A configuration tool for diffuse ceiling ventilation

Poster presentation

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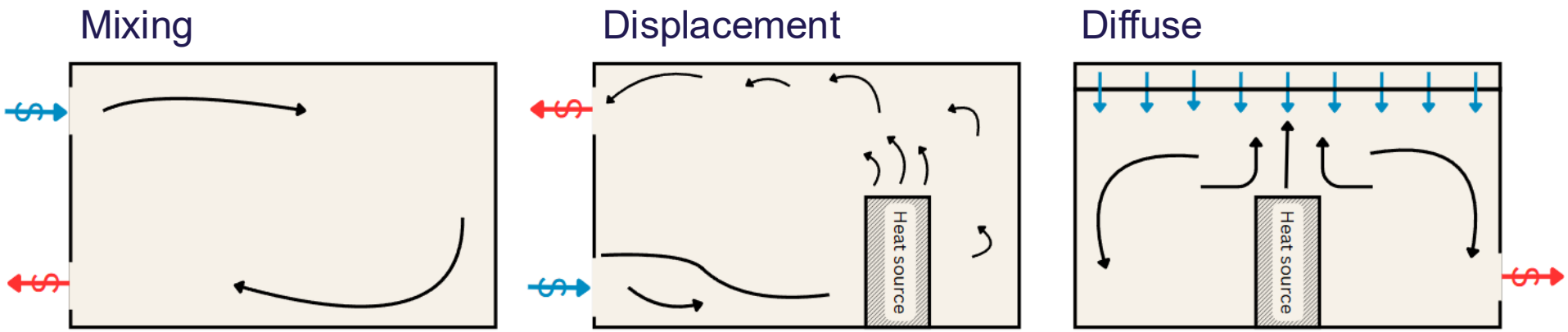
Agenda

