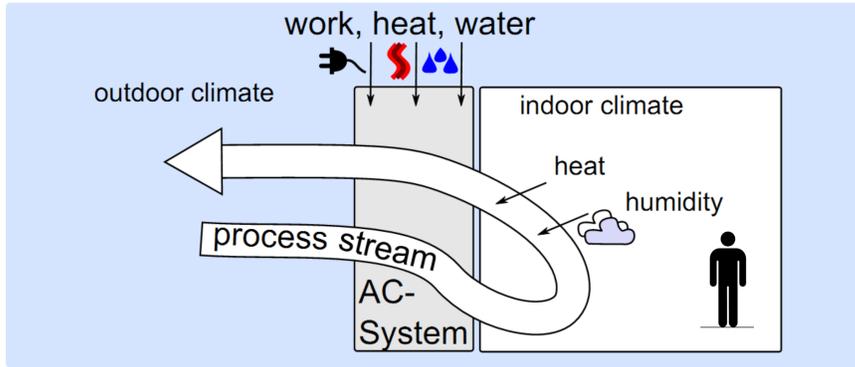


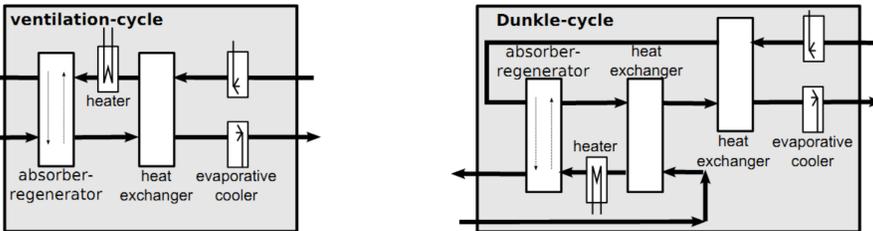
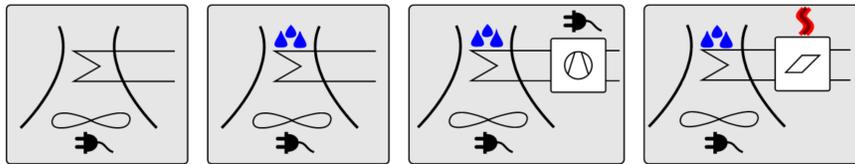
Research questions

Systems:

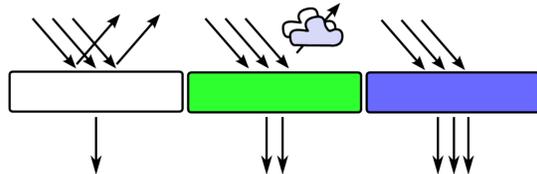
- Which systemic aspects can be identified and quantified, concerning feedback mechanisms and substitution effects?



- What is the impact of system concepts and specific system configurations on emissions and substitution effects?



- Which conflicts occur within the building envelope (White-Green-Blue(Tech)-Concept)?



Fundamentals:

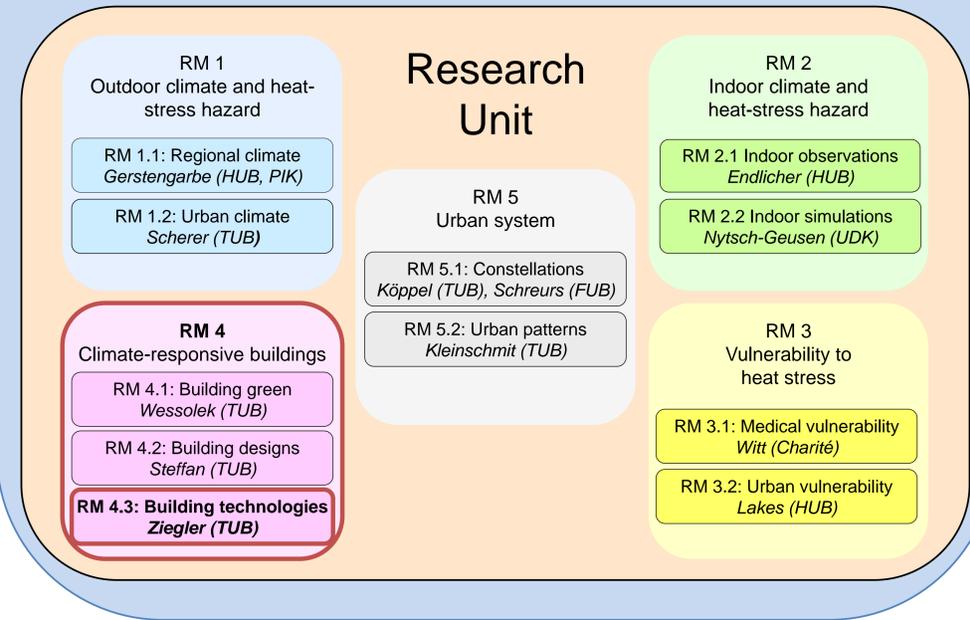
- Can a general group theory allow for a system comparison of the multitude of air-conditioning-systems?
- How can such a theory be theoretically founded?
- Can a risk concept be implemented within the thermodynamic description of air-conditioning-systems?

