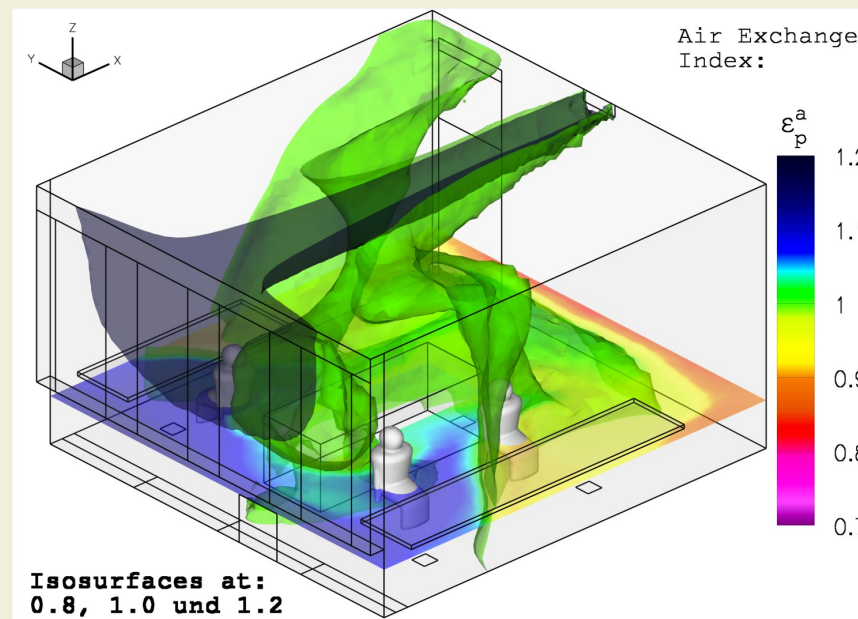


Regulation of displacement ventilation systems combined with surface heating/cooling in passive house office model rooms



Tobias Waltjen, Thomas Zelger, Bernhard Lipp, IBO – Austrian Institute for Healthy and Ecological Building

tobias.waltjen@ibo.at,

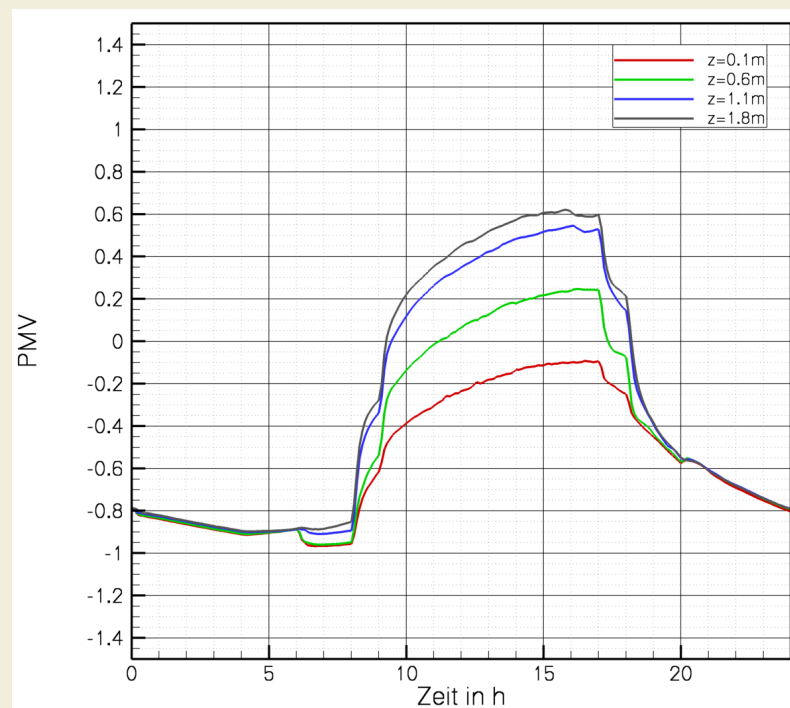
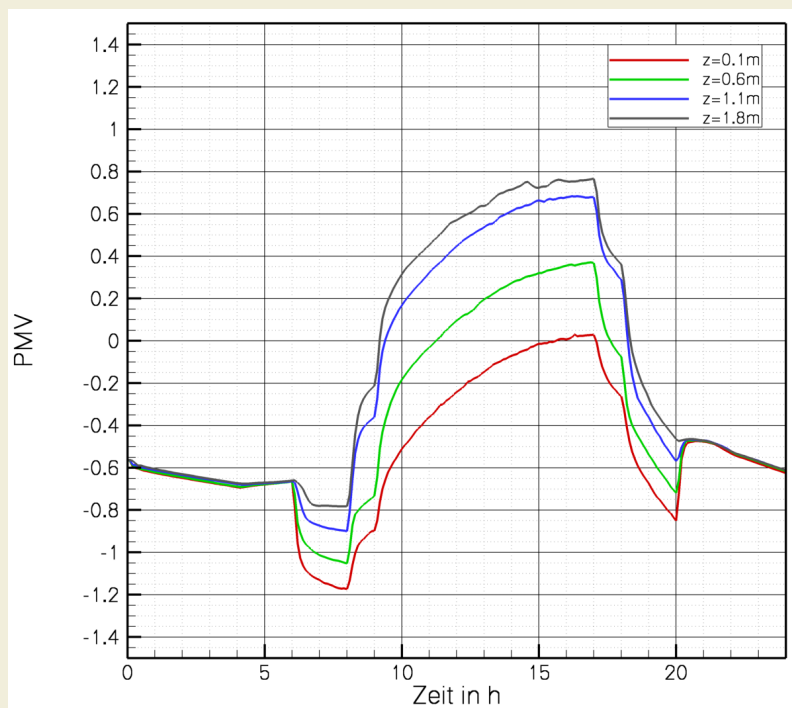
Ralf Gritzki, Markus Rösler, TU Dresden, Institut für Energietechnik, Deutschland, ralf.gritzki@tu-dresden.de