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

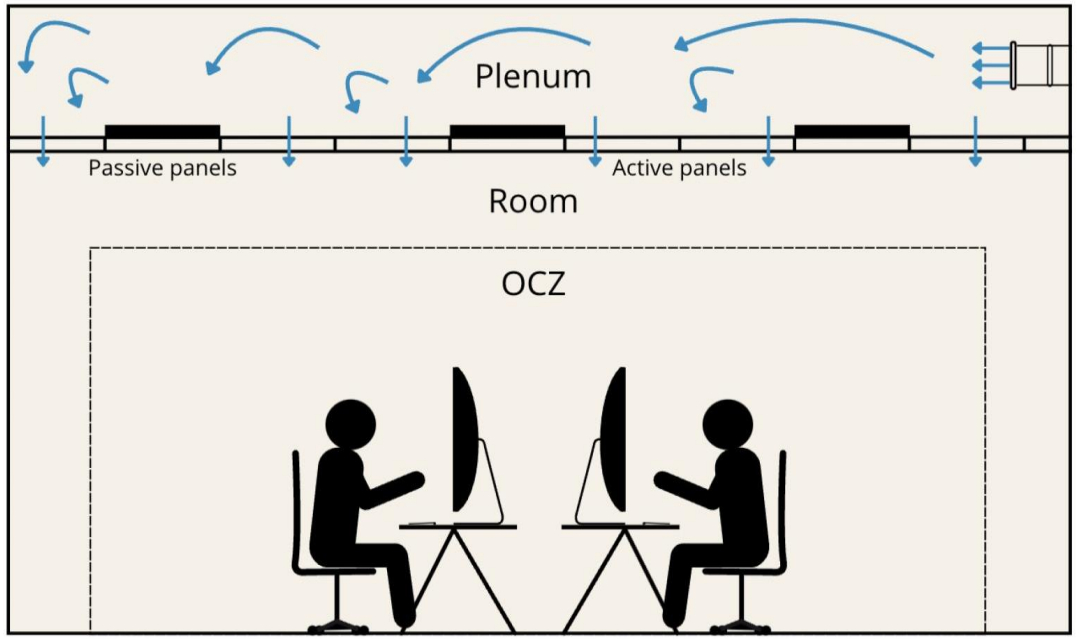
Aim of our project

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



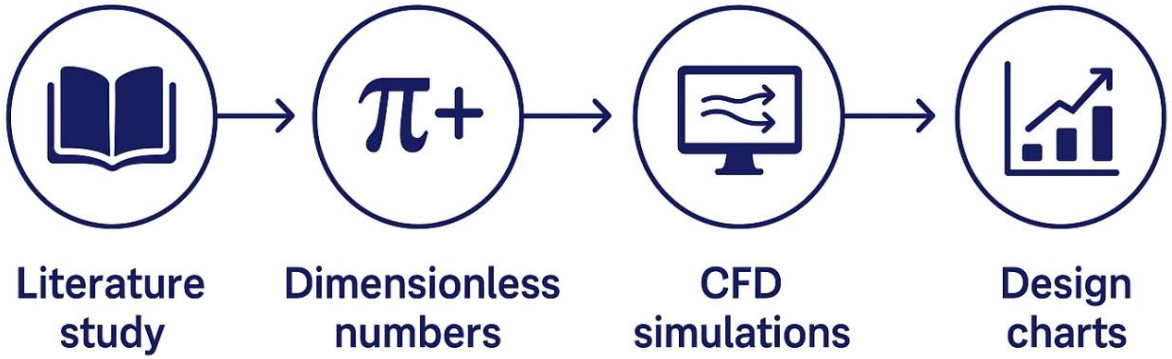
DCV principle

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



Methodology

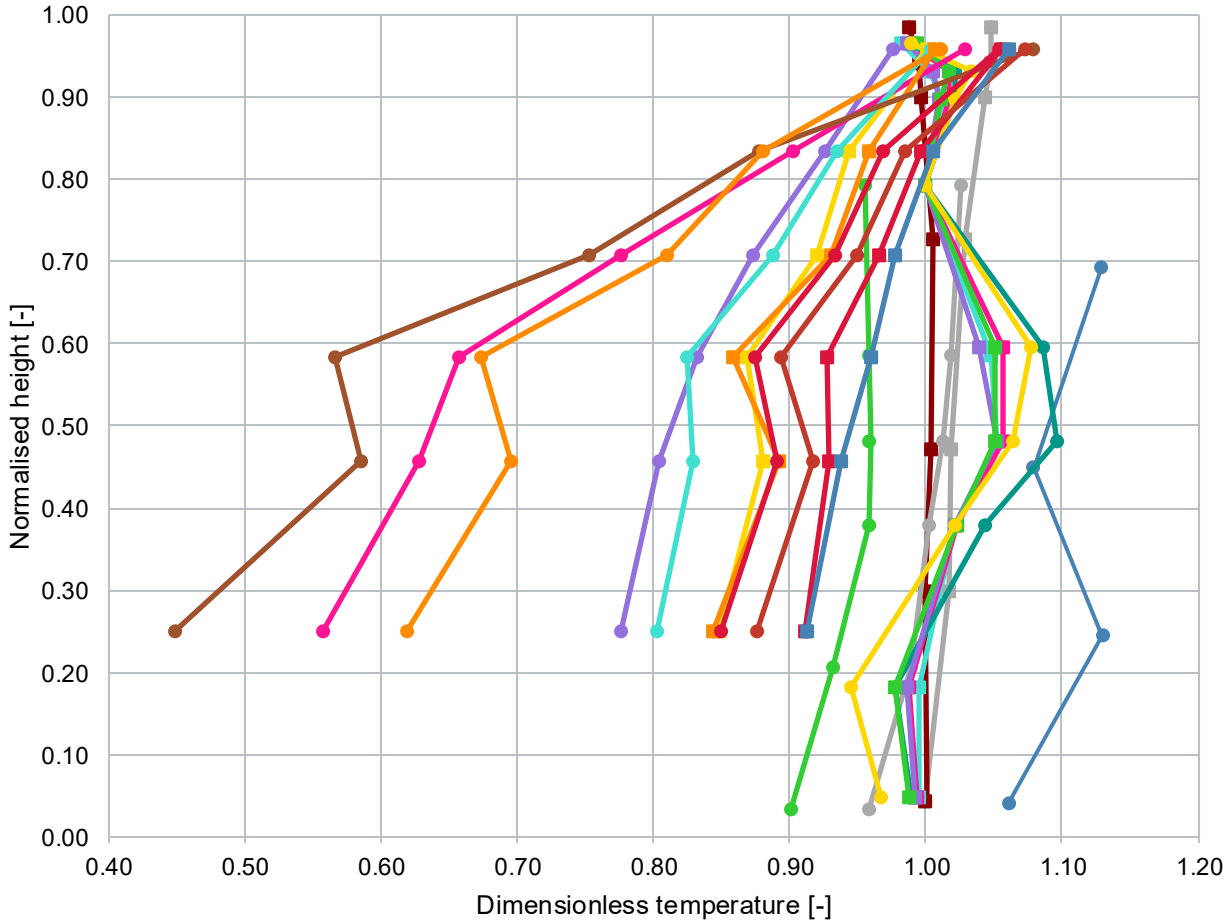
- Literature review
- Dimensionless numbers
- CFD simulations
- Design charts



