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Coupled Heat, Air, Moisture and Pollutant Simulation in Building Envelope Systems

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CHAMPS-BES is a software tool for free non-commercial use. Its user community includes research institutes and consulting companies.

Outcome of a joint effort between

- Building Energy and Environmental Systems Laboratory (BEESL) @ Syracuse University, U.S.A.
- Institute for Building Climatology (IBK) @ University of Technology Dresden (TUD), Germany

Research and developmental works include

- A model of gaseous and adsorbed pollutant transport through building envelopes
- A one-way coupled model of airflow effects on the heat, moisture and pollutant transport
- A database of material properties for heat and moisture and for volatile organic compounds

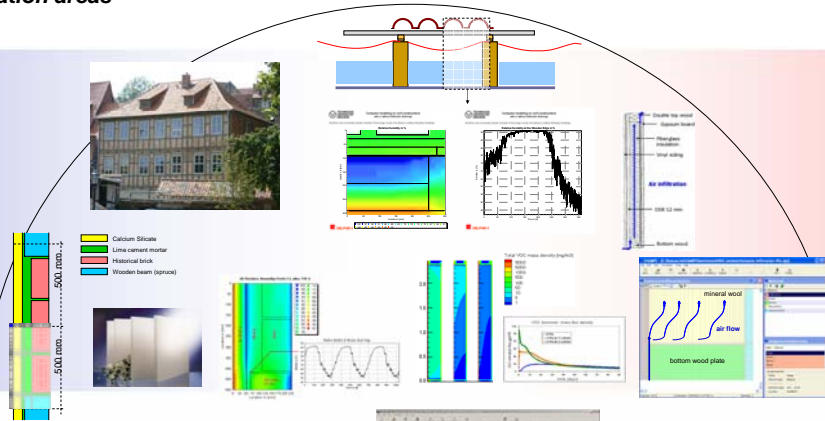
Used for analysis and prediction of

- Hygrothermal performance of building enclosures
- Impact of outdoor climate and pollution on indoor environment
- Impact of VOC emissions from building materials and indoor furnishings on indoor air quality
- Efficient solver for integration of ordinary differential equation systems (CVODE, LNLL)
- Small-scale environmental chamber experiments to determine the material properties
- Full-scale experiments, coupled indoor/outdoor environmental simulator (C-I/O-ES) for model validations

CHAMPS-BES Application areas

Building Climatology

- Preservation of historical buildings and cultural heritage
- Interaction Building – Climate – Inhabitants

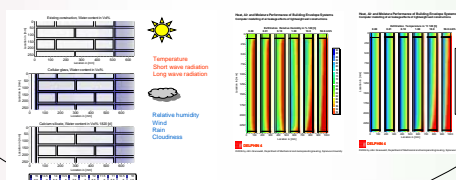
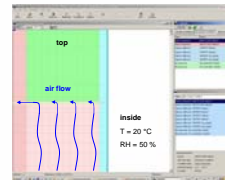


Mechanical & Energy Engineering

- Energy efficiency, sustainable development of built environment
- Mechanical properties, durability, damaging processes

Building Physics & Soil Science

- New materials and processes
- Hygrothermal and hydraulic material properties



Environmental & Architectural Engineering

- Material emissions and IAQ
- Outdoor to indoor pollutant transport
- Moisture buffering, dampness and mold control

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