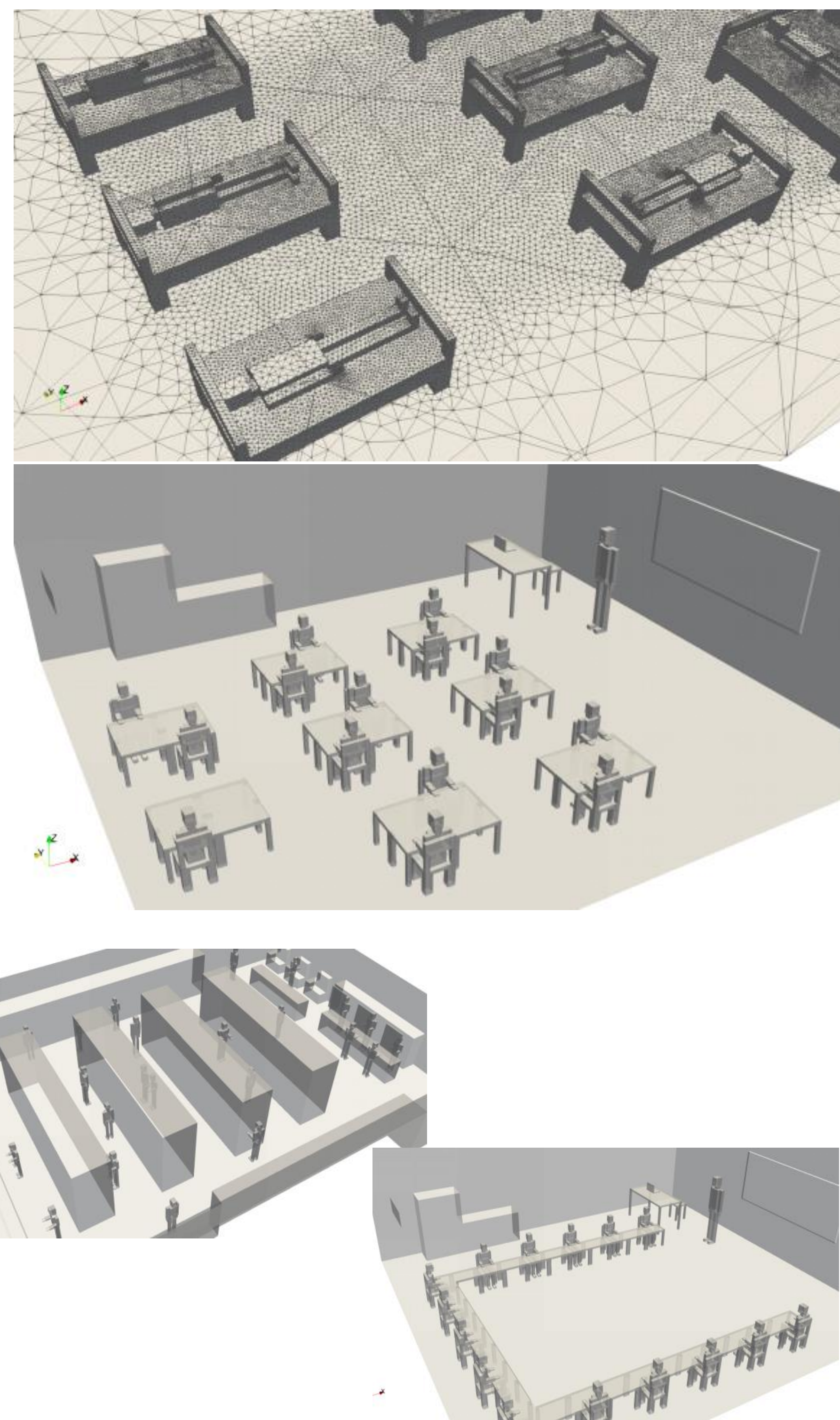




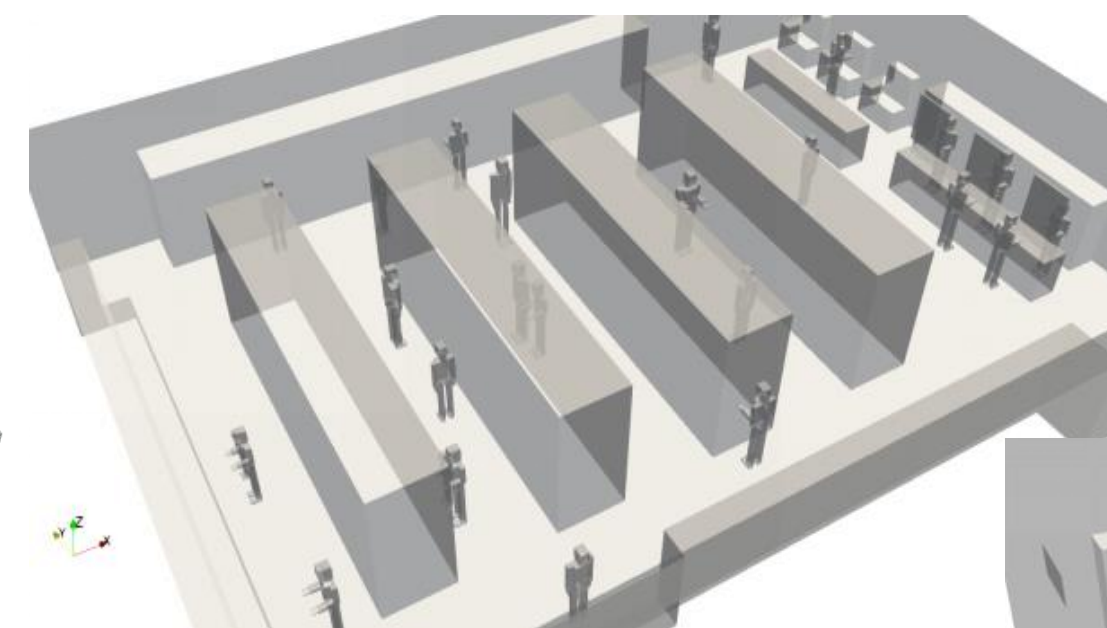