Literature review

Temperature

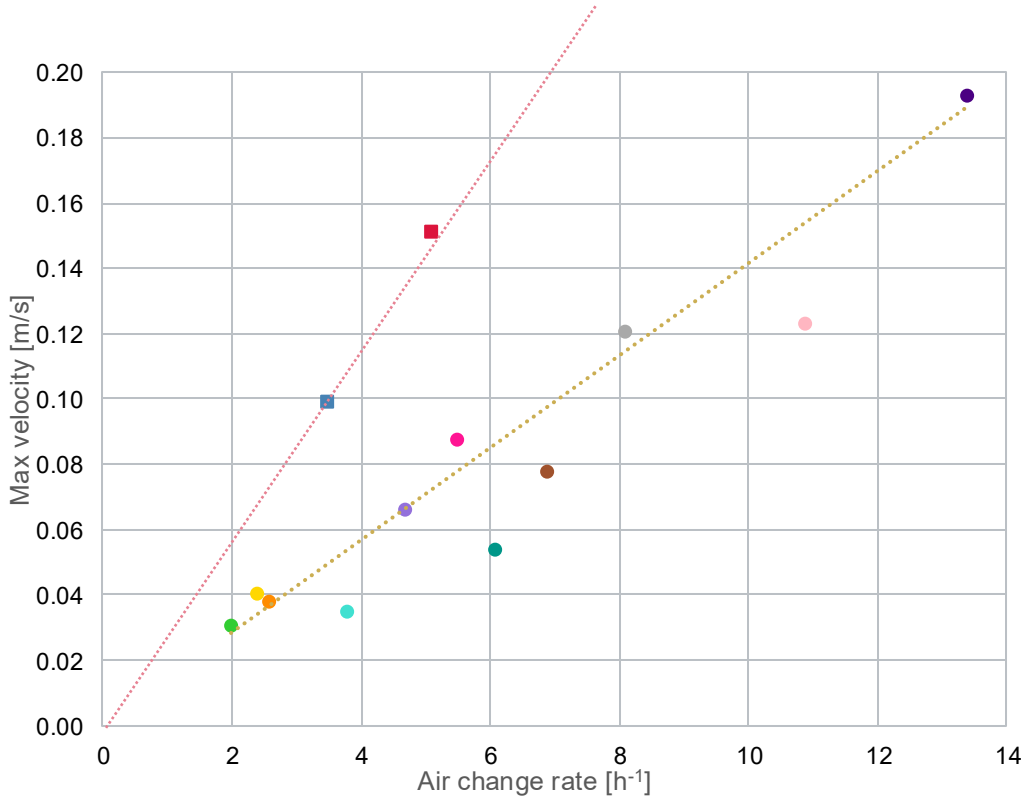
- Temperature gradients are compared between different studies
- Values normalised
- Greatest difference 1.5°C
- Not a limiting parameter



