

A Green's Function Sensor Fusion Approach for Reconstructing the Heat Loads on Atmospheric Entry Spacecraft



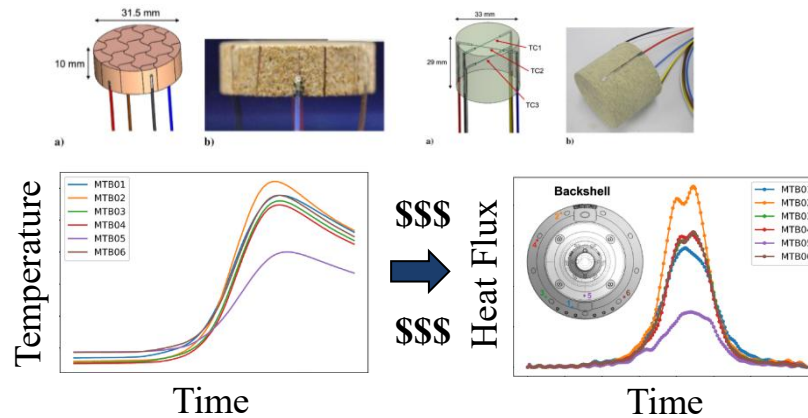
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Motivation



https://mars.nasa.gov/mer/gallery/artwork/entry_br.html



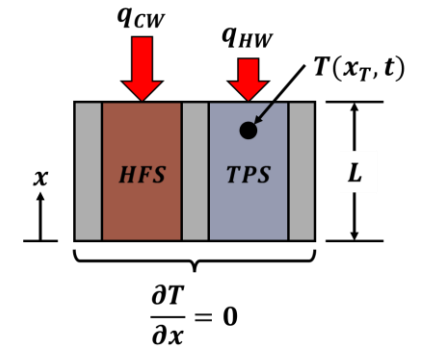
Alpert, H., et al. *J. Spacecr. Rockets* (2023)

Approach

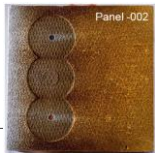
$$\rho C_p \frac{\partial T}{\partial t} - \frac{\partial}{\partial x} \left(k \frac{\partial T}{\partial x} \right) = g$$

$$T = - \int_0^t q_{HW}(\tau) G(t - \tau) d\tau$$

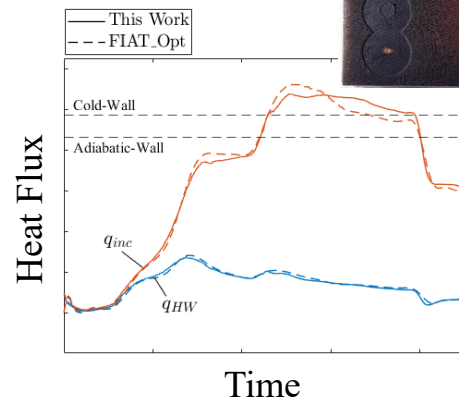
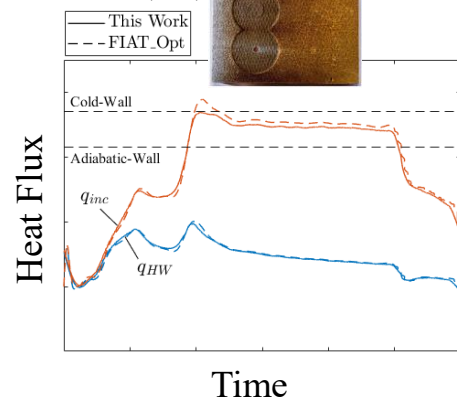
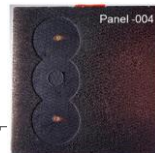
$$\{T\} = -[G]\{q_{HW}\} \quad \text{Computation time} \rightarrow \mathcal{O}(10 \text{ seconds})$$



Miller, R., et al. *J. Spacecr. Rockets* (2024)



Arc-Jet Validation



Mars 2020 Backshell Reconstruction