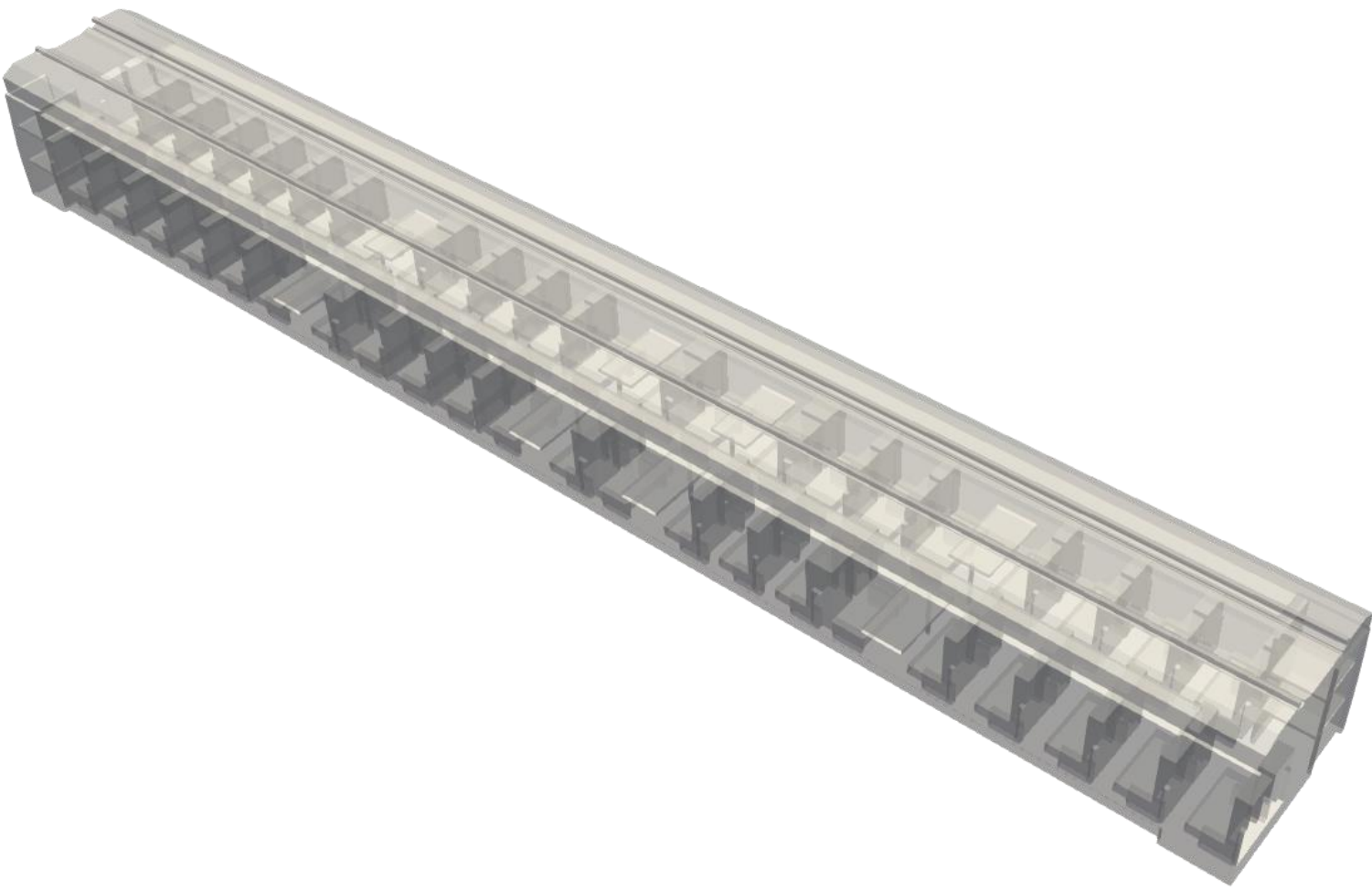
Indoor Geometry Generator (IGG)