Literature review

Velocity and draught

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



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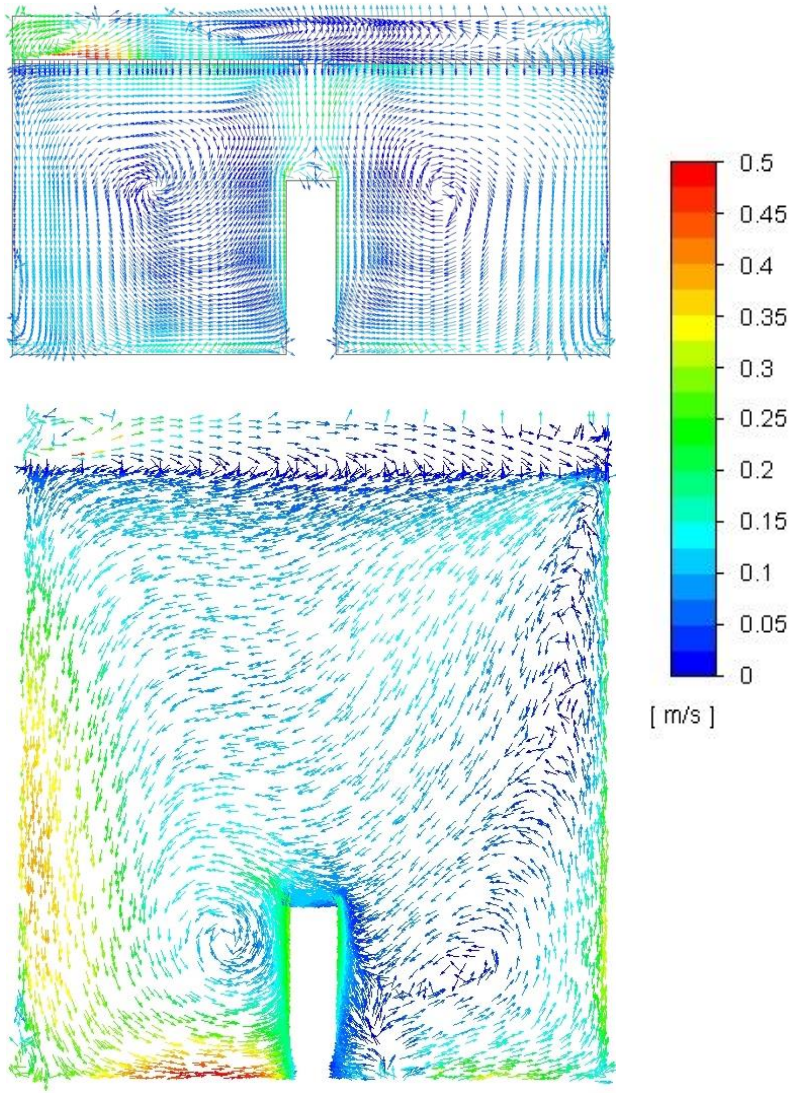
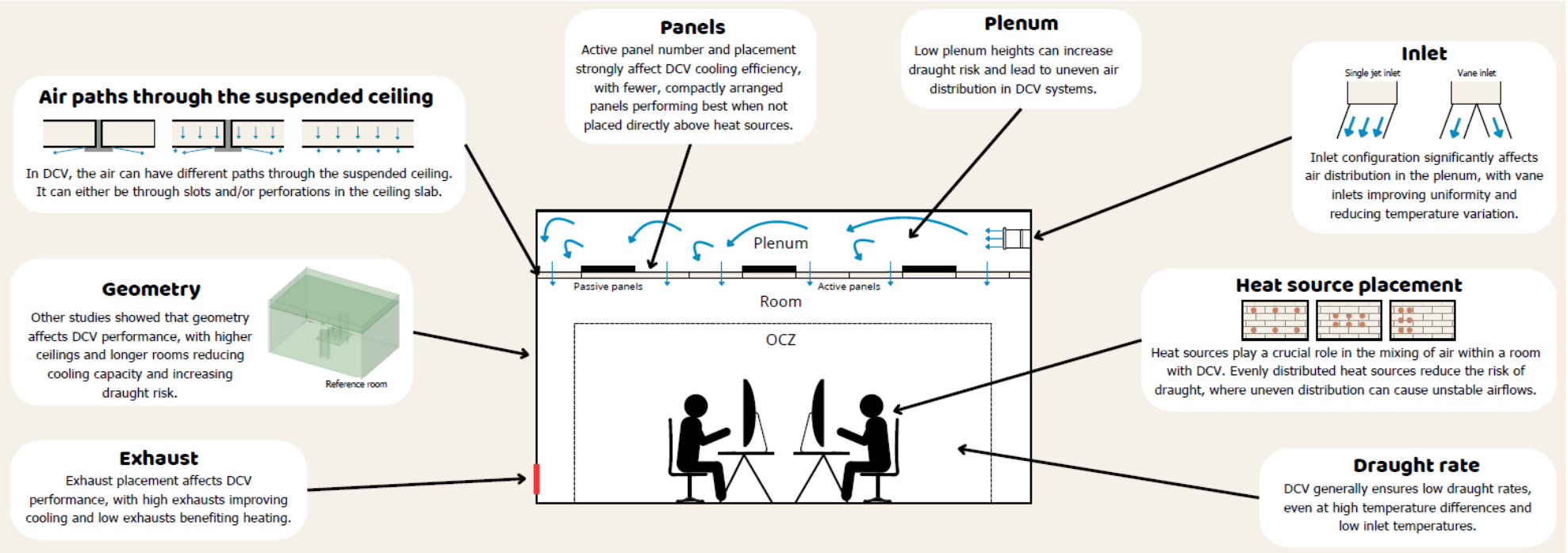


