



## Studien- oder Masterarbeit

(deutsch oder englisch)

# Integration of 2D Heat Conduction with 1D Nozzle Flow and Heat Convection Tools

At the Institute of Space Systems (IRAS) at the Technische Universität Braunschweig, we are exploring advanced simulation methods to improve thermal management in rocket engines. This thesis focuses on developing a tool in Matlab/Simulink that integrates 2D heat conduction with 1D nozzle flow and convection models, using experimental data from the literature (for example the SSME) as a reference.

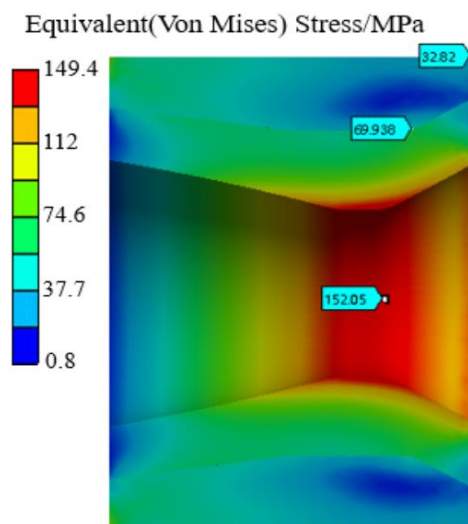


Figure 1: Thermal stresses in a rocket nozzle (Yunpeng 2023).

### Tasks and Deliveries Include:

1. Conduct a literature review on existing models for heat conduction, nozzle flow, and heat convection in rocket engines.
2. Develop and integrate a 2D heat conduction tool with existing 1D nozzle flow and heat convection models in Matlab/Simulink.
3. Validate the integrated model against CFD simulations, focusing on temperature distribution and heat flux predictions.
4. Document the modeling process, assumptions, and results in a detailed manner.
5. Present a comprehensive evaluation of the model's performance compared to standalone approaches.

**Required Skills and Knowledge:**

- Proficiency in Matlab/Simulink, preferably with the Partial Differential Equation Toolbox.
- Fundamental understanding of heat transfer, fluid dynamics, and rocket engine physics.
- Experience with CFD tools is highly desirable.

Kontakt: M.Sc. Tobias Stelzer  
Tel. 0531 / 391-9977, E-Mail: [tobias.stelzer@tu-braunschweig.de](mailto:tobias.stelzer@tu-braunschweig.de)  
Hermann-Blenk-Str. 23, 38108 Braunschweig