Allows automatic and consistent generation of indoor spaces for CFD. Easy, quick, and user-friendly.

Features:

- Inlet and outlet ventilation;
- Doors, windows;
- Furnitures (bed, table, chairs, etc);
- Accessories (laptops, computers, etc);
- Static humans in different positions
- Different Bcs on different features;
- User freedom to coarsen/refine the mesh.

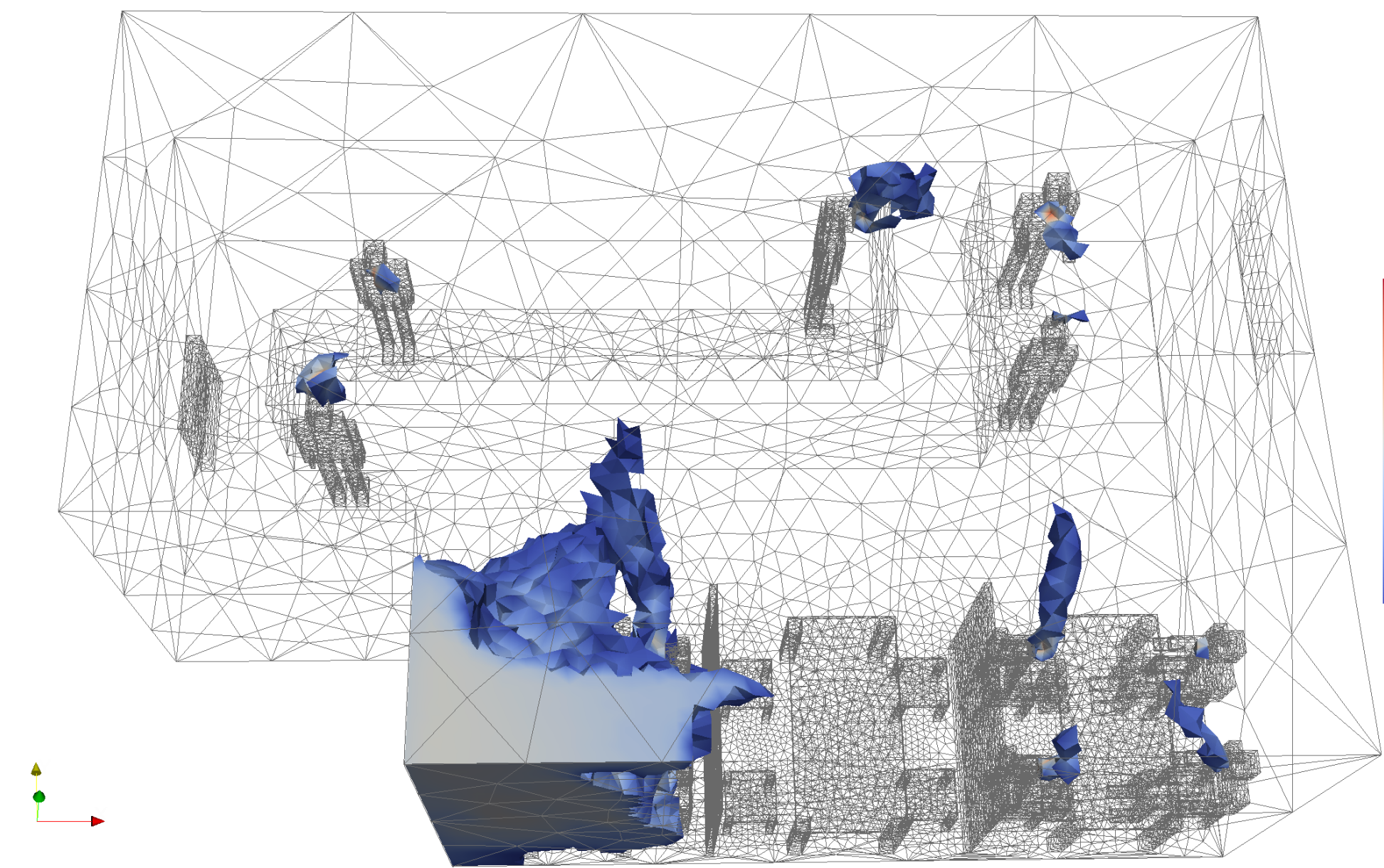


Small pub – CO2 concentration after 2 hours



Scale:
400 ppm
39k ppm