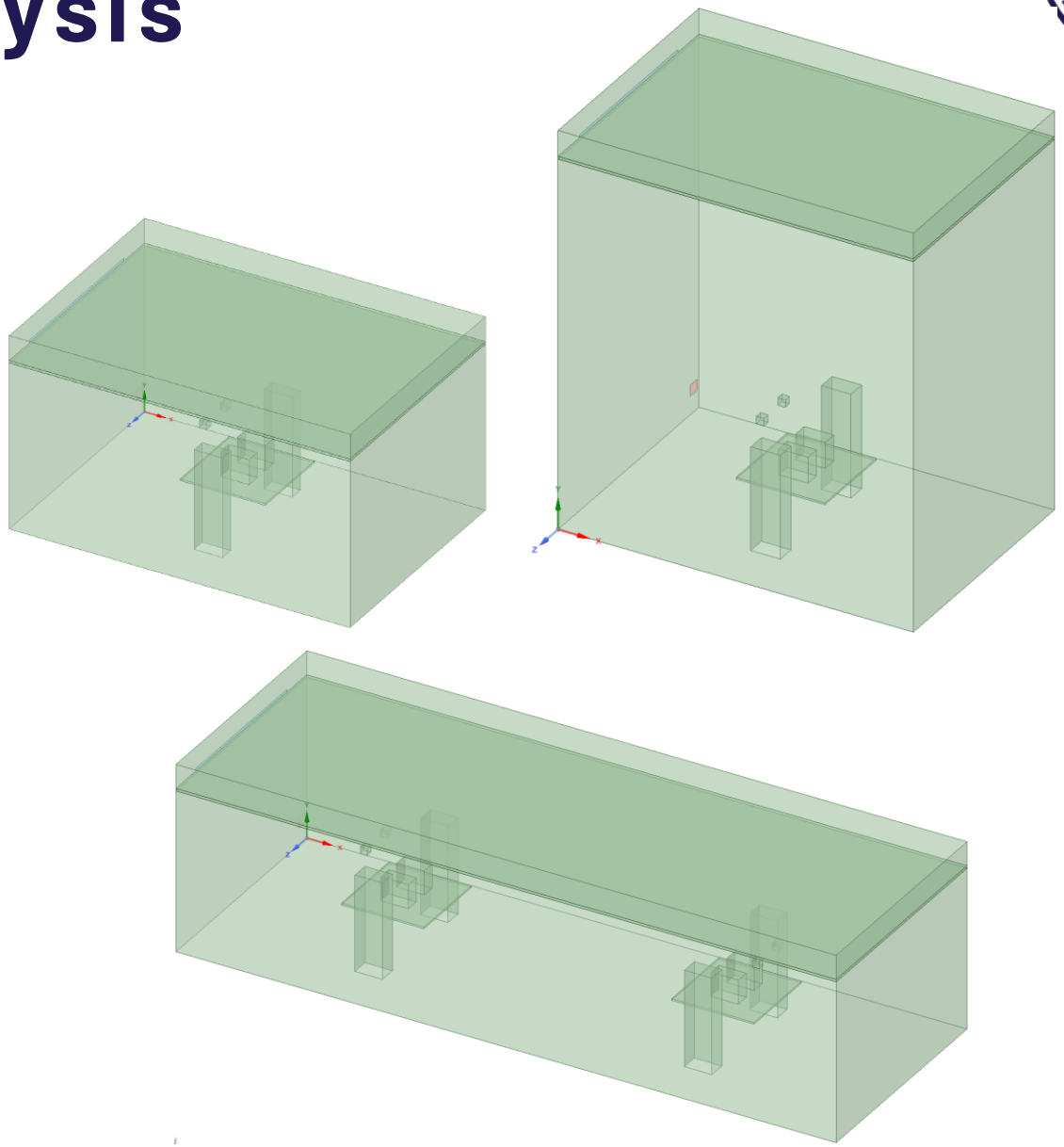
Literature review

Design parameters



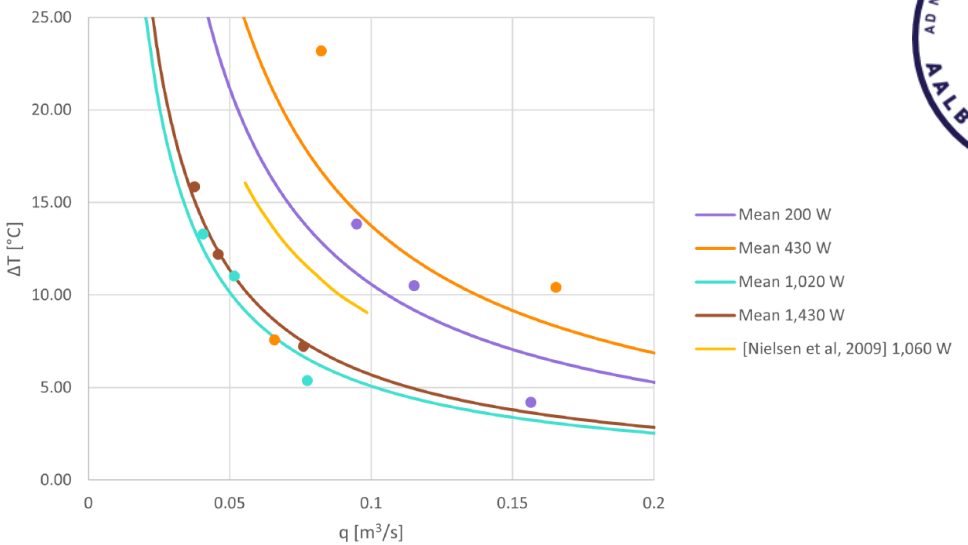
Numerical analysis

- Heat load intensity
- Heat load distribution
- Geometry analysis

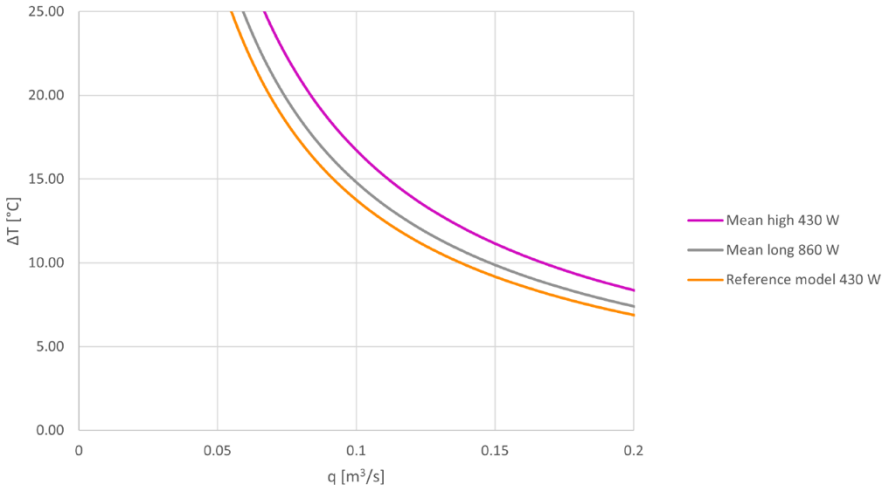


