

Fossil-Free Combustion in Grate-Kiln Pelletizing Plants Using Co-Jet Burner



Project leader

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Partners

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Project duration

20220401 - 20250531

Goals of the project

Reduce emissions from grate-kiln pelletizing plants

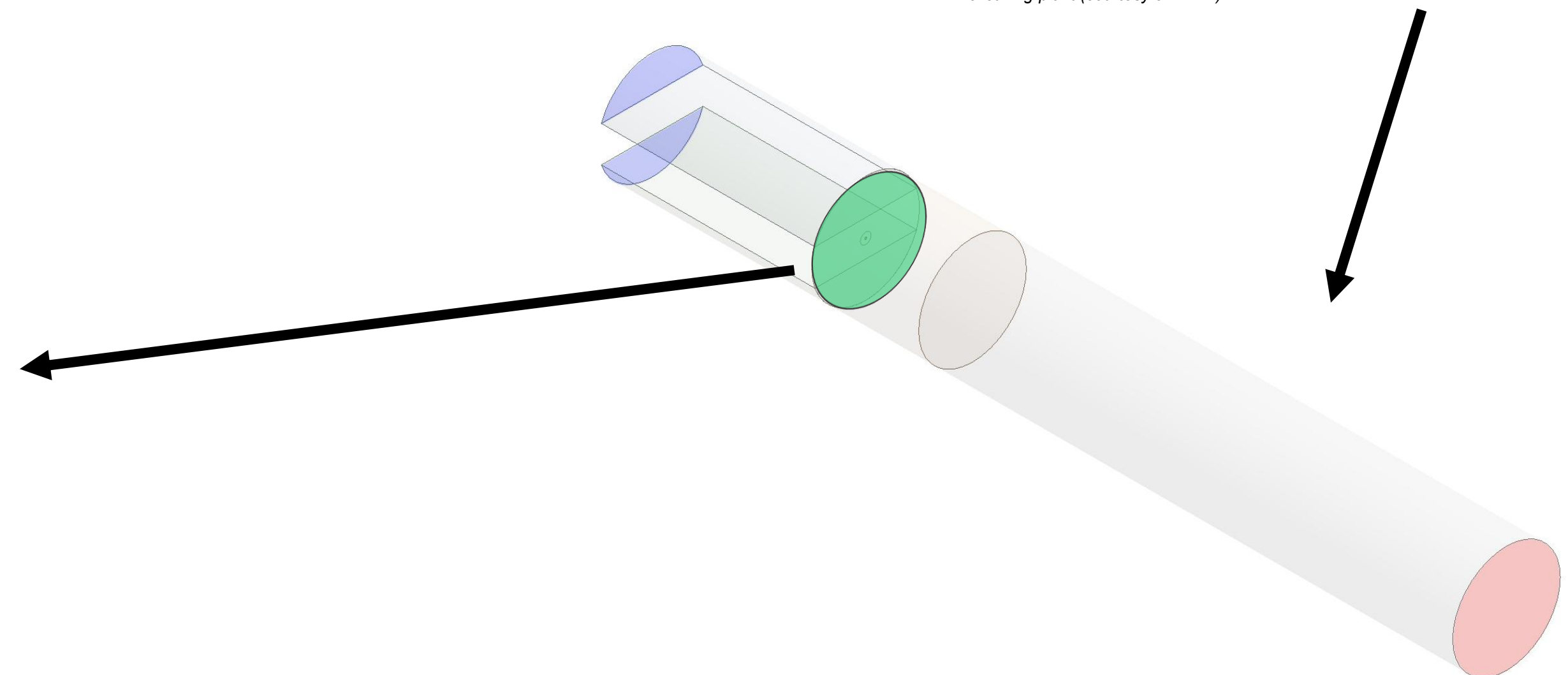
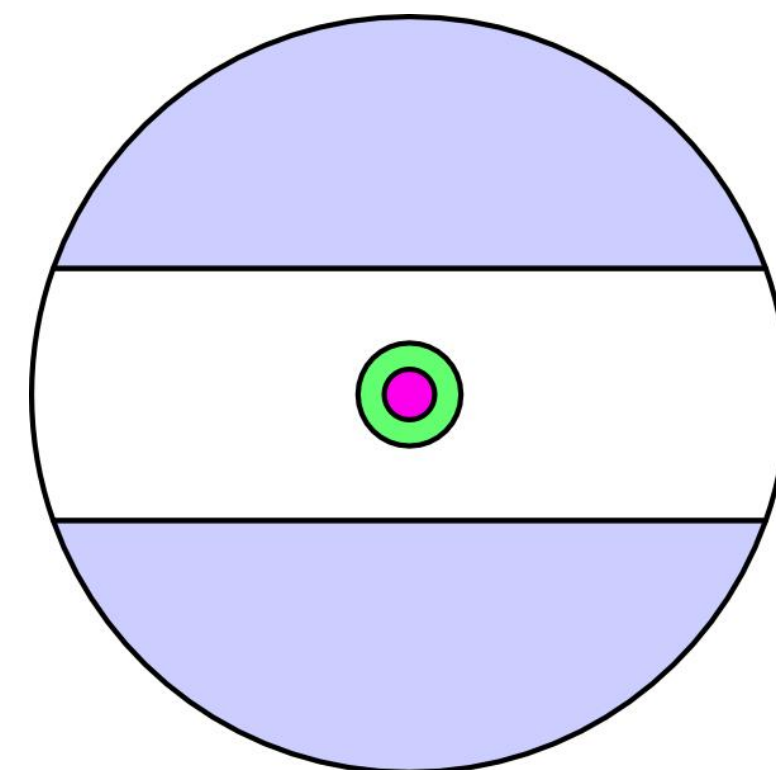
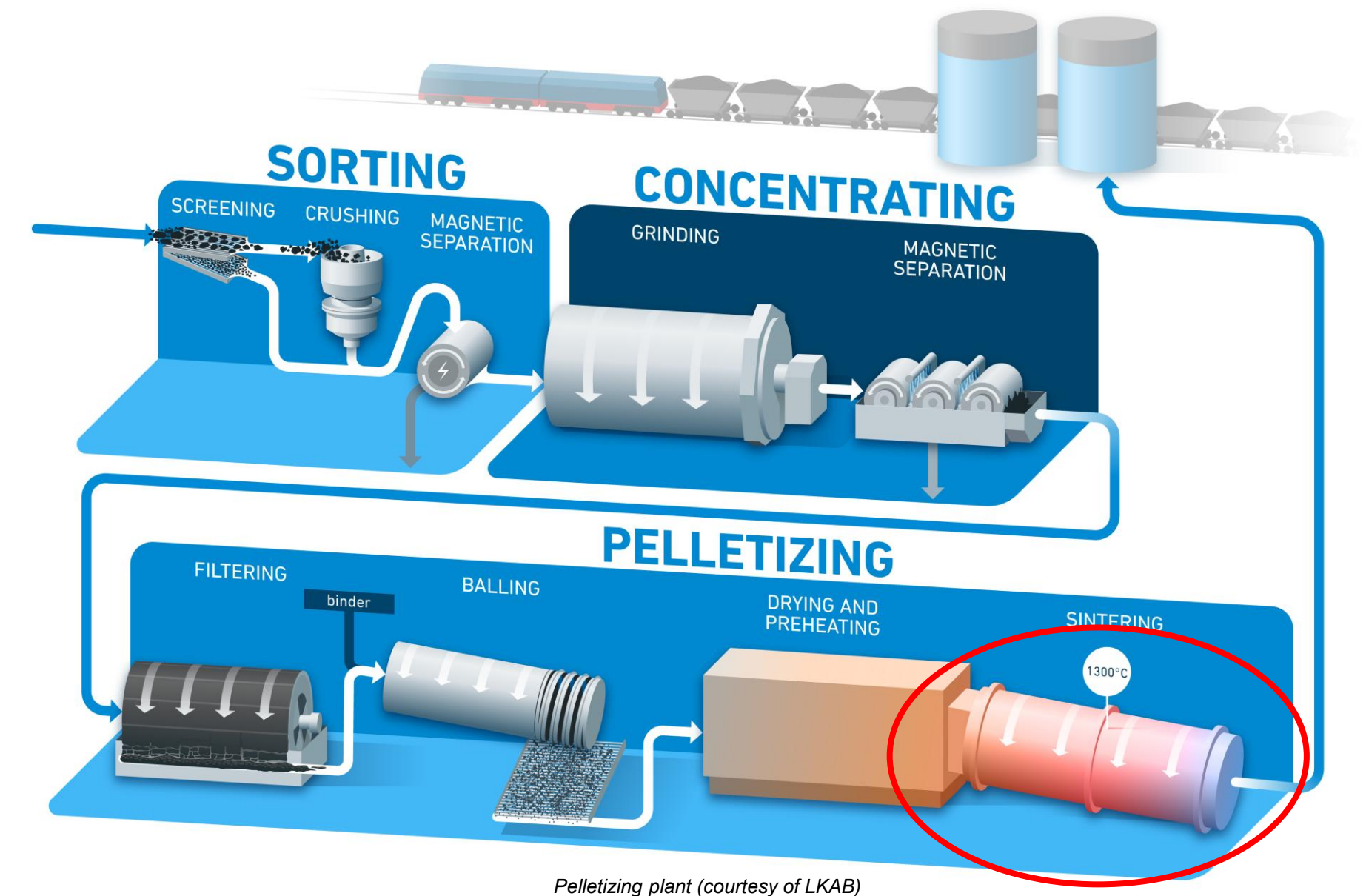
Aimed at rotary kiln