Surface heating & cooling systems

System	Cooling	Heating
1. Concrete core activated ceiling	40 W/m ²	30 W/m ²
2. Plastered ceiling w. integrated tube mat	80 W/m ²	52 W/m ²
3. Suspended cooling/heating ceiling	150 W/m ²	55 W/m ²
4. Underfloor cooling/heating	30 W/m ²	50 W/m ²

Cooling mode –

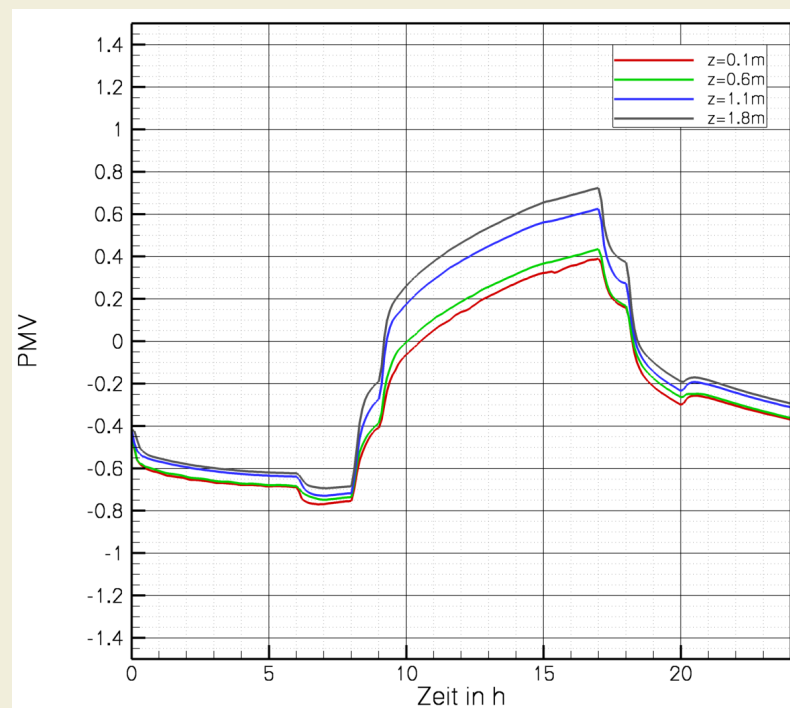
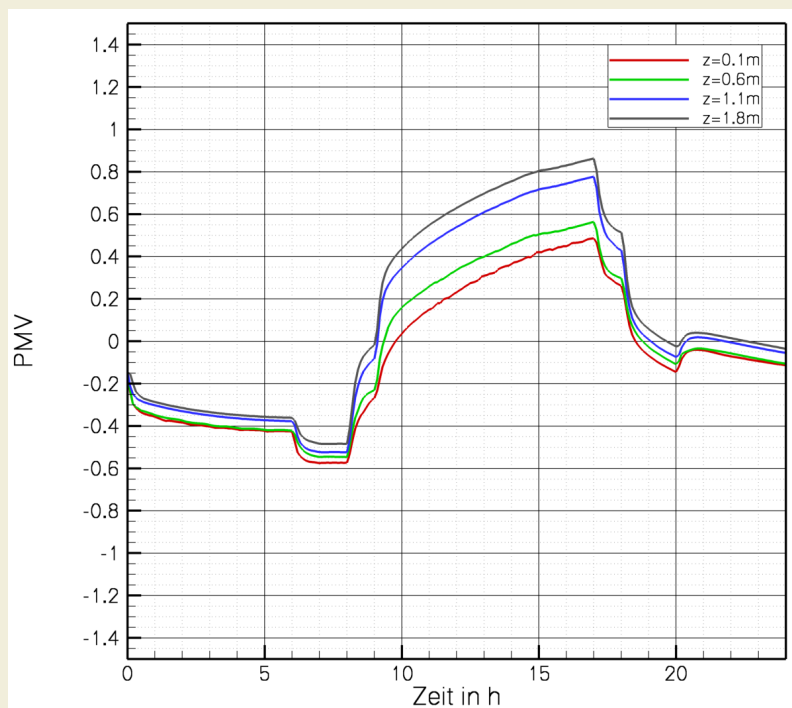
1. Concrete core activated ceiling, 40 W/m²



