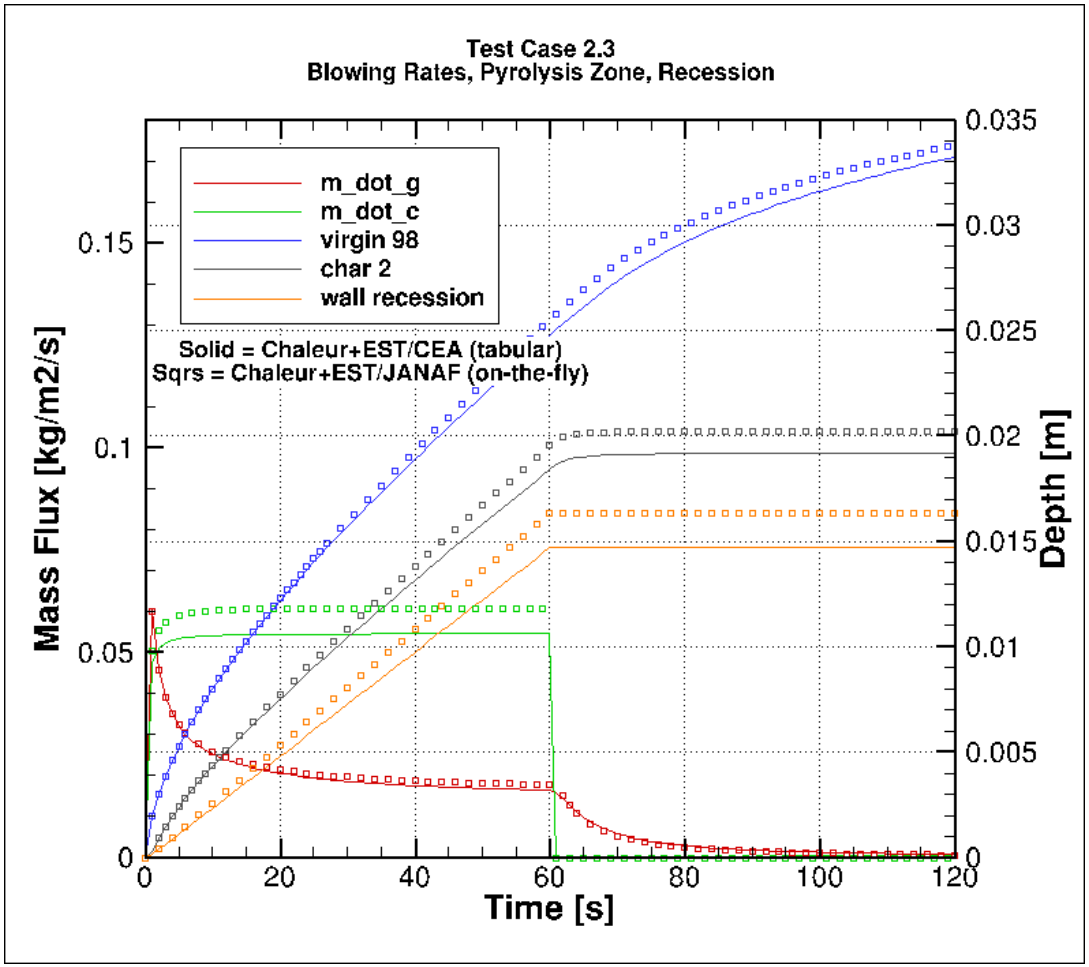

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