Solar Energy and Building Physics Laboratory LESO-PB

LESO LUNCHTIME* LECTURES

Friday 10 March 2017, 12:15
EPFL – CM1 221

Influence of thermal and moisture storage in building materials on urban microclimate

Dr Aytaç Kubilay

Postdoctoral researcher,
Laboratory for Multiscale Studies in Building Physics, EMPA, Switzerland

Summary

Thermal and moisture properties of different materials in the built environment, e.g. concrete, asphalt, brick, strongly influence the absorption, transport and storage of heat and moisture in urban areas. The use of different materials have an impact on thermal comfort and energy use. An accurate prediction of local thermal conditions should take into account moisture distribution, since moisture availability affects evaporative cooling as well as thermal capacity and conductivity of building materials. This study presents a computational fluid dynamics (CFD) model coupled with heat-air-moisture (HAM) transport in porous building materials and the solar and thermal radiation with exchanges. This approach allows for detailed study of contributions to cooling, e.g. convective cooling, sensible heat transfer due to rain, evaporation for different materials and meteorological conditions (wind, sun, rain). A case study is performed on an isolated three-dimensional street canyon. Specifically, the impact of evaporative cooling due to rain on microclimate is investigated by comparing the resulting thermal conditions for different materials. The results show significant differences in evaporative-cooling potential for concrete compared to bare soil or clay brick. Further work will include the effects of vegetation and evaluate the local effects of short-term phenomena, e.g. heat waves, at neighborhood scale.

About the speaker

Aytaç Kubilay is a postdoctoral researcher at the Laboratory for Multiscale Studies in Building Physics at Empa. His current research mainly deals with numerical modeling of urban microclimate, mainly at building/neighborhood scale. His research interests include wind-flow modeling in urban areas, wind-driven rain, porous media and heat and mass transfer. He completed his Ph.D. in 2014 at the Chair of Building Physics at ETH Zurich. His Ph.D. work focused on the modeling of wind-driven rain in urban areas by computational fluid dynamics (CFD) simulations and field experiments.

Organised in partnership with the Swiss Competence Centre for Energy Research "Future Energy Efficient Buildings and Districts" SCCER FEEB&D

sccer | future energy efficient buildings & districts

Open to all !

Jean-Louis Scartezzini, Full Professor
Head of Solar Energy and Building Physics Laboratory (LESO-PB)
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
Website : http://leso.epfl.ch

*Presentations are followed by drinks & snacks, to give the opportunity to guests and speaker to further discuss the topic.

Organized by Dr Nahid Mohajeri, & Barbara Smith

LESO-PB
EPFL