

A modern office interior with a grid ceiling and large windows. The ceiling features a series of square panels with a grid pattern, and the walls are made of large, light-colored panels. The office is furnished with long wooden desks, black office chairs, and several potted plants. Large windows on the right side provide a view of a city skyline.

A configuration tool for diffuse ceiling ventilation

Poster presentation

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UNIVERSITY

Agenda

- Aim of our project
- DCV principle
- Methodology
- Literature review
- Numerical analysis
- Design charts
- Conclusion
- Further work



1 Aim of our project

DCV principle

Methodology

Literature review

Numerical analysis

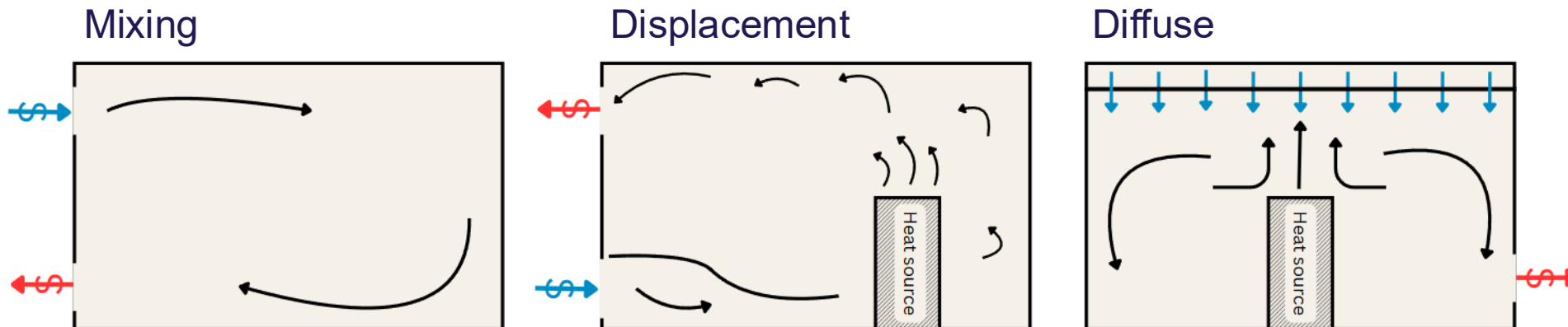
Design charts

Conclusion

Further work

Aim of our project

- Design tools exist for mixing & displacement ventilation
- No design tools and formulas exist for DCV
- Thesis lays groundwork for DCV configuration tool