optimised

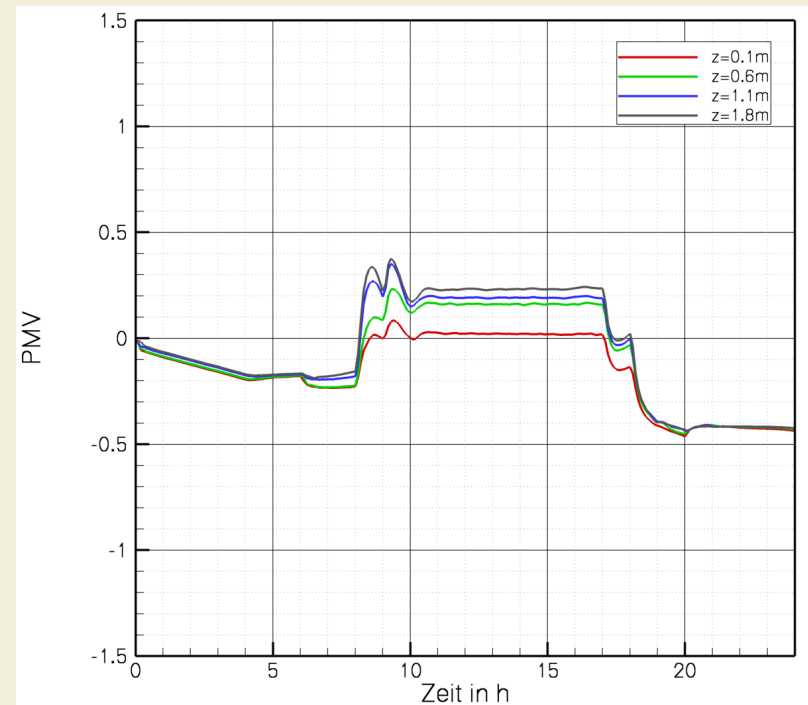
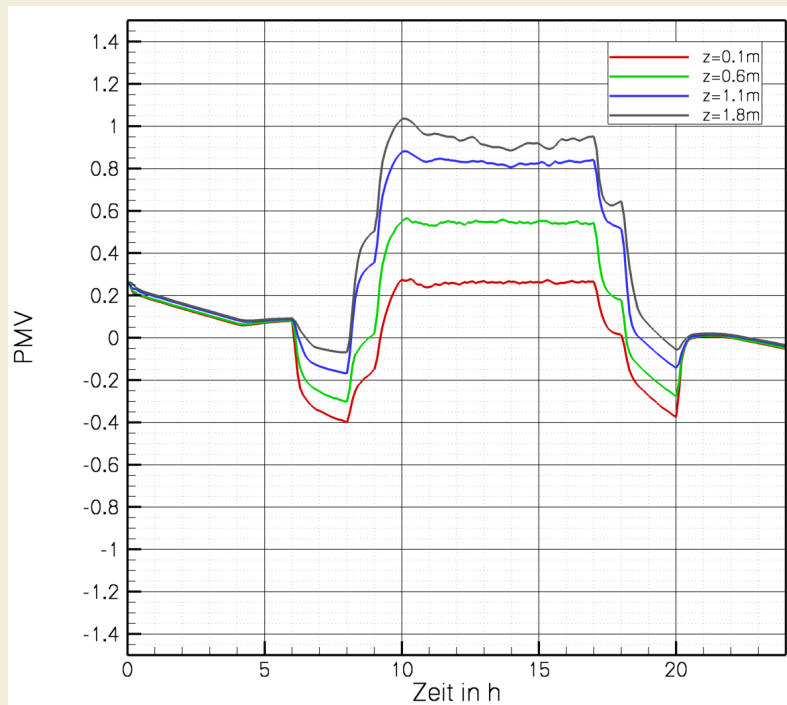
Heating mode –

1. Concrete core activated ceiling, 30 W/m²



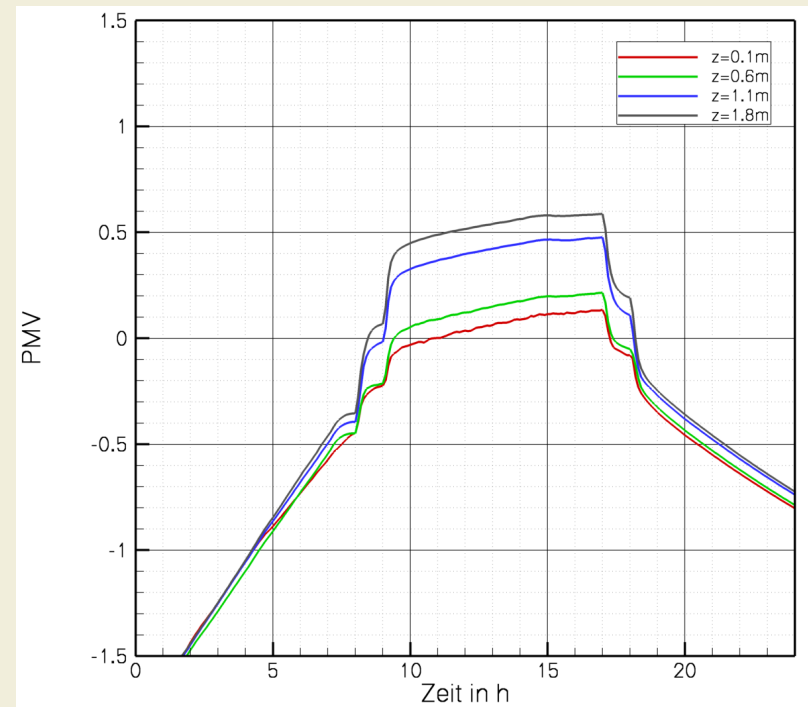
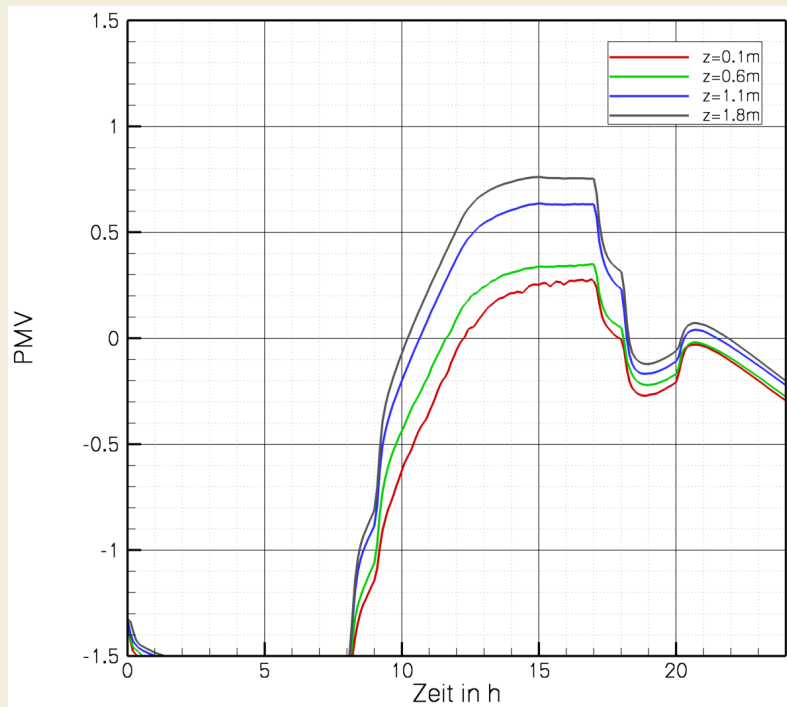
optimised