Find methods of replacing coal with hydrogen

Not possible using existing equipment

Idea: coaxial jet

Control mixing of fuel and air



Goals of the project – Deliverables

Simulation model for testing of flow parameters

Simulation model including hydrogen combustion

Coaxial burner concept



Methodology

Computer simulations

Computational Fluid Dynamics – CFD

Change M_{jet}

Compare jet length and spread

Low fidelity → high fidelity CFD

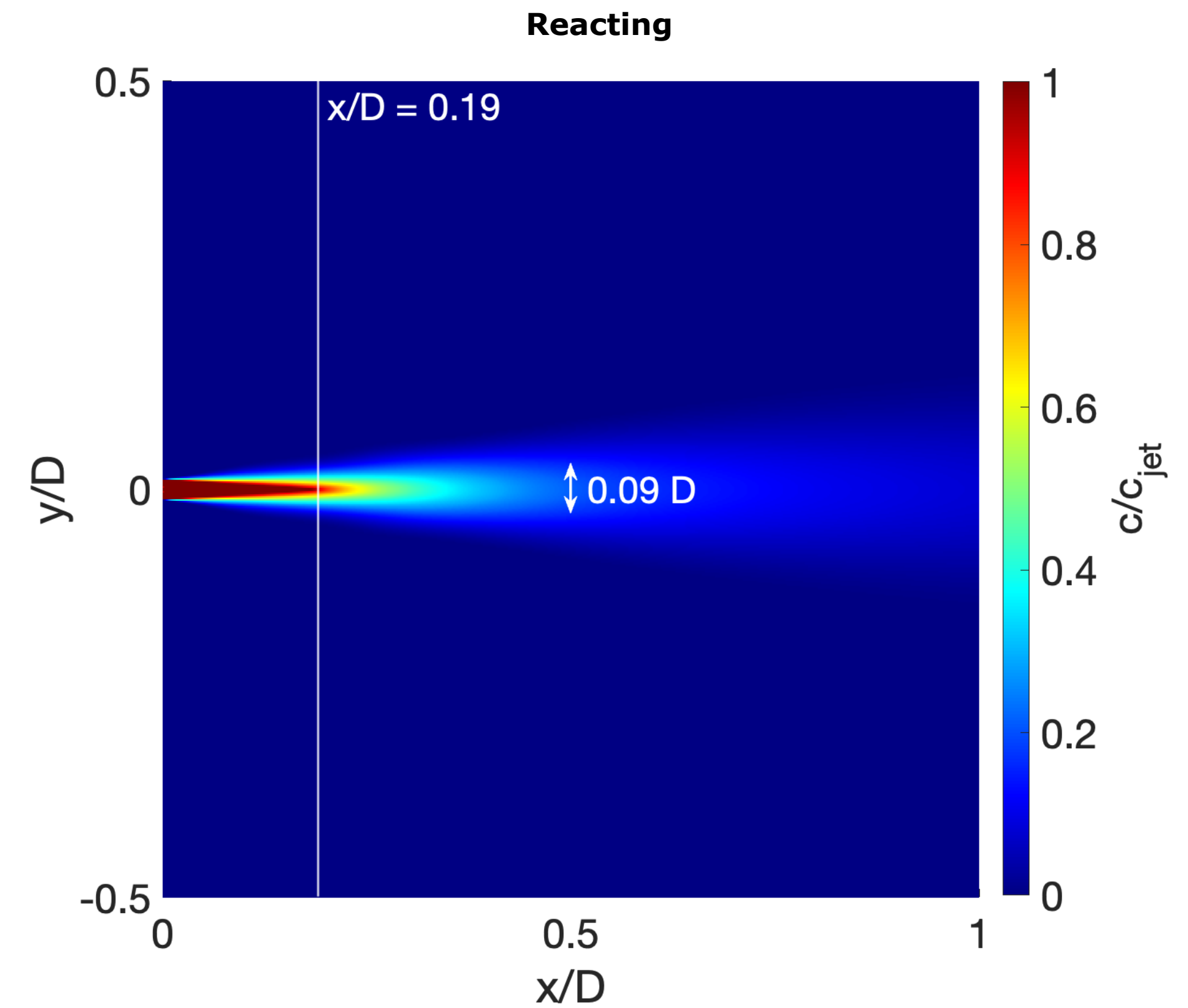
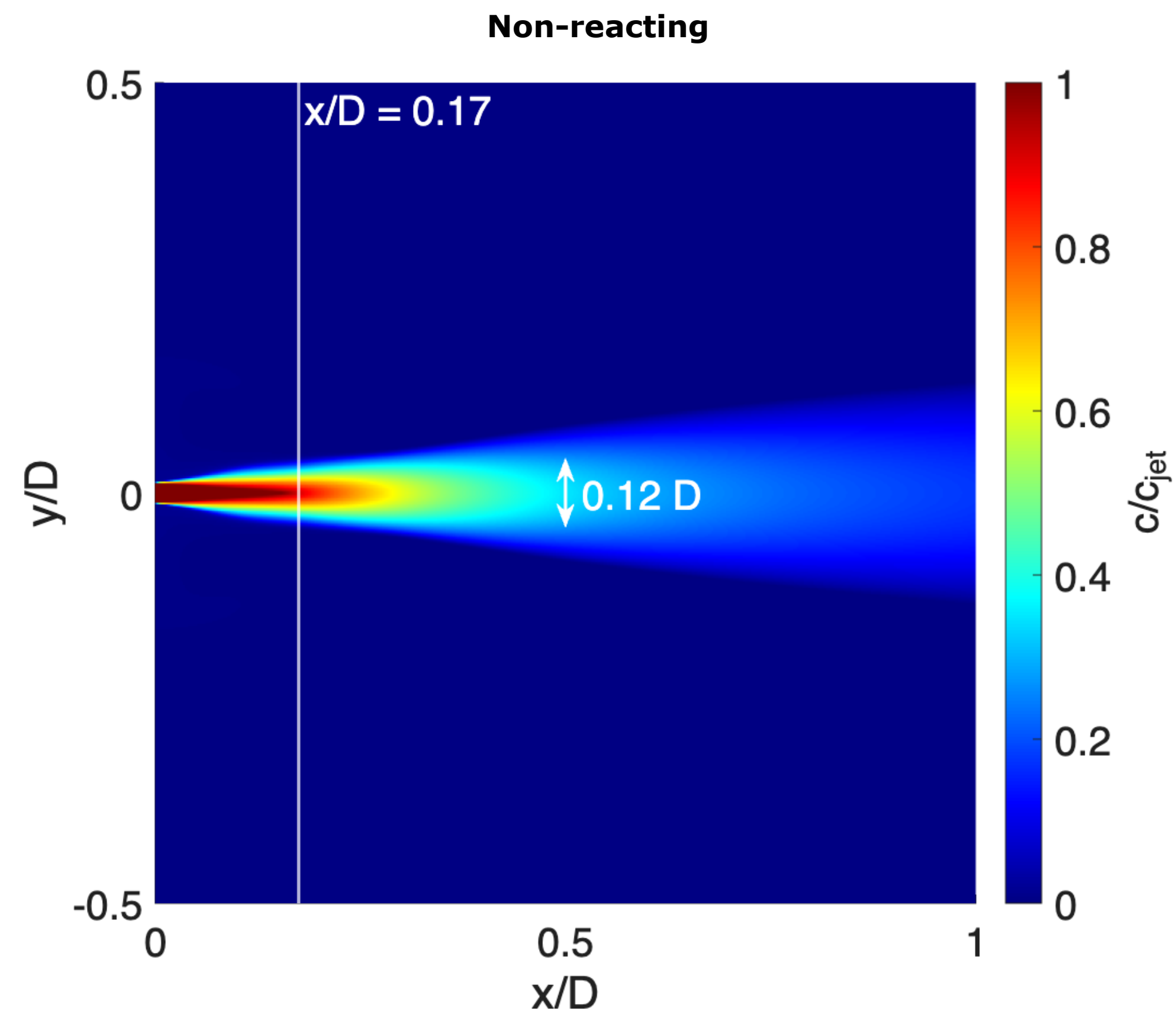
With and without combustion