2 Aim of our project

DCV principle

Methodology

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Numerical analysis

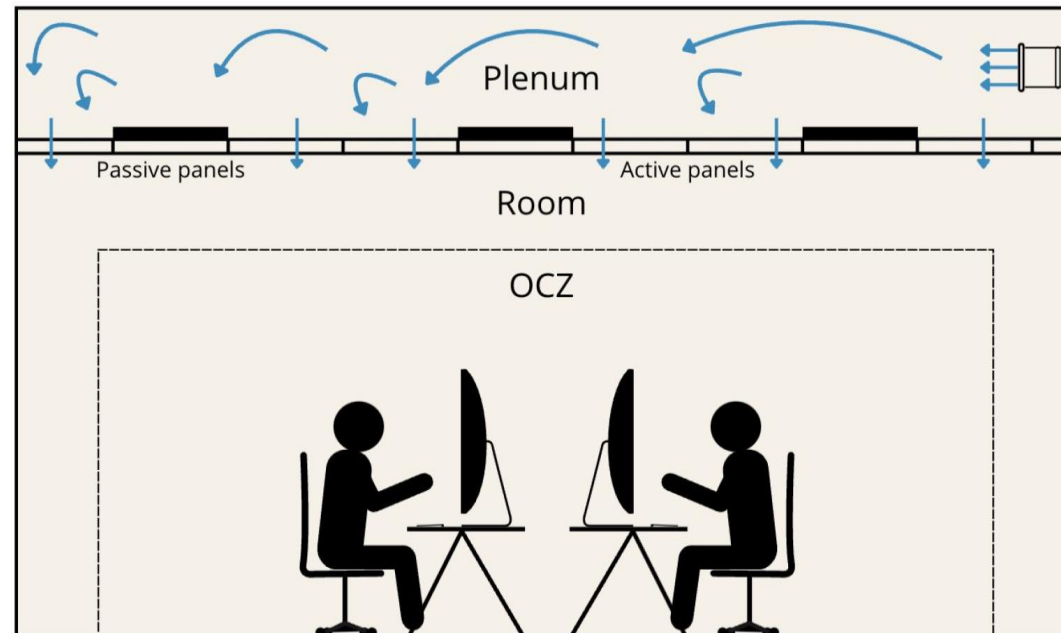
Design charts

Conclusion

Further work

DCV principle

- ▶ Plenum
- ▶ Ceiling as a diffuser
 - ▶ Active and passive panels
- ▶ Pressure difference
- ▶ Heat sources ensures mixing