Projection period 2041-2050:

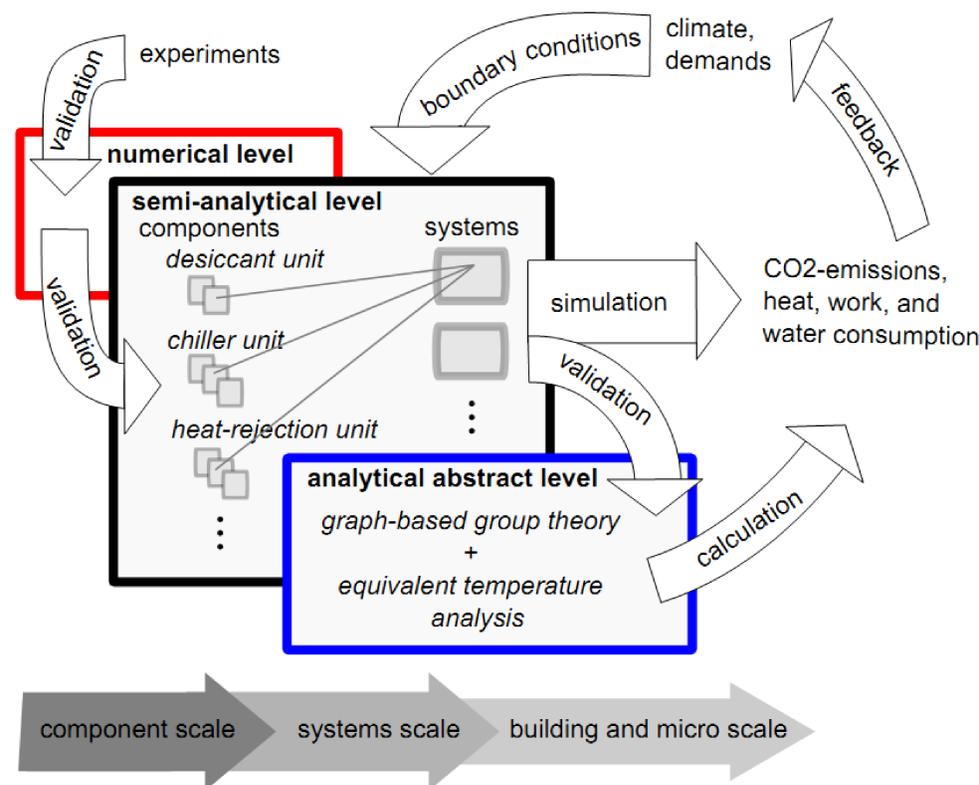
- Which systems allow for an effective and efficient air-conditioning under future heat stress hazards?
- How would prospective building technologies be integrated into future climate responsive buildings?

Sub-project 4.3

Building technologies



Research approach



Methodology

Numerical level

- 2-dimensional Finite Difference and Finite Volume Methods
- MATLAB, MATLAB Simulink
- Validation based on literature survey and existing experimental measurements

Semi-analytical level

- empirical correlations and characteristic temperature functions
- Modular build-up
- Yearly and seasonal simulations
- MODELICA /DYMOLA object oriented physical modeling

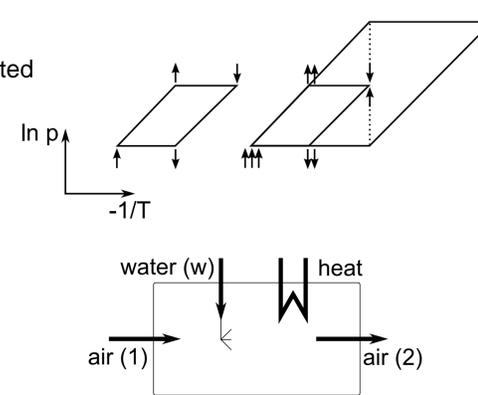
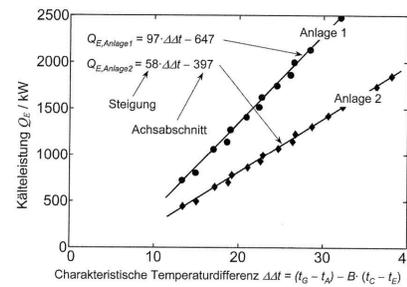
Analytical abstract level

- Graph based group theory
- Equivalent temperature analysis

$$\dot{q}' = h_{1+x,1} + w h_w - h_{1+x,2}$$

$$\Delta s' = s_{1+x,1} + w s_w - s_{1+x,2}$$

$$T' = \dot{q}' / s'$$



Work schedule

Work packages (WP) and associated work schedule (in half-yearly intervals)

WP	Description	Work schedule
100	Project management	
110	Reporting	
120	Logistics and organisation	
200	Individual research	
210	Systems overview and boundary conditions	
220	Development of methodologies	
230	Model build-up and validation	
240	Substitution effects	
300	Collaboration within Research Module (RM)	
310	Interactions of architectural and technical measures	
320	White-Green-Blue concept	
400	Collaboration within Research Links (RL)	
420	Urban climate and building energy demands	
430	Simulation-based design for rooms and buildings	
440	Prospective active A/C-solutions and building design	
500	Collaboration within Research Clusters (RC)	
510	From regional weather and climate to indoor climates	
520	Present-day heat-stress hazards, vulnerabilities and risks	
530	Effectiveness of actions for reducing heat-stress risks	
540	Efficiency of actions for reducing heat-stress risks	
600	Collaboration within Research Unit (RU)	
610	Projected heat-stress hazards, vulnerabilities and risks	
620	Transferability of the methodology to other mid-latitude cities	
630	Identification of future research and development activities	
640	Preparation of the follow-up proposal	