Simplified and realistic geometries

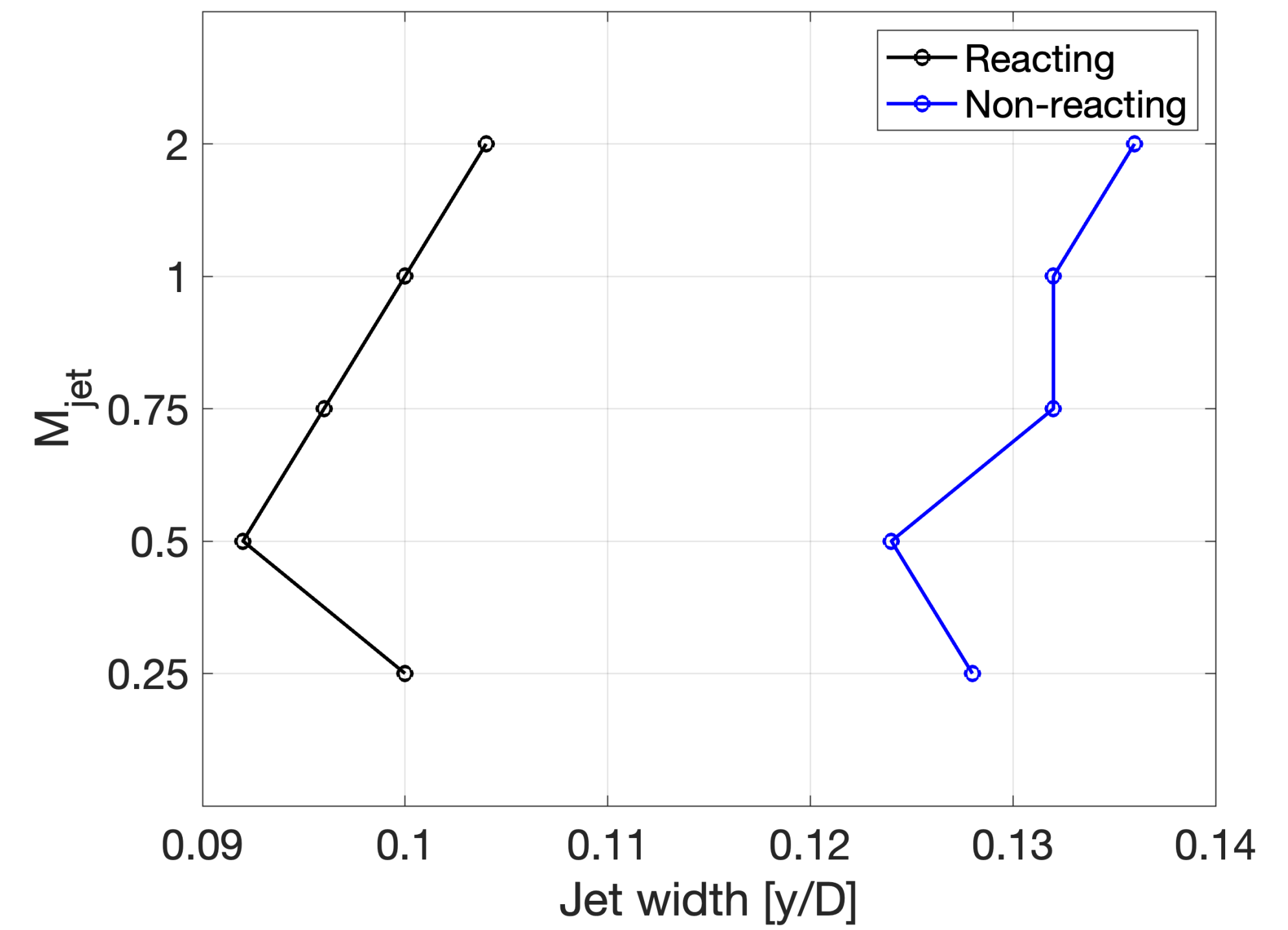
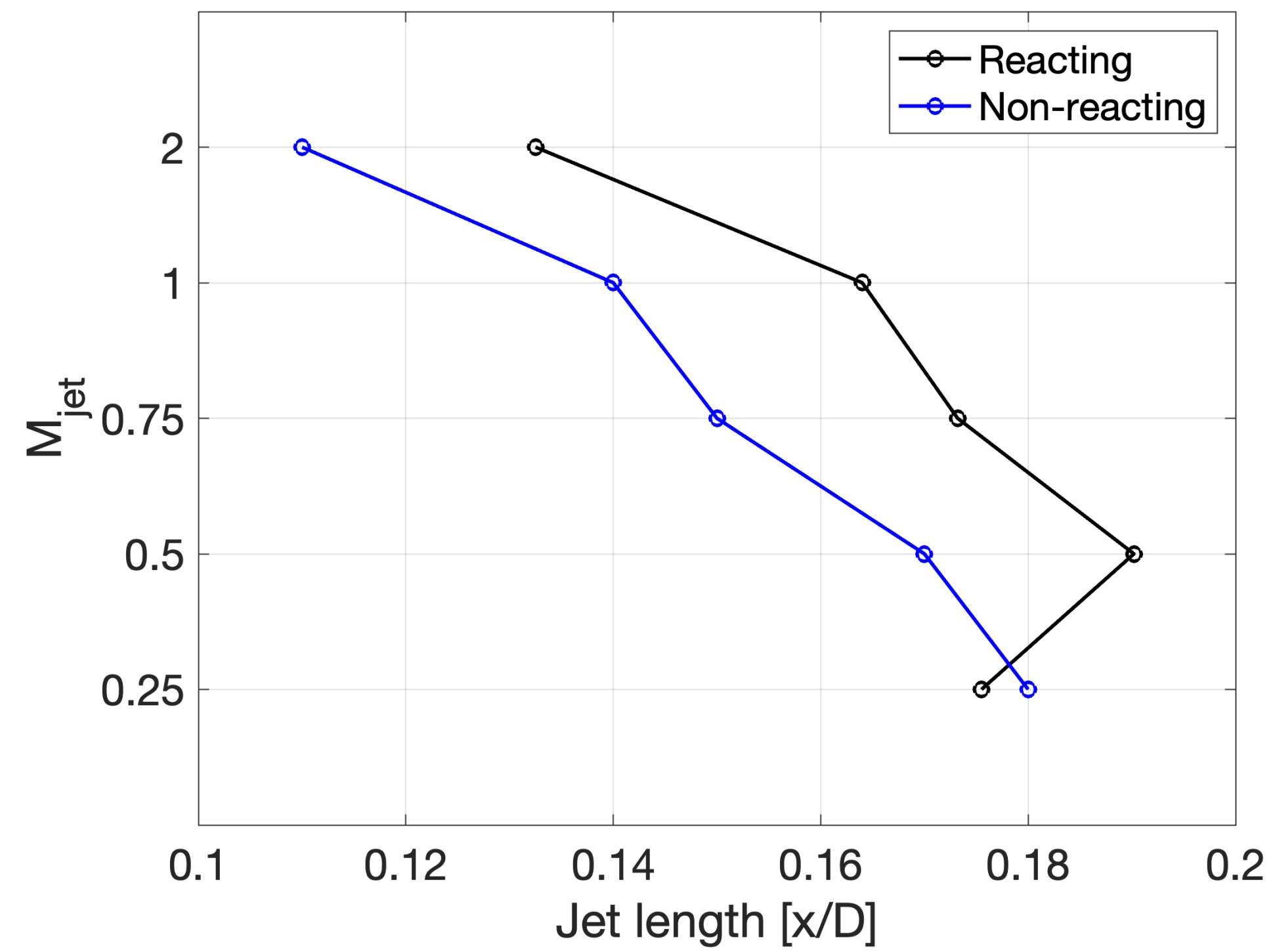