Aim of our project

3 **DCV principle**

Methodology

Literature review

Numerical analysis

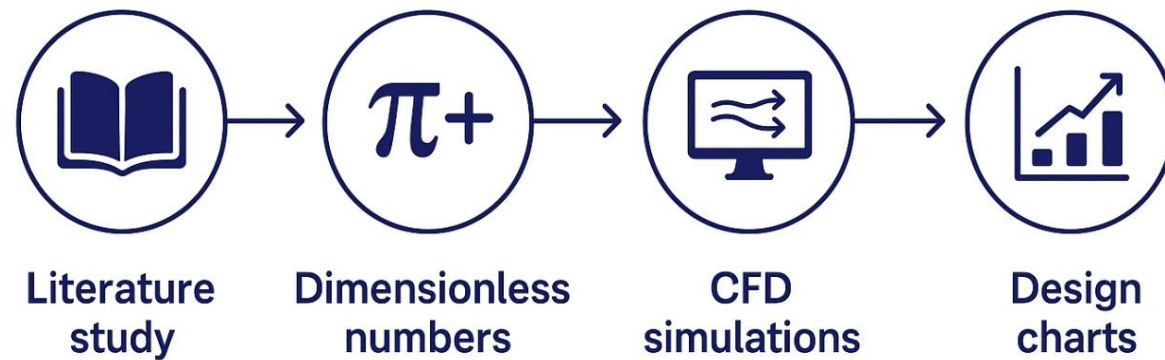
Design charts

Conclusion

Further work

Methodology

- Literature review
- Dimensionless numbers
- CFD simulations
- Design charts



Aim of our project

DCV principle

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Methodology

Literature review

Numerical analysis

Design charts

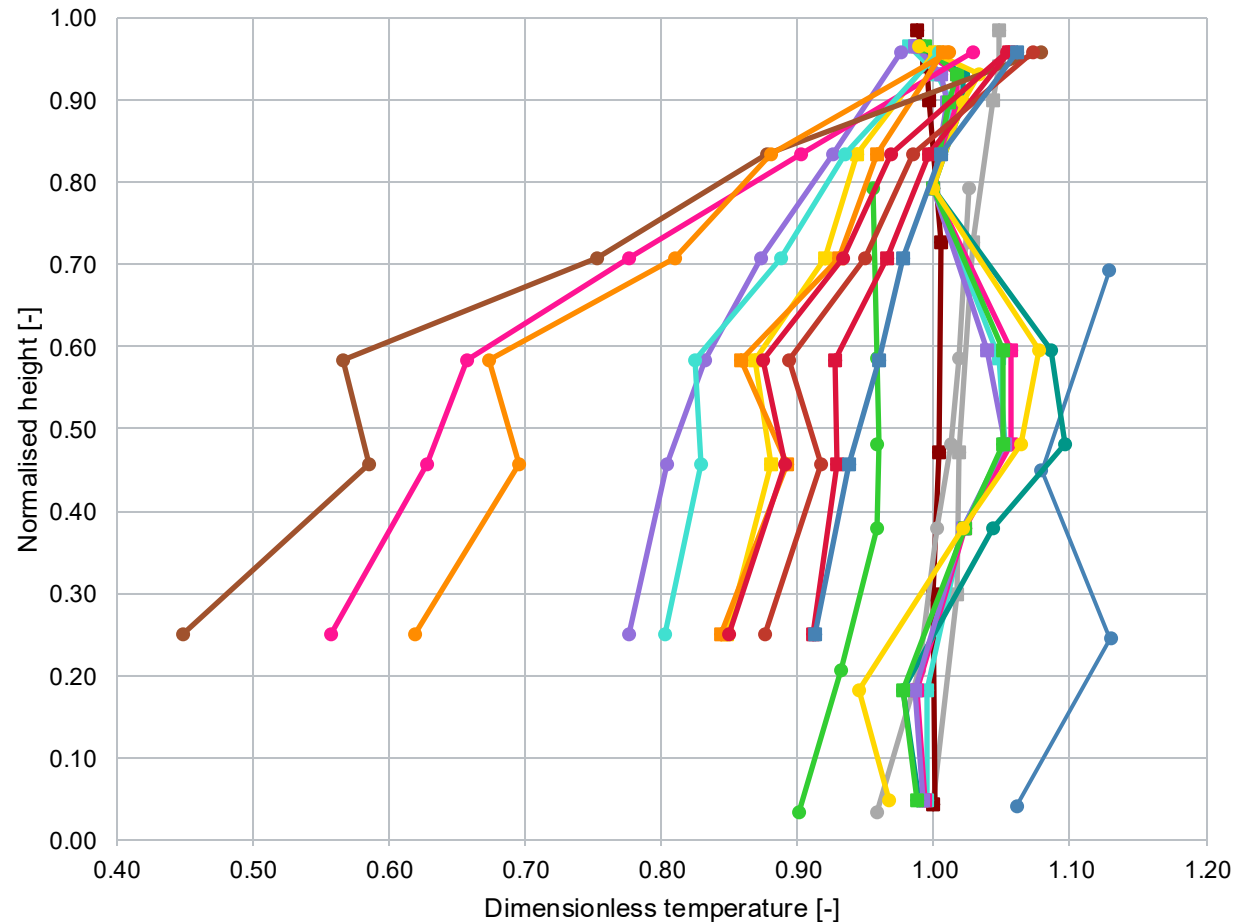
Conclusion

Further work

Literature review

Temperature

- ▶ Temperature gradients are compared between different studies
- ▶ Values normalised
- ▶ Greatest difference 1.5°C
- ▶ Not a limiting parameter