Design charts

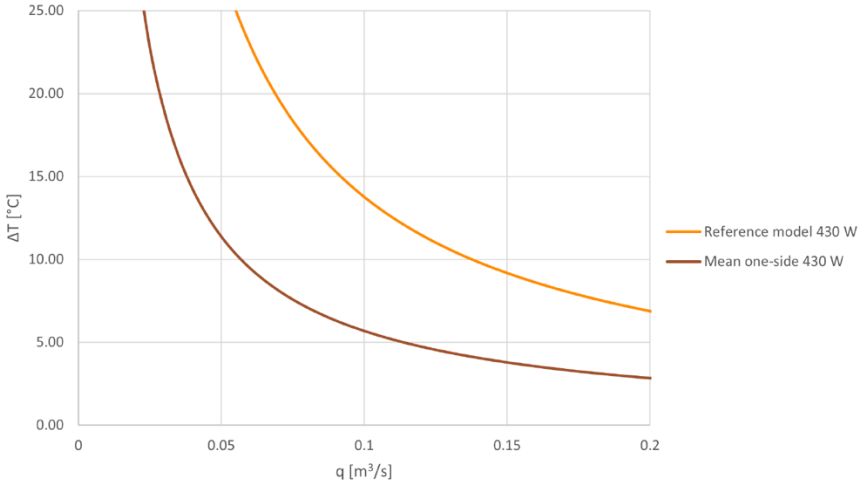
- Based on CFD simulations
- Indicate cooling performance



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



Design chart showing different room geometries.