Completeness
increases

Results – Combustion



Results – Combustion



Results – Geometry

Simplified 2D model

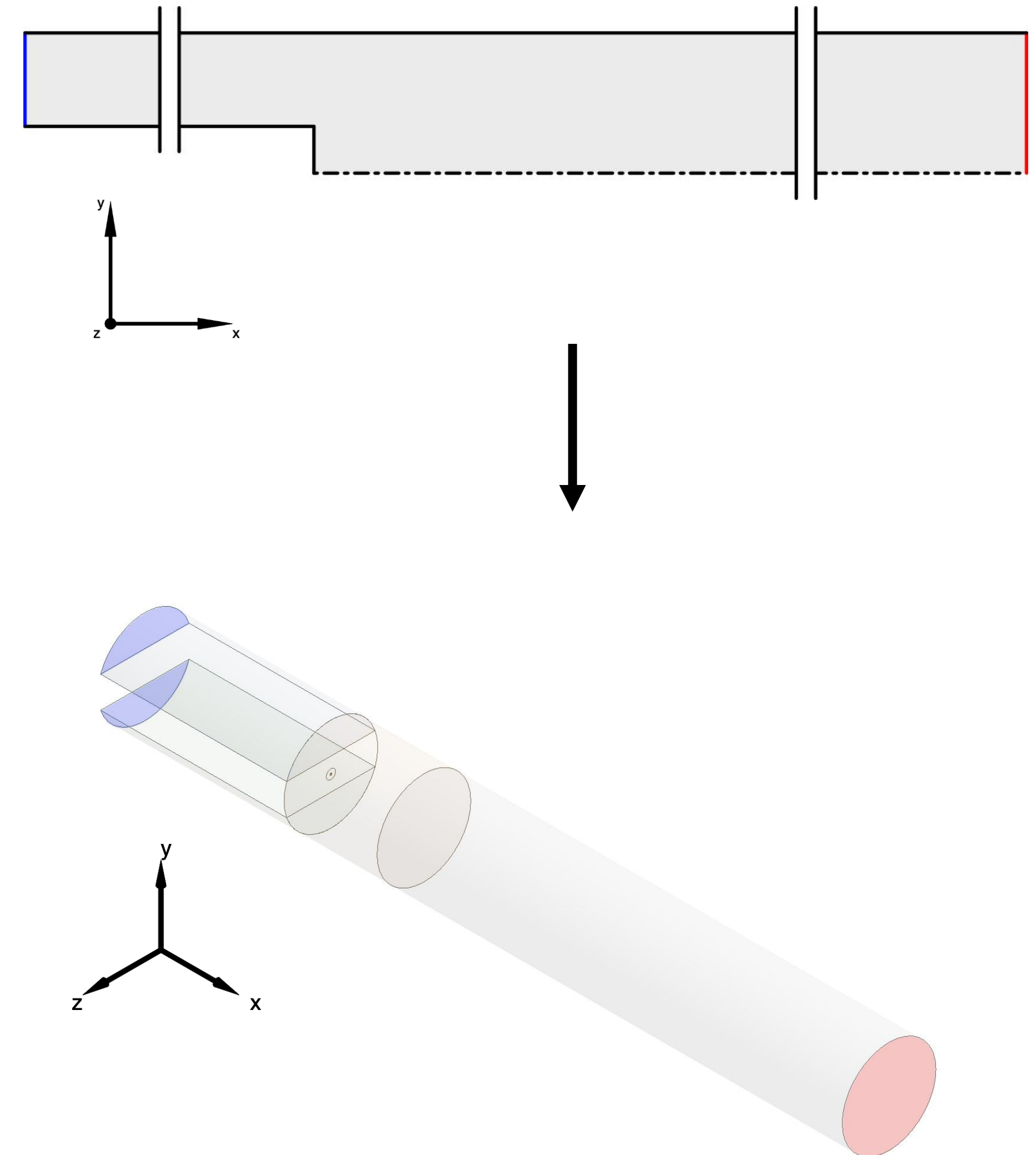