Aim of our project

DCV principle

Methodology

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Literature review

Numerical analysis

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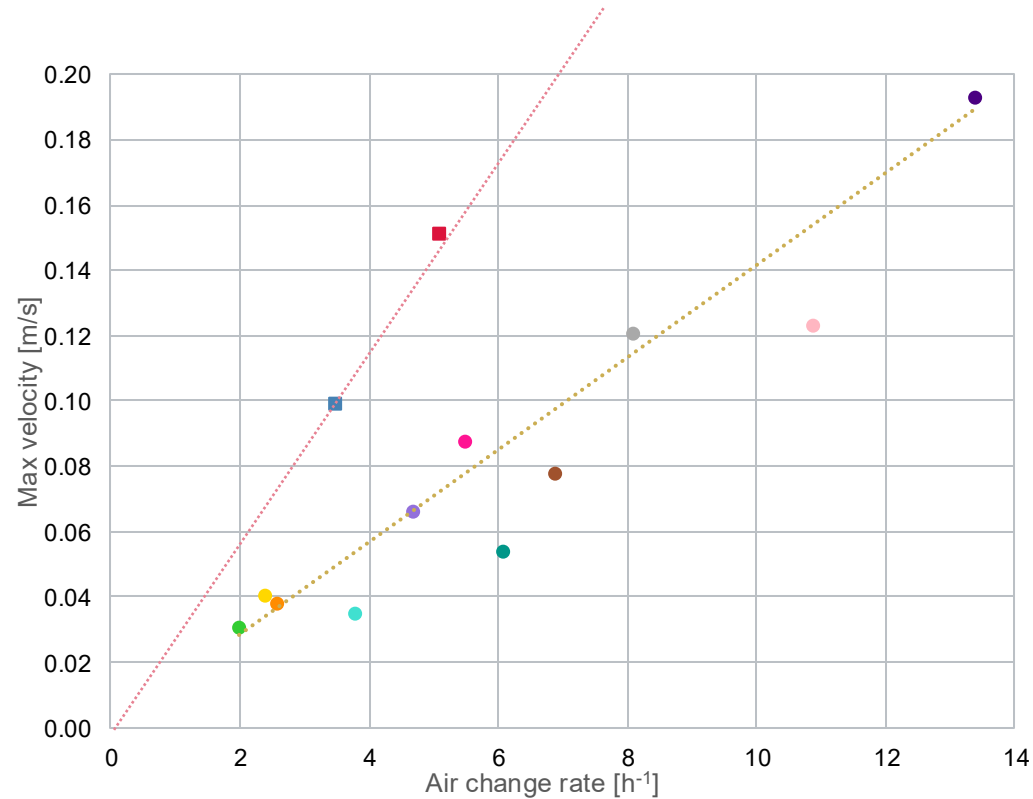
Further work

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Literature review

Velocity and draught

- ▶ Velocity and draught were also compared
- ▶ Changes in design charts were shown to cause draught