Cooling mode – 2. Plastered ceiling with integrated tube mat, 80 W/m²



optimised

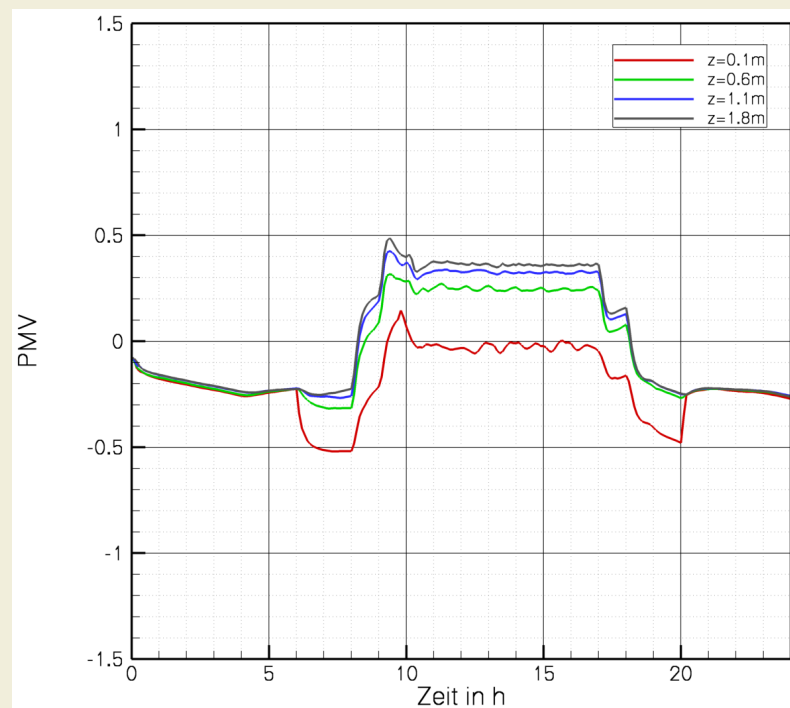
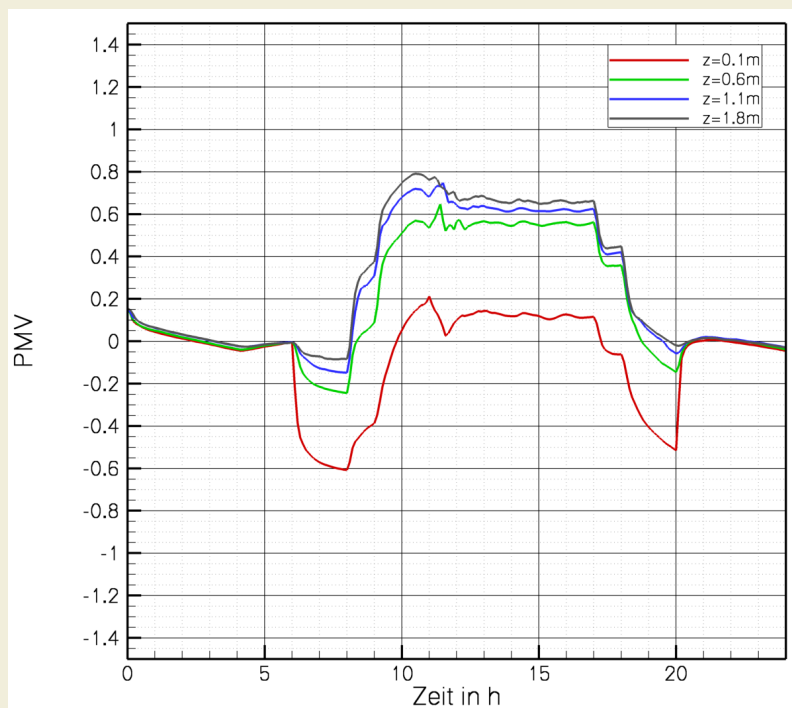
Heating mode – 2. Plastered ceiling with integrated tube mat, 52 W/m²