Axisymmetric

3D model

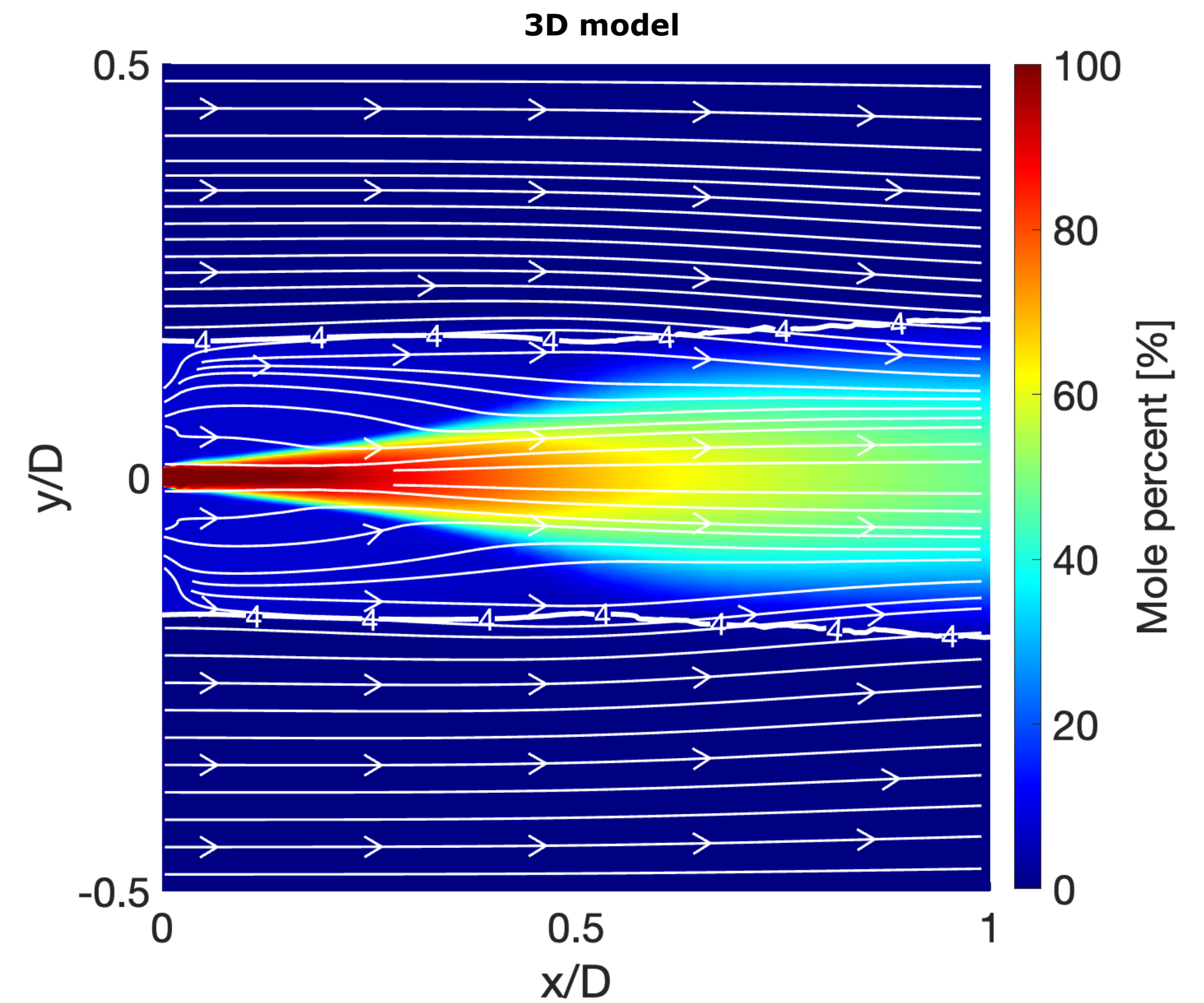
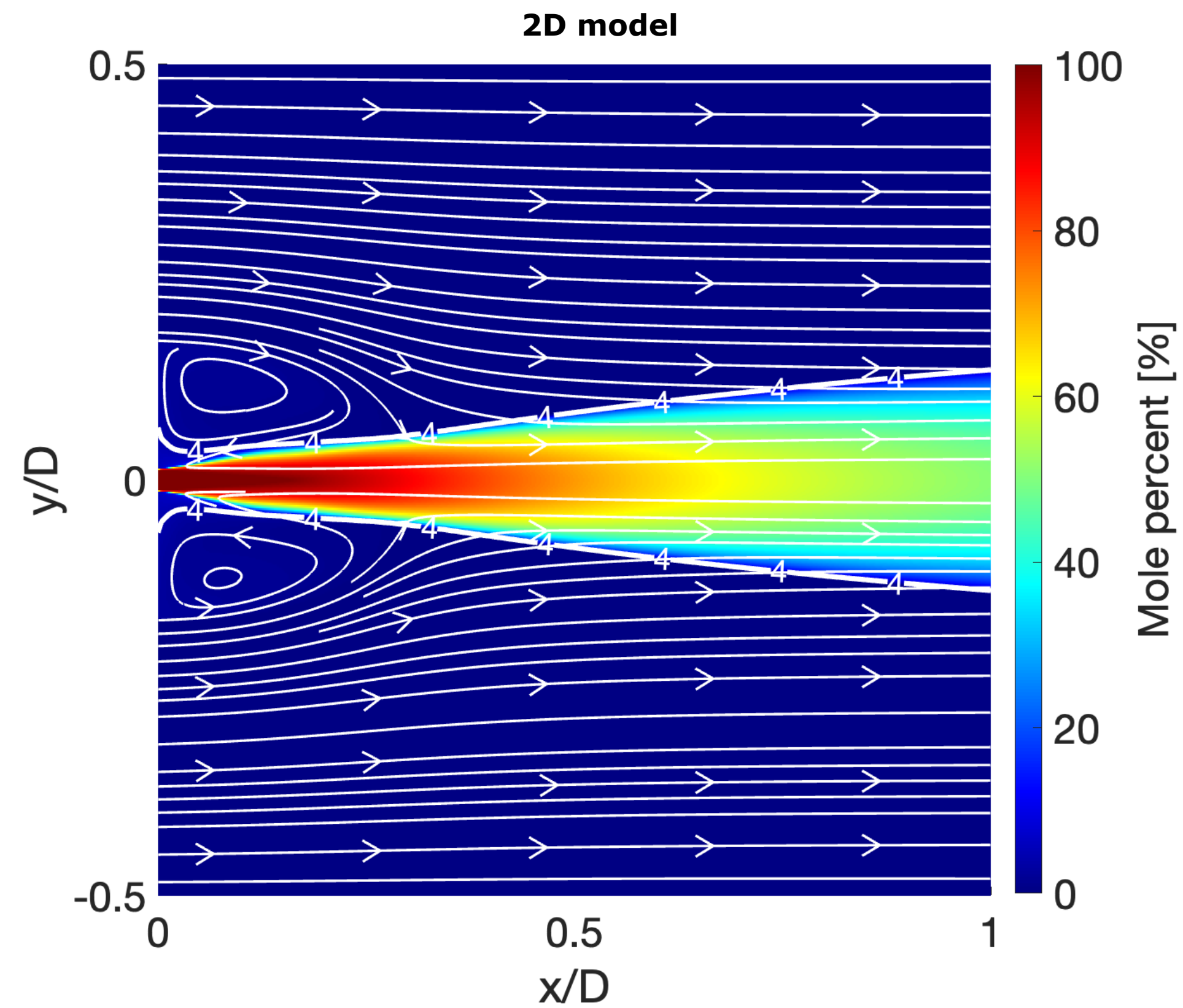
Non-axisymmetric