Aim of our project

DCV principle

Methodology

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Literature review

Numerical analysis

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Conclusion

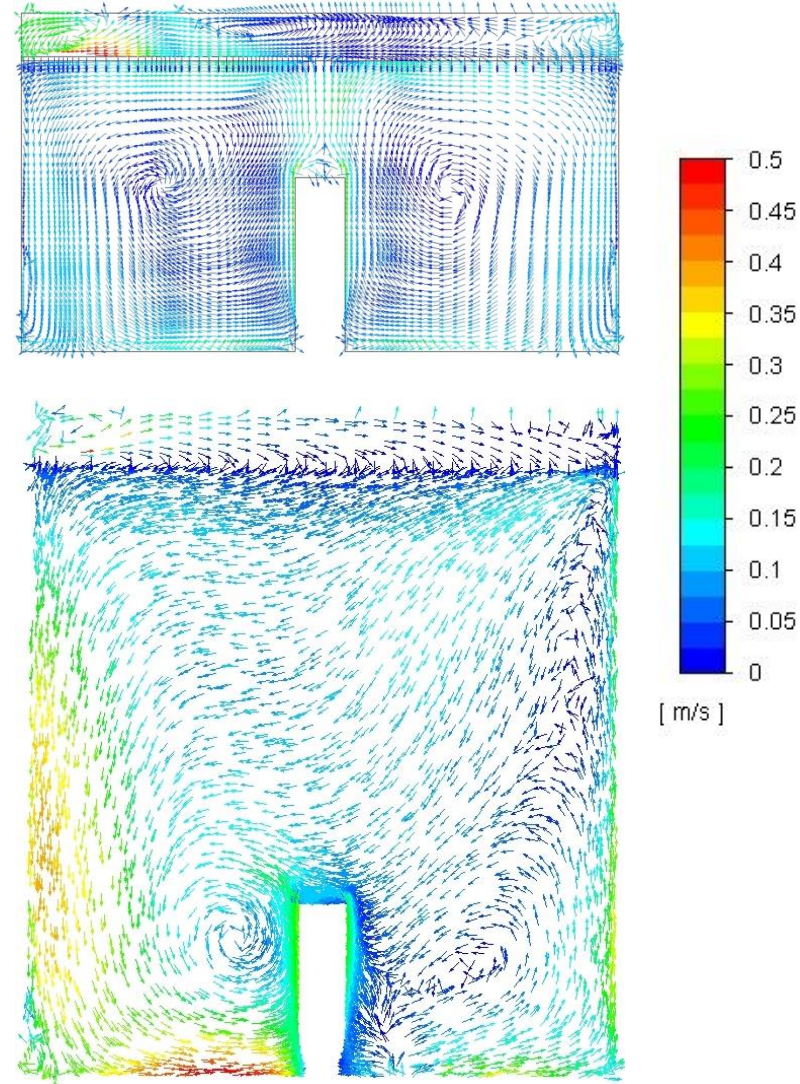
Further work

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Literature review

Velocity and draught

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Aim of our project

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Literature review