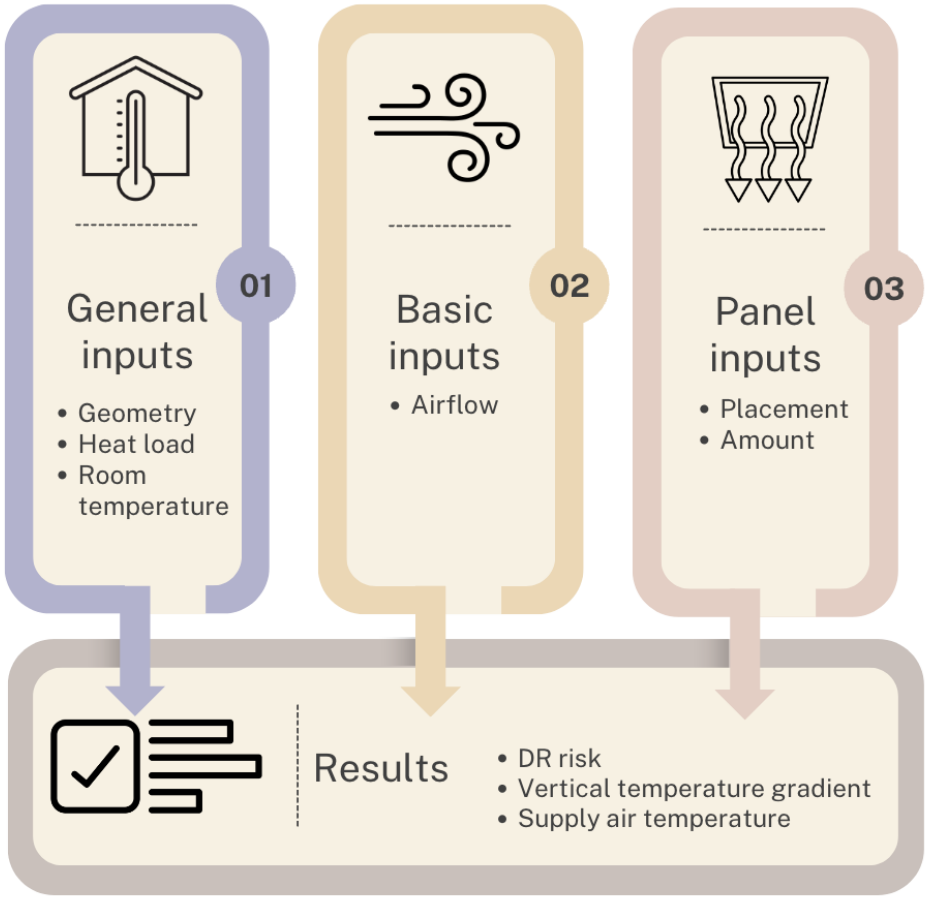


Centred vs. one-sided heat load distribution.

Conclusion

Prototype configuration tool

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



Further work

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

Questions?