More realistic

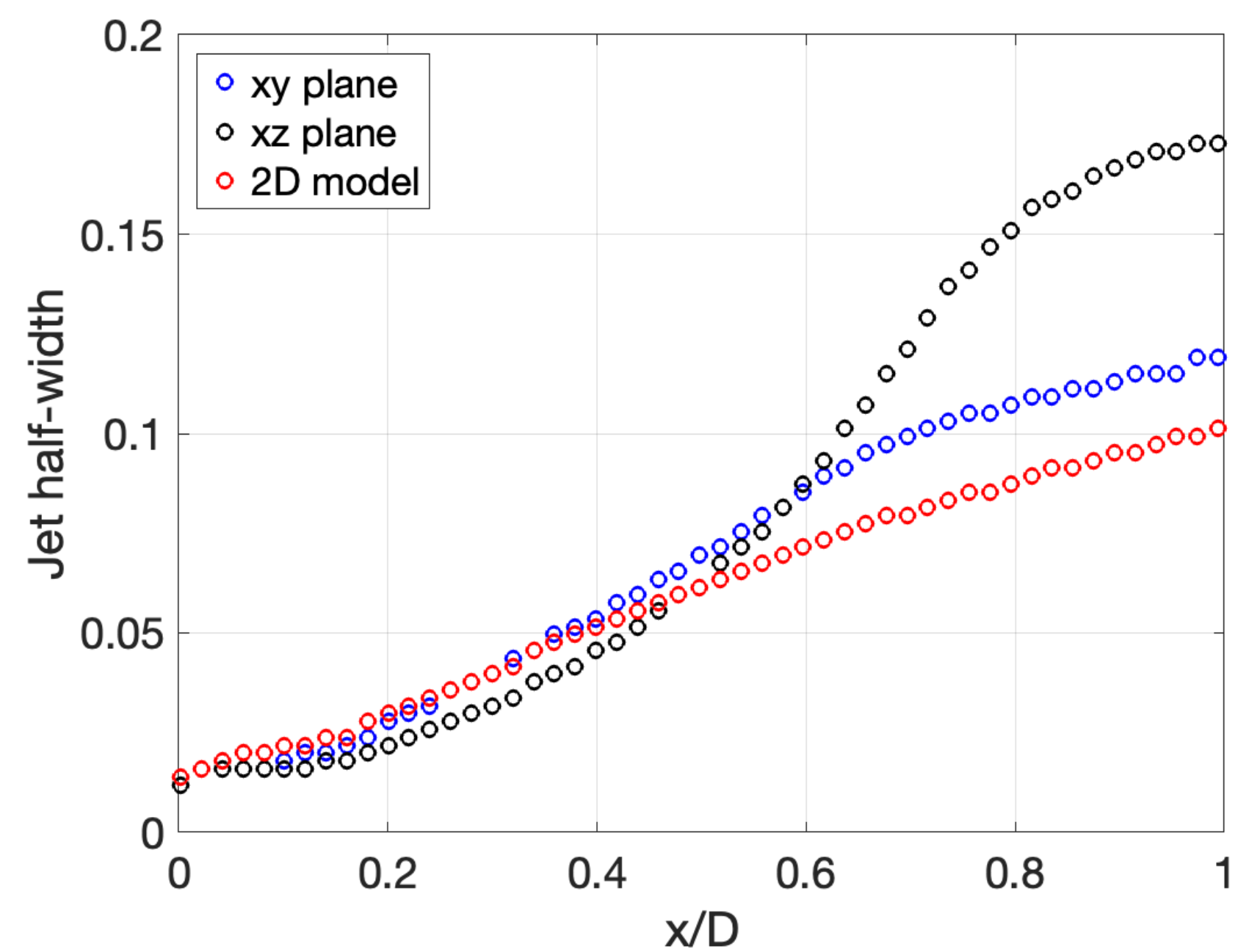
Evaluate 3D and transient effects



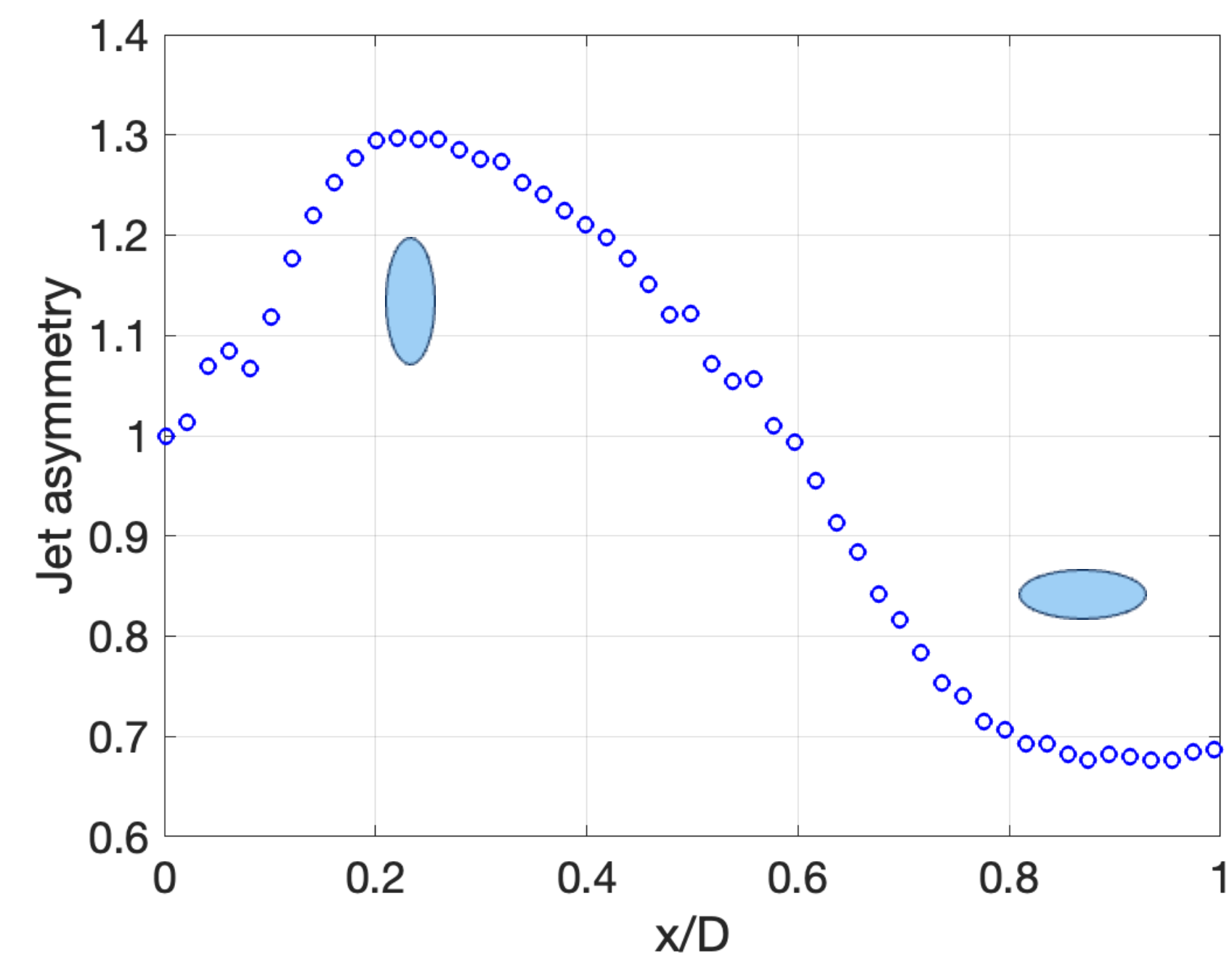
Results – Geometry



Results – Geometry



Asymmetric jet spread



Conclusions

Possible to control mixing using coaxial jet

Non-reacting simulations overestimate mixing

3D effects important for accuracy

2D model useful in predicting trends

Upcoming activities and next step

Thesis defence of PhD student in September 2026

Continuation project until 2027



Mining innovation for a sustainable future