Numerical analysis

Design charts

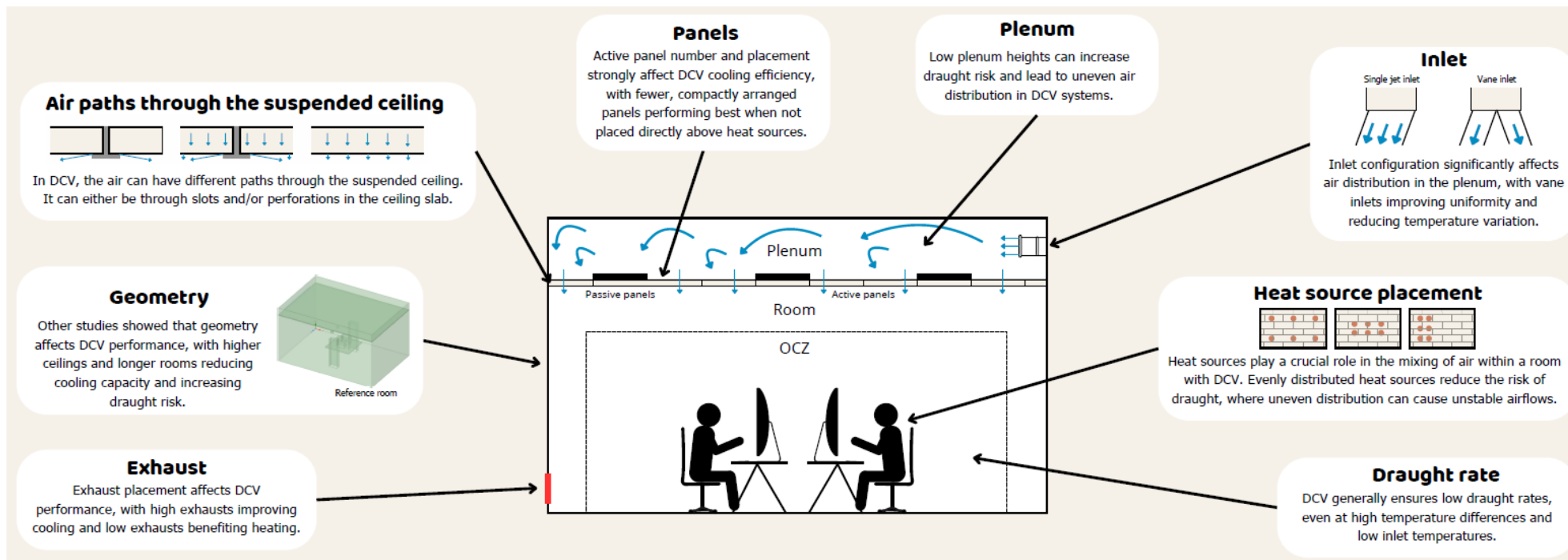
Conclusion

Further work

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Literature review

Design parameters



Aim of our project

DCV principle

Methodology

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Literature review

Numerical analysis

Design charts

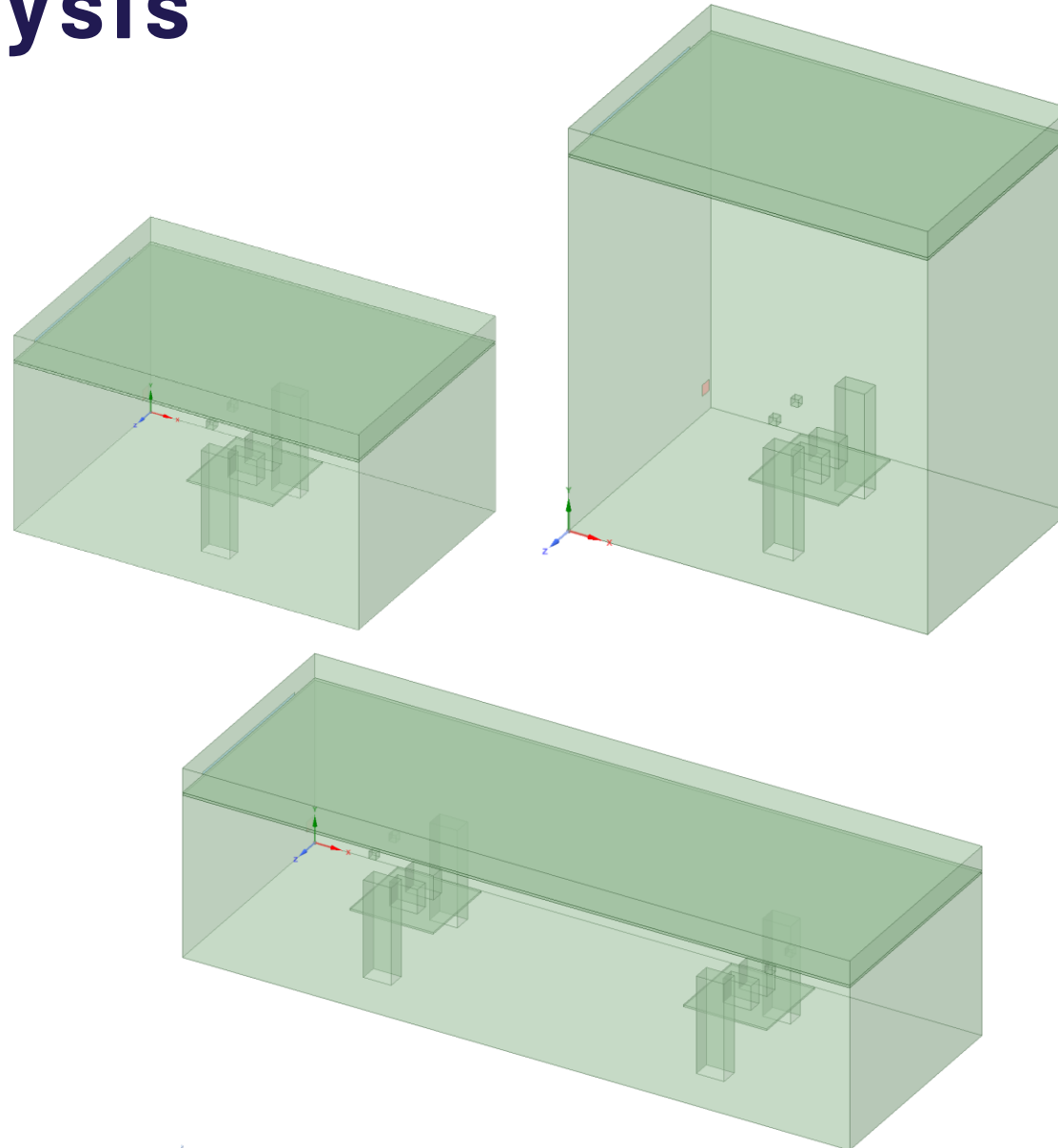
Conclusion

Further work