optimised

Cooling mode –

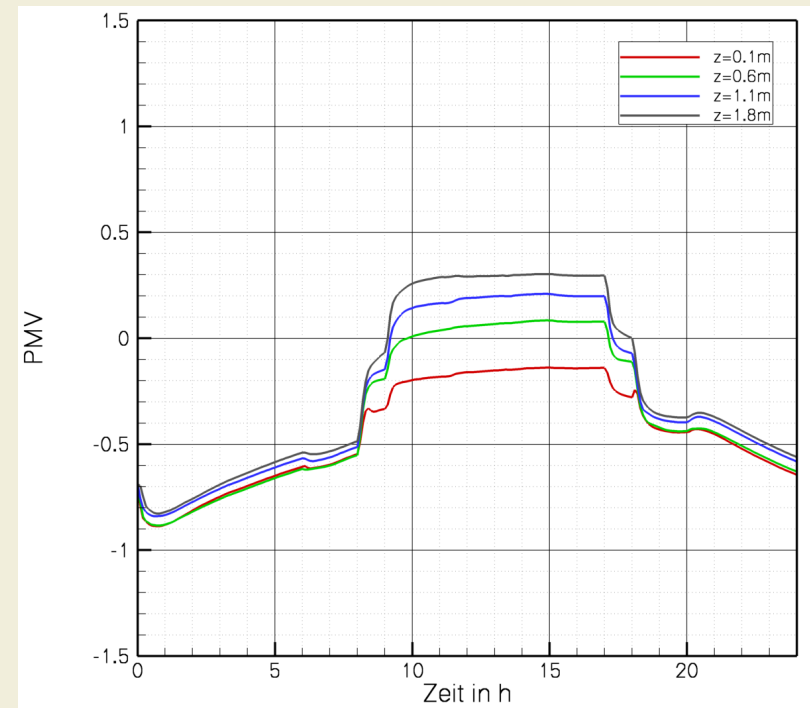
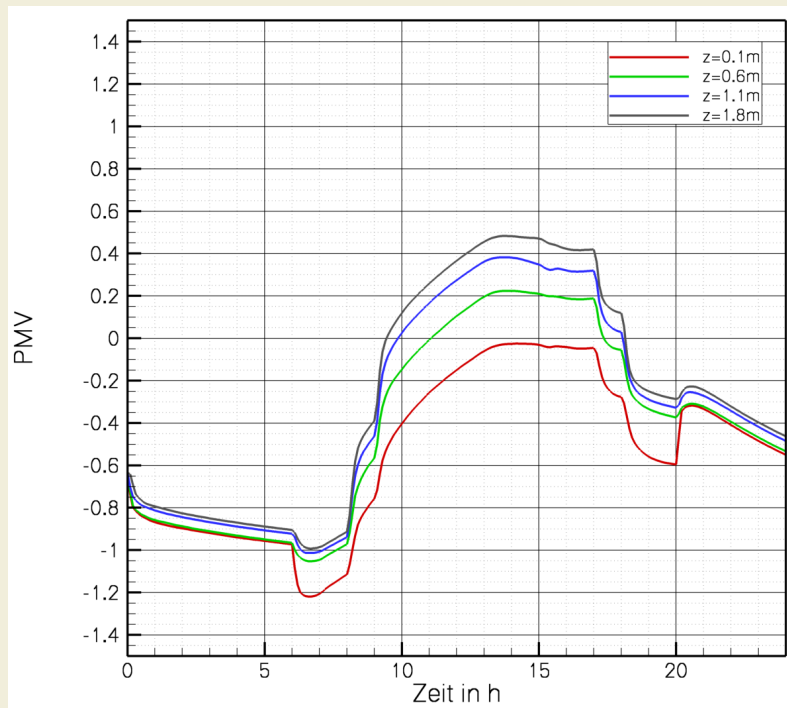
3. Suspended cooling/heating ceiling, 150 W/m²



optimised

Heating mode –

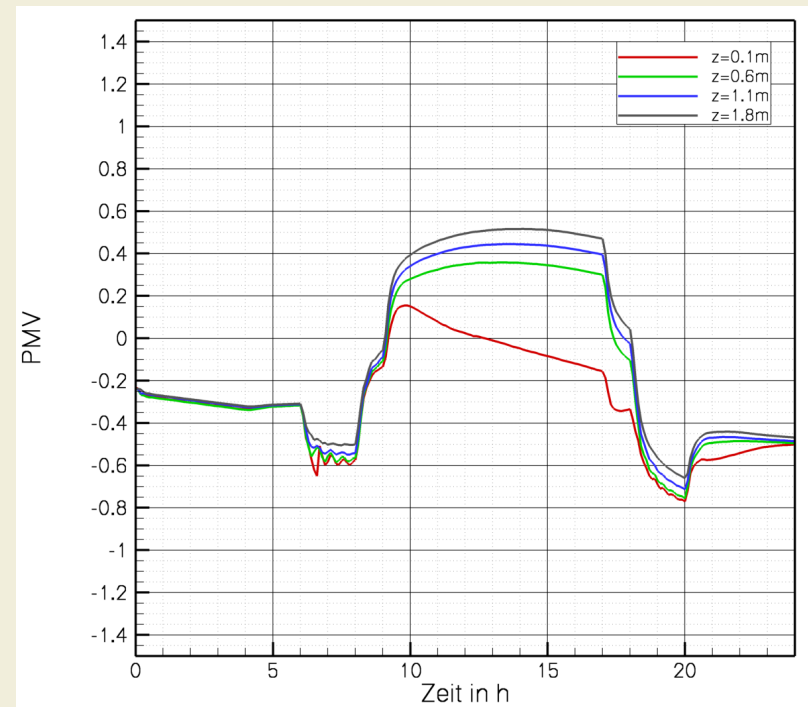
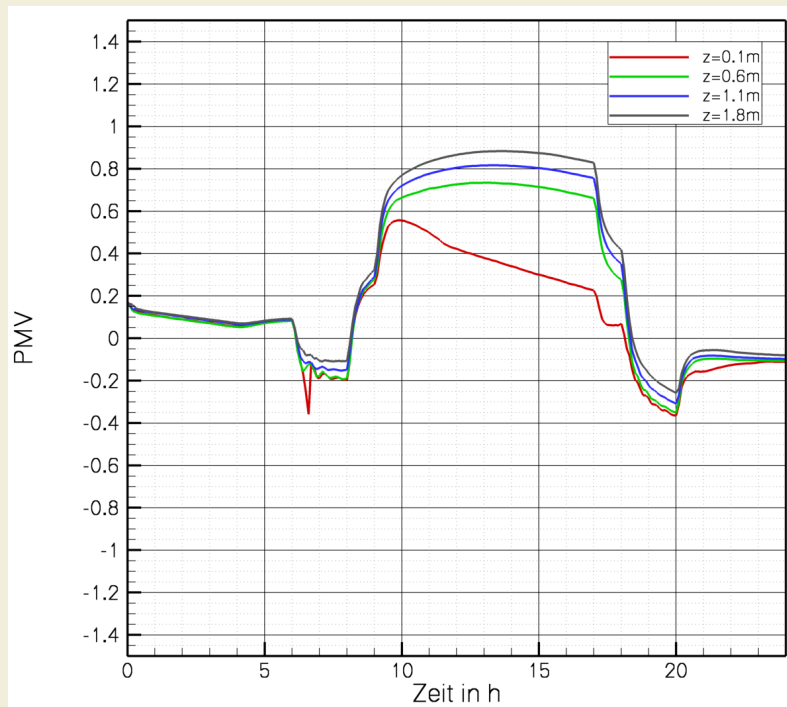
3. Suspended cooling/heating ceiling, 55 W/m²