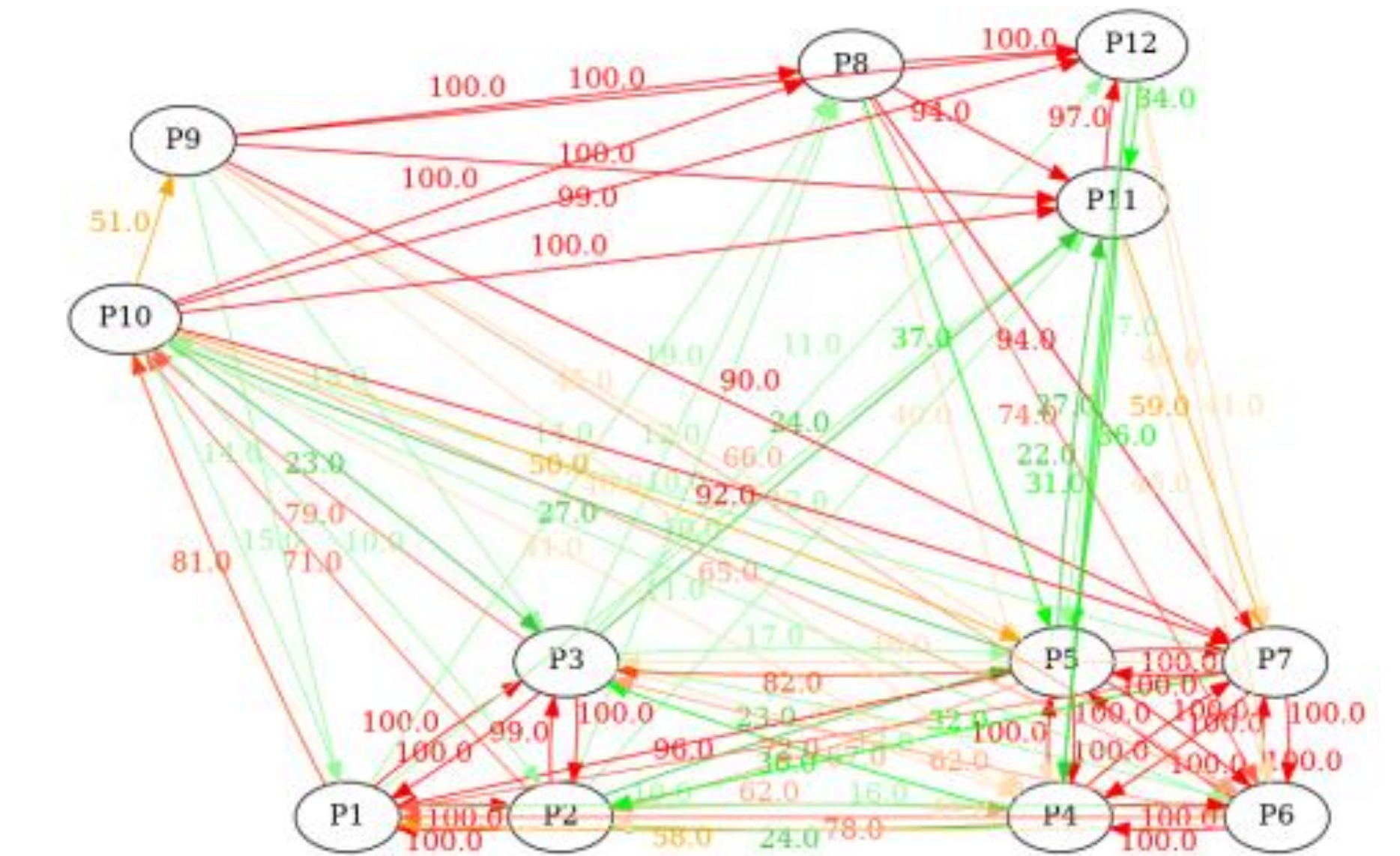
ACH 1.1



Scale:
39k ppm
10k ppm

Person to Person risk

- Right: Percentage probability of infection P from person to person with a quanta rate of 1000/hour, with an ACH of 1.1
- Very heterogeneous results are obtained as a consequence of the flow paths
- Close contacts have a high possibility of get infected



- Table: Average and median (in brackets) infection probability P given different quanta emission rates and ACH from our spatially dependent CFD model.