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Numerical analysis

- ▶ Heat load intensity
- ▶ Heat load distribution
- ▶ Geometry analysis



Aim of our project

DCV principle

Methodology

Literature review

9 **Numerical analysis**

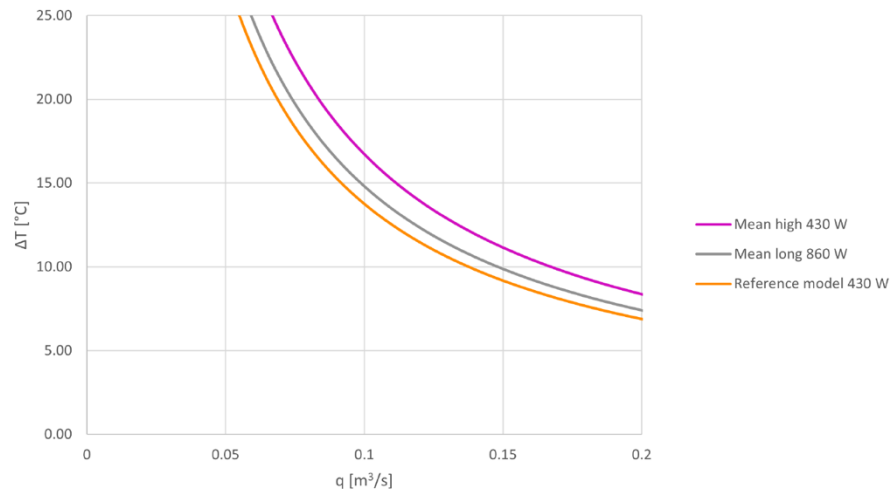
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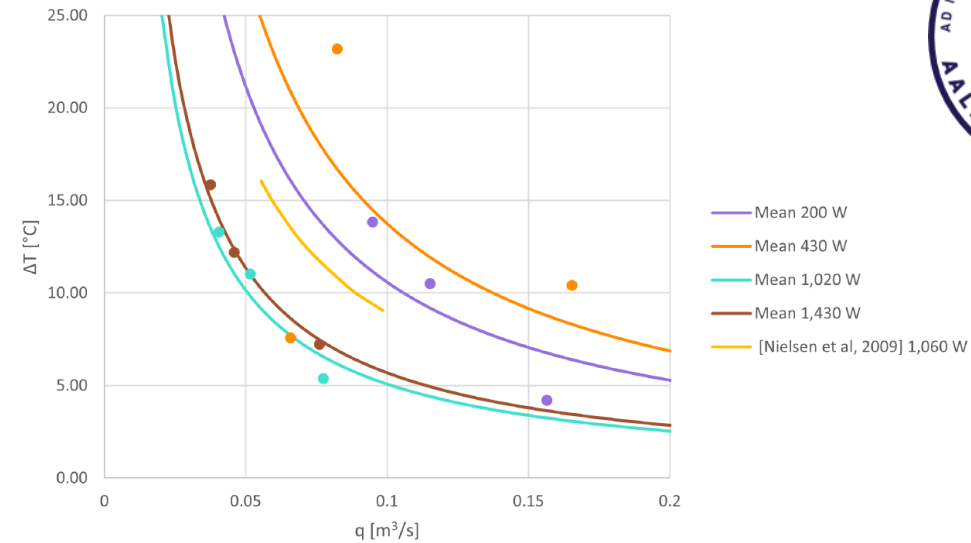
Further work

Design charts

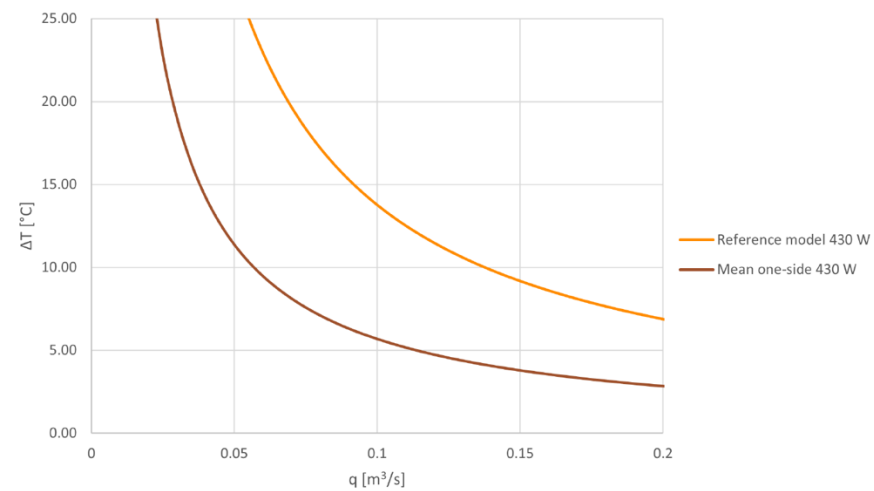
- Based on CFD simulations
- Indicate cooling performance