optimised

Cooling mode –

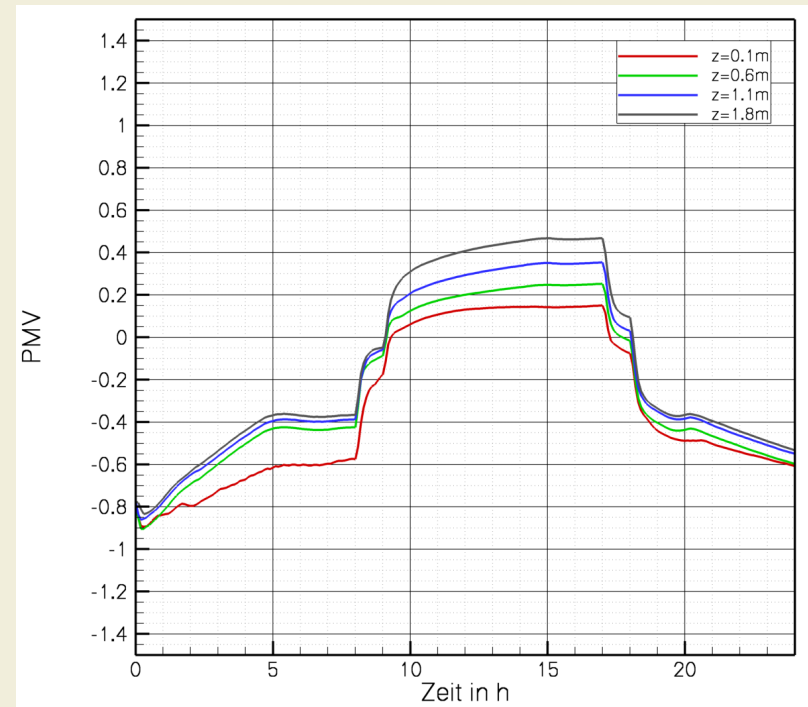
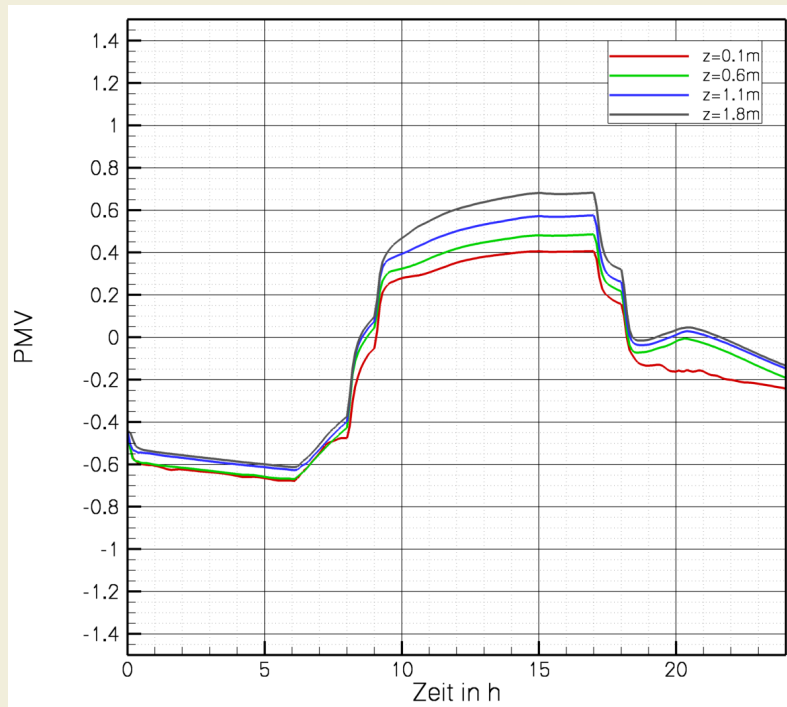
4. Underfloor cooling/heating, 30 W/m²