ACH	1 quanta/h	10 quanta/h	100 quanta/h	1000 quanta/h
0.4	0.46% (0.02%)	4.1% (0.42%)	13.9% (1.05%)	40.2% (24%)
1.13	0.41% (0.04%)	3.9% (0.43%)	13.6% (1.07%)	44.5% (35%)

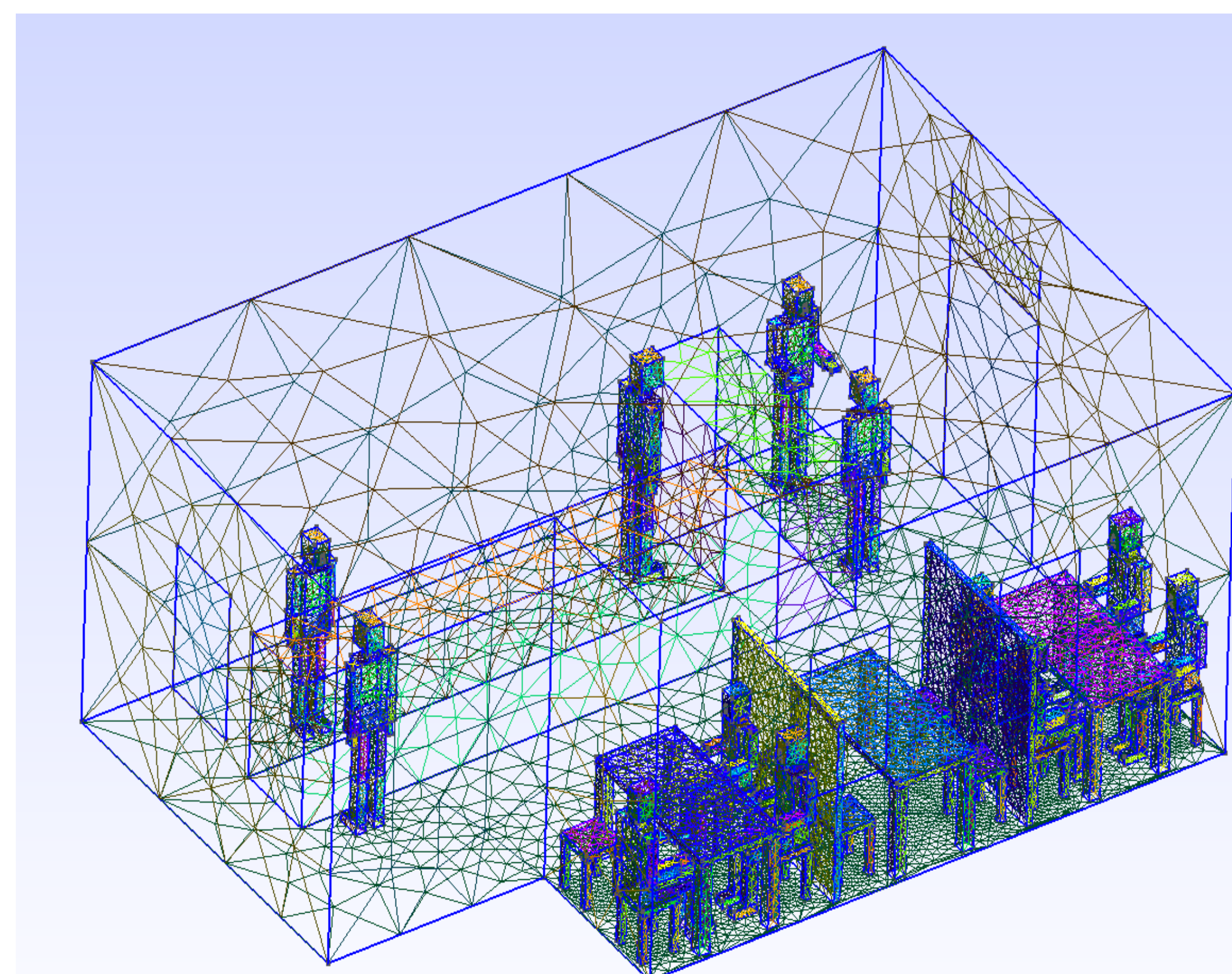
Small pub test case

Created geometry and mesh with IGG

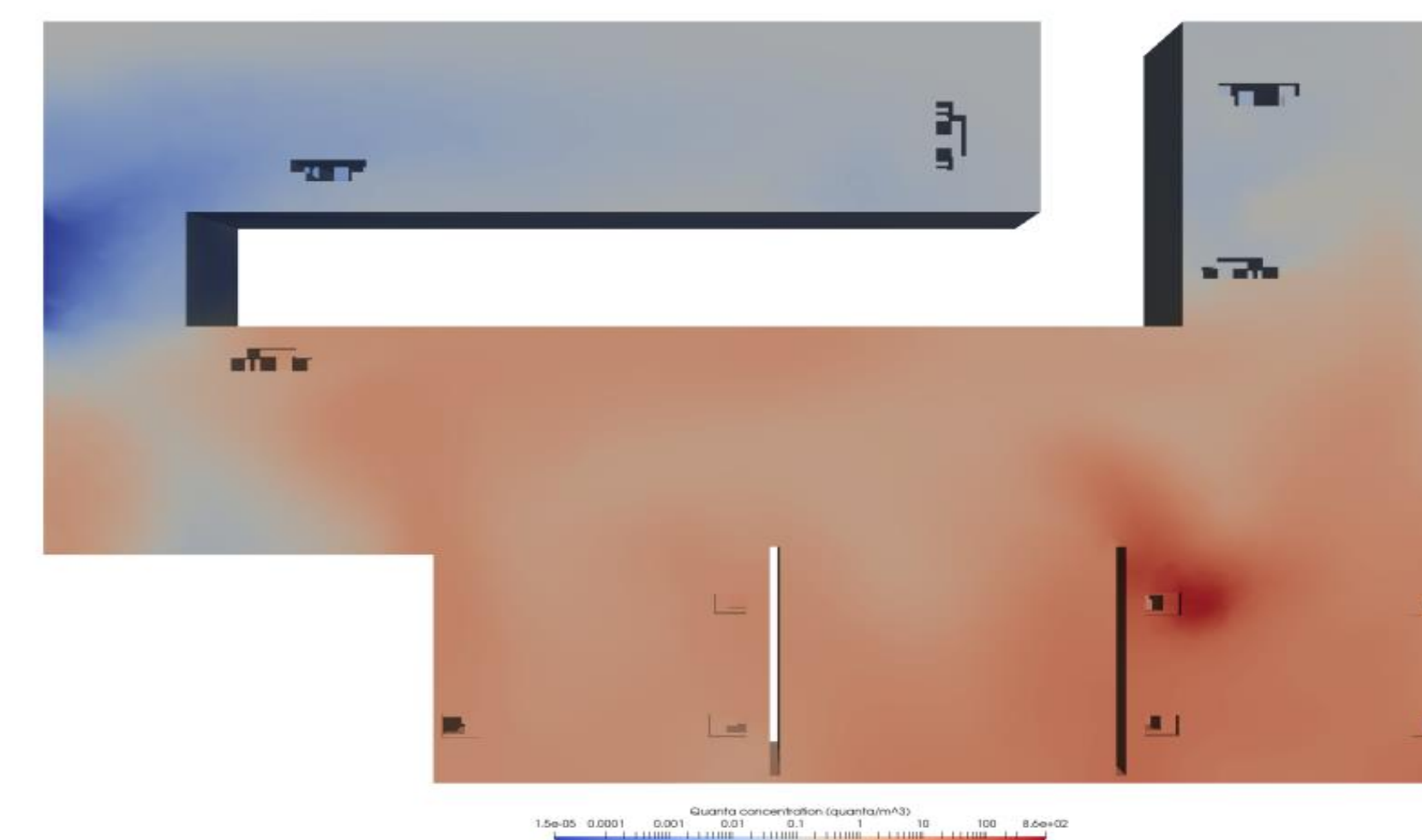
- 12 people, heated with Robin BCs
- Breathing out CO2
- Infective tracer emitted from each person
- Enables the use of a viral half life
- Boussinesq approximation
- Convection-diffusion for heat
- Lateral ventilation: One inlet and one outlet
- Radiator providing heating
- Dividers between tables

Some questions we have begun examining:

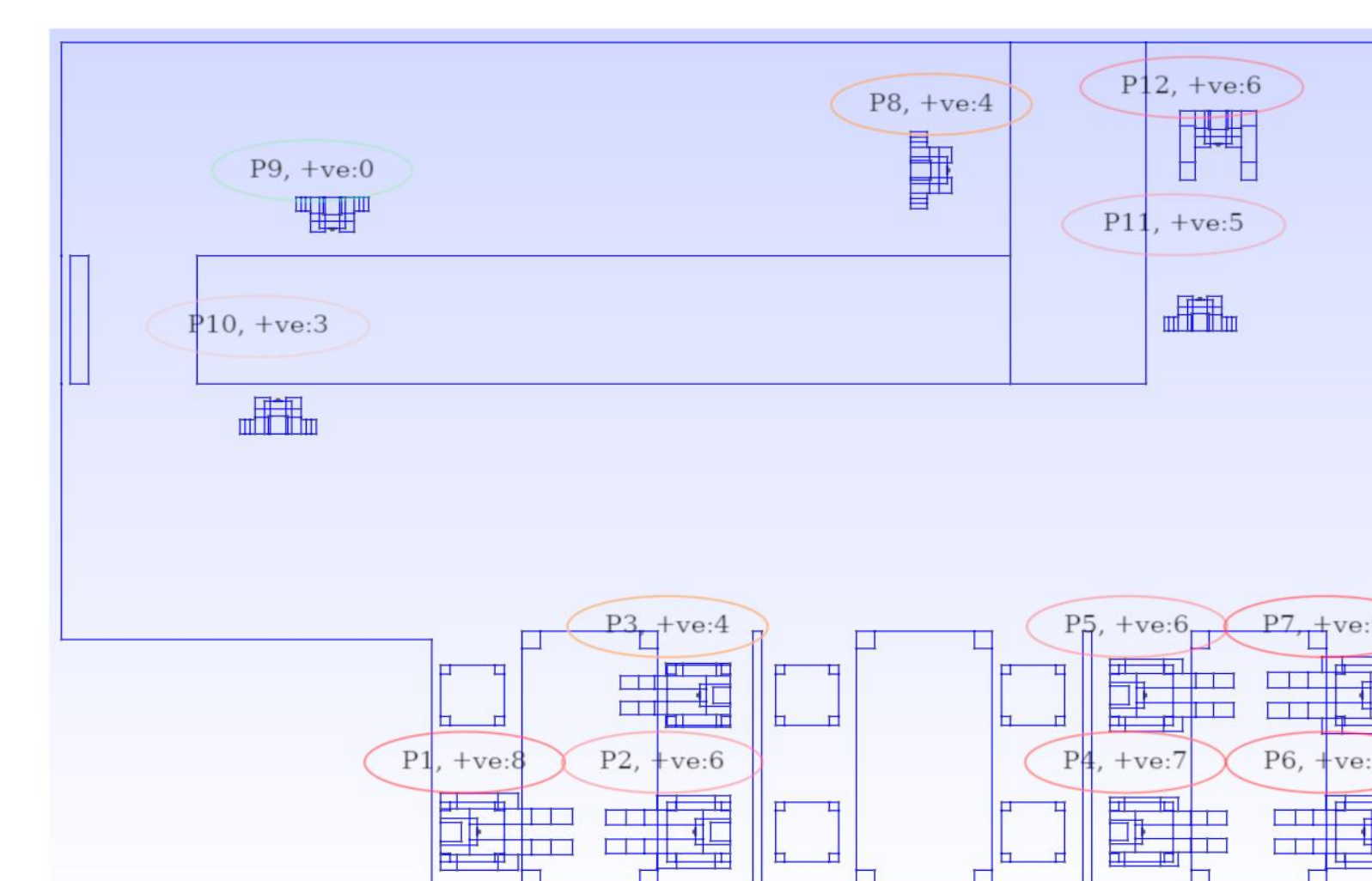
- Effect of ACH on CO2 concentration
- Does exposure to others breath = CO2 concentration?
- ie is CO2 a good proxy for infection risk?