Design chart showing different room geometries.



Average design chart for heat load intensity. Include data from Nielsen and Jakubowska [2009].



Centred vs. one-sided heat load distribution.



Aim of our project

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10 Design charts

Conclusion

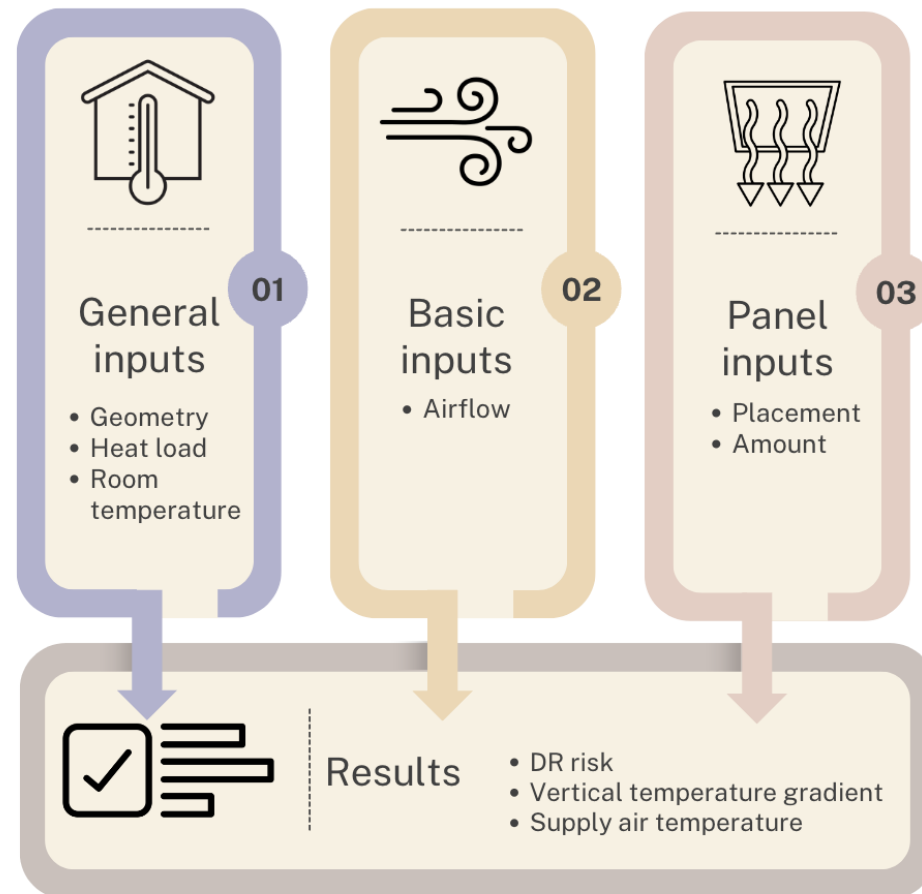
Further work

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Conclusion

Prototype configuration tool

- Based on data from experiments
- Limited data
- Too complex to make a generalised tool



Aim of our project

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11 **Conclusion**

Further work

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Further work

- ▶ More simulations for database
- ▶ Validate results experimentally
- ▶ Final development of tool



Aim of our project

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12 Further work

Questions?