optimised

Heating mode –

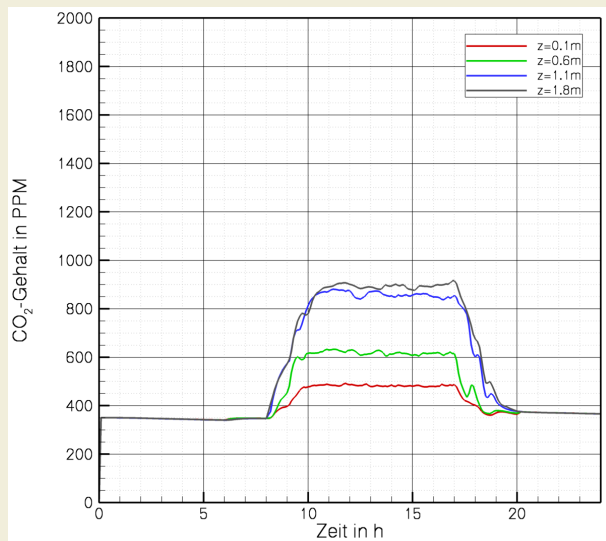
4. Underfloor cooling/heating, 50 W/m²



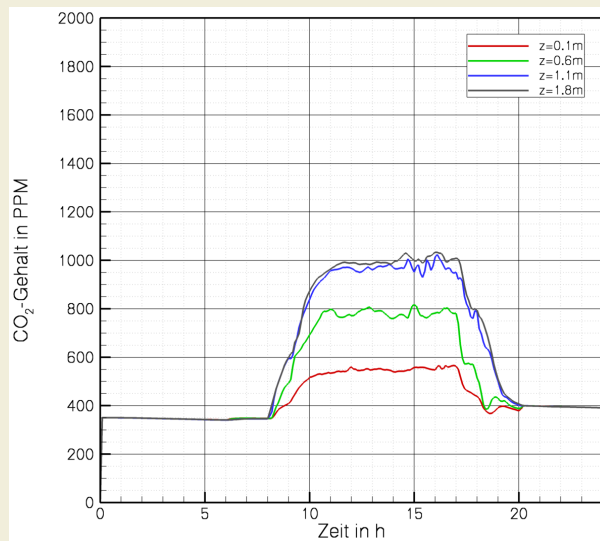
optimised

Displacement ventilation – cooling mode

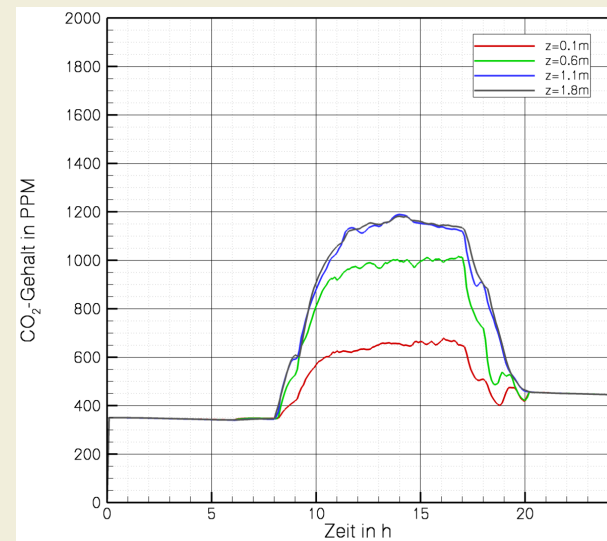
Ventilation reates reduced ...



35 m³/person.h



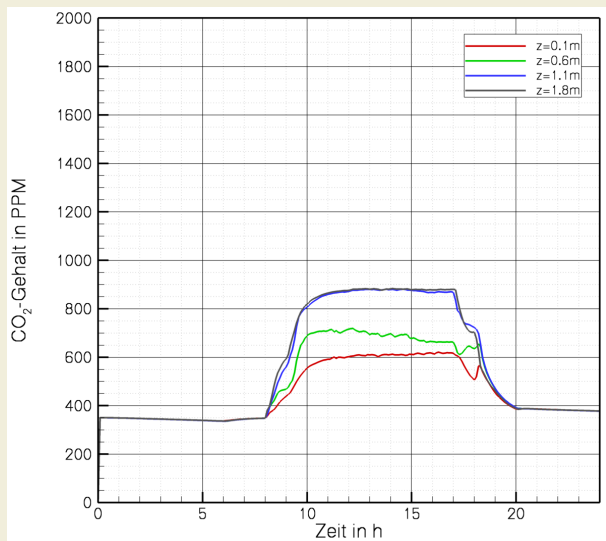
- 15 % =
30 m³/person.h



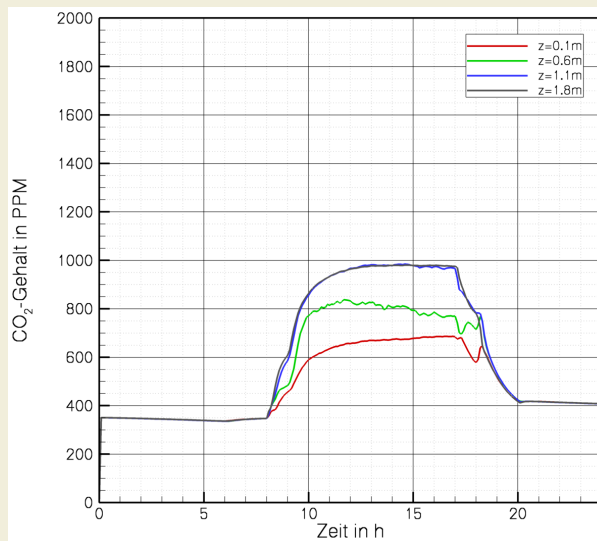
- 30 % =
24,5 m³/person.h

Displacement ventilation – heating mode

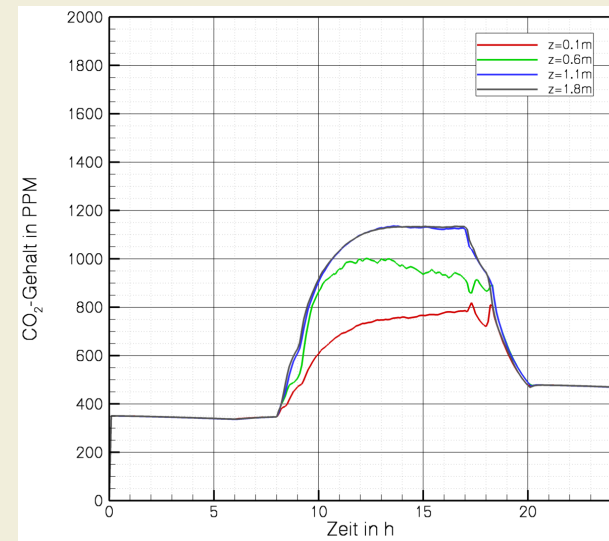
Ventilation reates reduced ...