ACH of 0.4: Spatial variation of the quanta concentration from Person 5



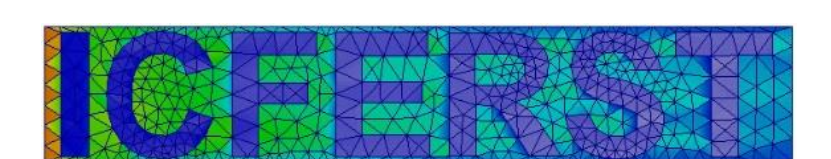
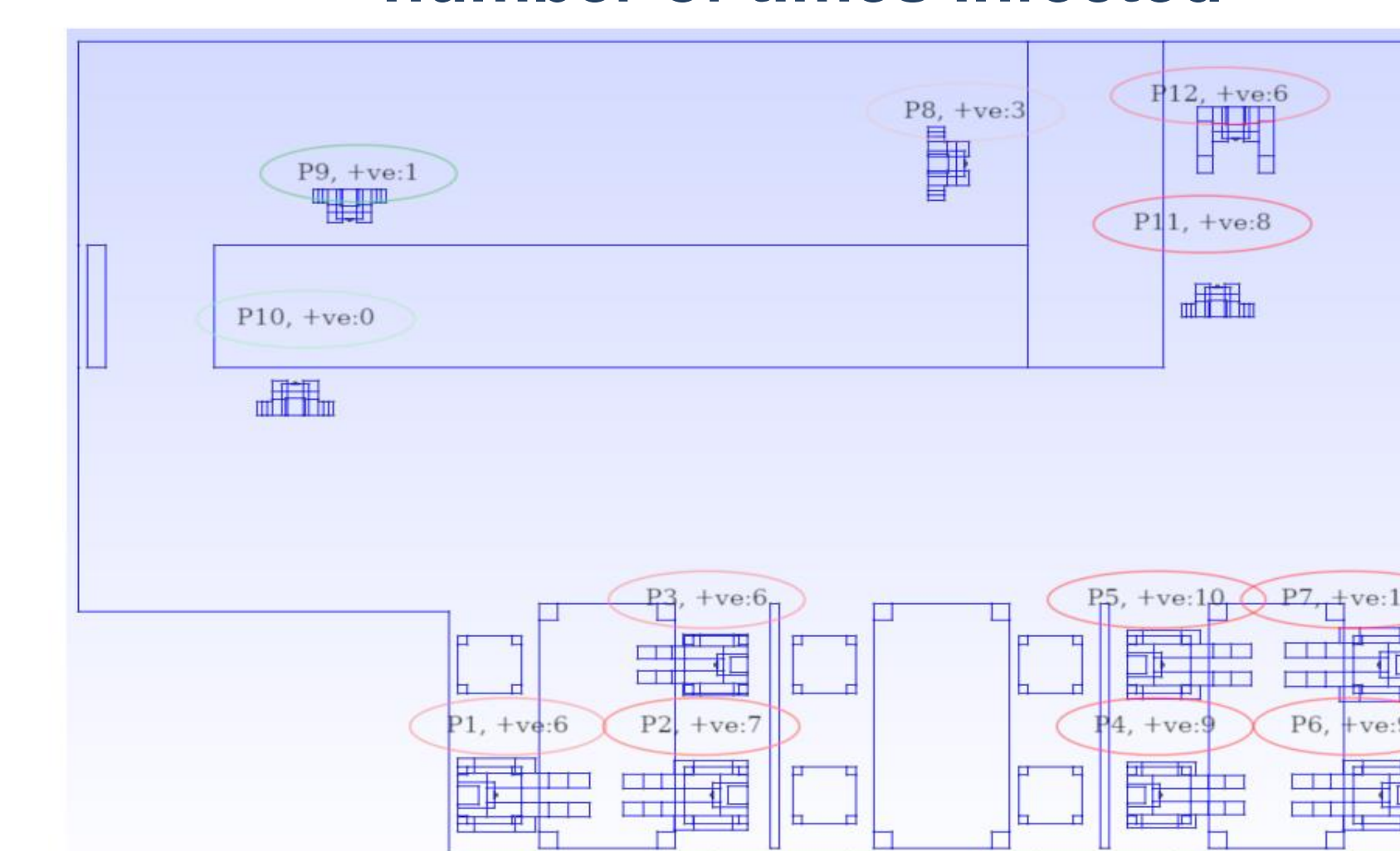
ACH of 0.4: Person numbering and number of times infected



Summary

- We consider 12 people in a room with individual tracers for each person for a period of 2 hours.
- We use CO2 as a proxy for COVID19 spread enhanced with an infectivity model which includes viral decay to assess infectivity risk.
- 48 different scenarios, and two ACH, are considered to simulate the risk of infection.
- We compare with a well-mixed Riley model. The well-mixed model substantially overestimated the probability of infection in this case, showing the CFD more heterogeneous results.
- For low viral emissions, the further away the lower the infection risk. However, for “super-spreaders” infection can occur across the whole domain.
- We find that increased ACH does not necessarily decrease, in this scenario, the number of infections.

ACH of 1.1: Person numbering and number of times infected



For more information visit:
<http://multifluids.github.io/>

WEBSITE



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