35 m³/person.h



- 15 % =
30 m³/person.h



- 30 % =
24,5 m³/person.h

Displacement ventilation

Air flow patterns

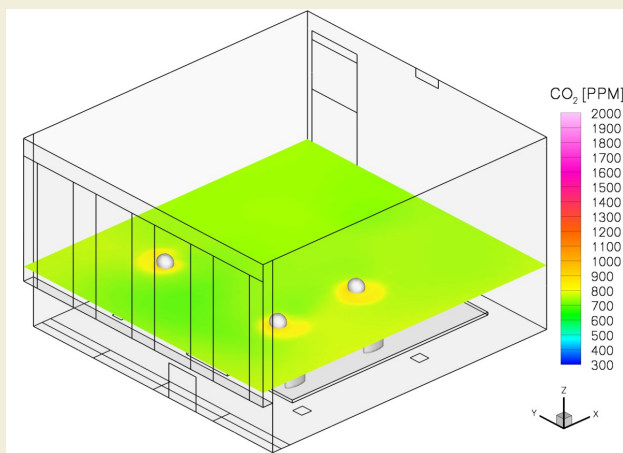
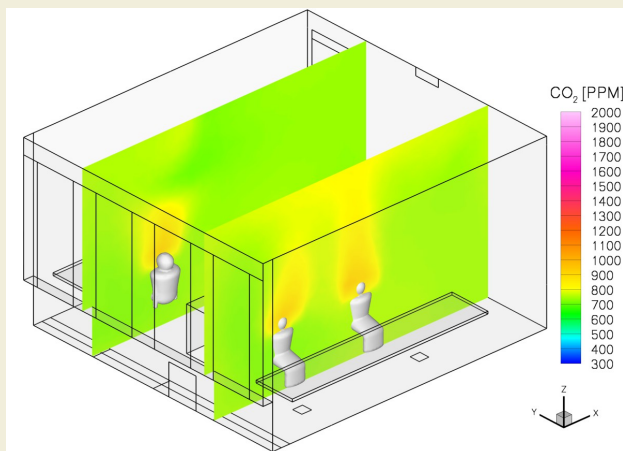


Beurteilungswert als CO ₂ -Konzentration (absolut)	Beschreibung der Innenraum-Luftqualität nach ÖNORM EN 13779 (2008)	Hygienische Bewertung der Ad- Hoc-Arbeitsgruppe	Empfehlungen der Ad-Hoc- Arbeitsgruppe
< etwa 800 ppm	Hohe Raumlufthqualität (IDA 1, RAL 1)	Hygienisch unbedenklich	Keine weiteren Maßnahmen
etwa 800 - 1000 ppm	Mittlere Raumlufthqualität (IDA 2, RAL 2)		
etwa 1000 - 1400 ppm	Mäßige Raumlufthqualität (IDA 3, RAL 3)	Hygienisch auffällig	Lüftungsmaßnahme (Außenluft volumenstrom bzw. Luftwechsel erhöhen). Lüftungsverhalten überprüfen und verbessern
etwa 1400 - 1900 ppm	Niedrige Raumlufthqualität (IDA 4, RAL 4)		
> etwa 1900 ppm		Hygienisch inakzeptabel	Belüftbarkeit des Raums prüfen; ggf. weitergehende Maßnahmen prüfen

Air flow patterns

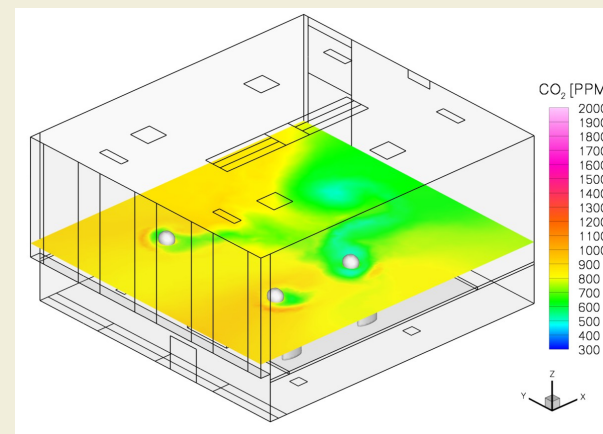
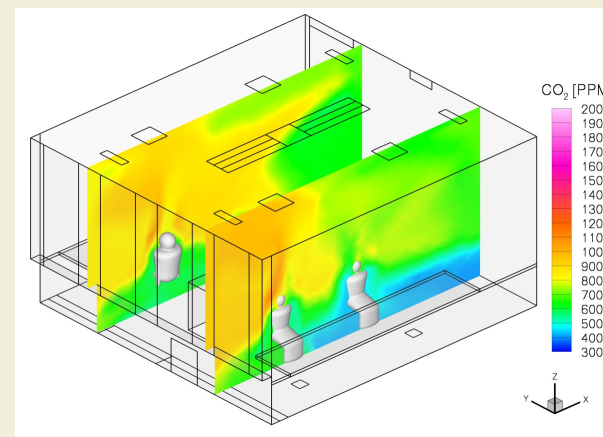


Mixed air ventilation



Var. 5: PL2 F5A Winter: Lüftungsgitter und Fußbodenheizung. 10 Uhr

Displacement ventilation



Var. 3: PL5 F1D Winter: Drallausslässe im Boden und Putzheizdecke mit Kapillarrohrmatte. 10 Uhr

Thank you !

