Dr.ir. Twan van Hooff [1,2]
[1] *FWO research fellow, Building Physics Section, Department of Civil Engineering, Leuven University, Kasteelpark Arenberg 40, Box 2447, 3001 Leuven, Belgium, twan.vanhooff@bwk.kuleuven.be*
[2] *Part-time assistant professor, Building Physics and Services, Department of the Built Environment, Eindhoven University of Technology, PO Box 513, 5600 MB Eindhoven, the Netherlands, t.a.j.v.hooff@tue.nl; www.twanvanhooff.nl*

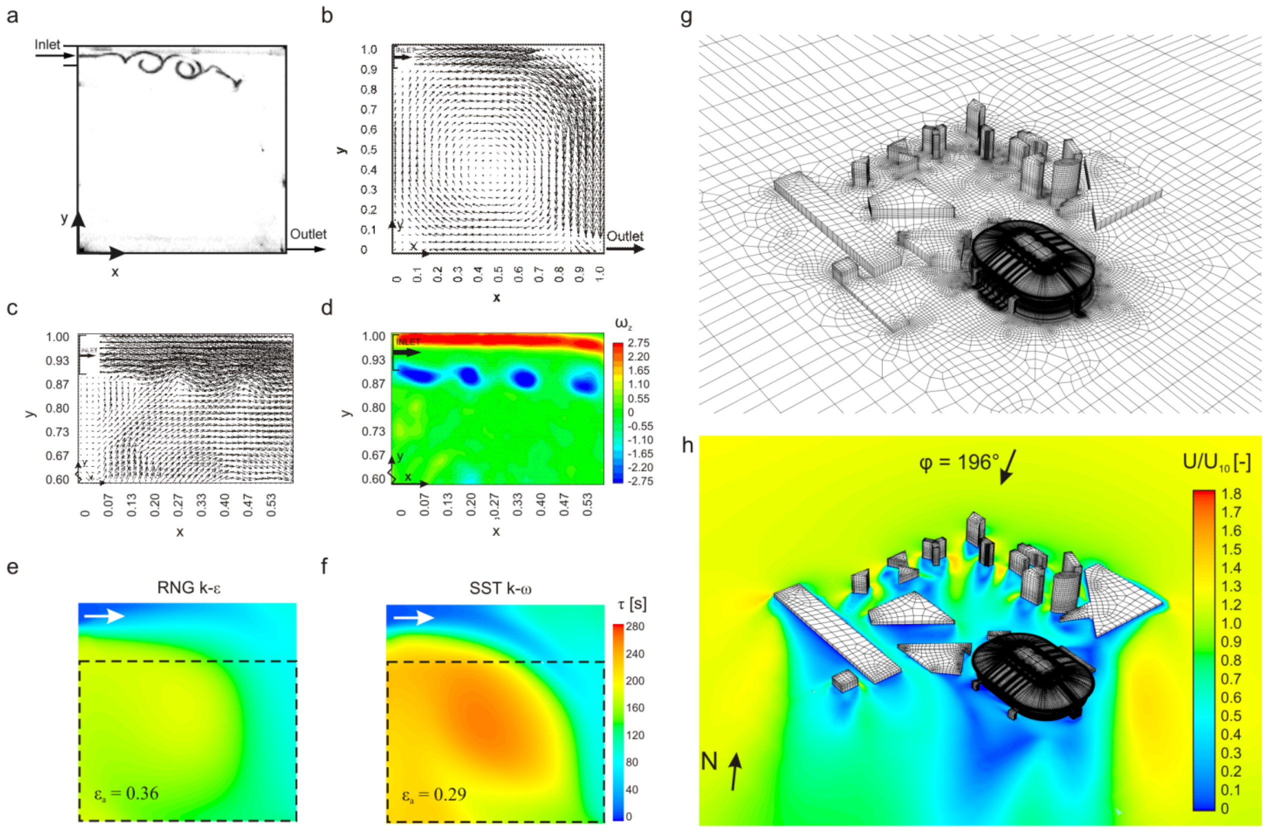
Biography

In 2008, Twan van Hooff graduated with honors as a MSc in Architecture, Building and Planning from Eindhoven University of Technology in the Netherlands (specialization in Building Physics). From July 2008 to July 2012, he was a PhD student at both the unit Building Physics and Services (BPS) of Eindhoven University of Technology (supervisor prof.dr.ir. Blocken) and the Building Physics Section of Leuven University, Belgium (double doctorate) (supervisor prof.dr.ir. Baelmans). In December 2012 he obtained his PhD with honors (cum laude). His PhD study focused on experimental and numerical techniques to assess mixing ventilation, both in a generic setup and in an actual full-scale case study. In addition, he performed numerical studies on pedestrian wind comfort, wind-driven rain and wind energy in the built environment. For one of his publications he received the Best Paper Award from the ISI journal Building and Environment.
From July 2012 until September 2014 he was active as a postdoctoral researcher in the Climate Proof Cities research program. From October 2014, he is a research fellow of the Research Foundation Flanders (FWO) (personal grant) in the Building Physics Section at Leuven University. From October 2015, he is also appointed as part-time assistant professor at Eindhoven University of Technology. He is a visiting researcher in the group of prof.dr. Q. Chen at Purdue University, IN, from September-December 2015. He is co-supervisor of five PhD students at Eindhoven University of Technology and Leuven University, and has published 24 ISI journal papers, 13 of which as first author, 41 papers in international conference proceedings, and acts as a reviewer for 26 ISI journals. Apart from his research activities, he has also been actively involved in the bachelor and master education at Eindhoven University of Technology and Leuven University.

Abstract

Experimental and numerical studies to improve the indoor environment

The indoor environment in buildings and other enclosures such as airplanes, trains, ships and cars is of primary interest in engineering with respect to human (thermal) comfort, energy efficiency and sustainability. This presentation provides an overview of experimental and numerical studies performed at Eindhoven University of Technology in the Netherlands and Leuven University in Belgium in the last seven years, with the aim to improve the indoor environment.
The topics that are addressed are: (1) a basic study on transitional mixing ventilation at transitional slot Reynolds numbers using reduced-scale particle image velocimetry (PIV) experiments in a water-filled generic enclosure and numerical simulations using Computational Fluid Dynamics (CFD), (2) an assessment and optimization process of natural ventilation in a semi-enclosed stadium in an urban area by means of full-scale measurements and steady Reynolds-averaged Navier-Stokes (RANS) CFD simulations, and (3) an analysis of passive climate change adaptation measures applied at the building scale using Building Energy Simulation.
In addition, a brief overview is given of several experimental and numerical studies that are currently being performed, or that have been performed in the last years, together with several PhD students at Eindhoven University of Technology. Example of research topics are the optimization of air curtain performance, assessment of ventilative cooling in buildings, and natural ventilation for residential buildings in Brazil.



Experimental (a-d; Re ≈ 1,750) and numerical (e-f; Re ≈ 1000) results of transitional ventilation flow. (a) Instantaneous flow pattern (flow visualization). (b) Time-averaged velocity vectors (PIV). (c) Instantaneous velocity vectors (PIV). (d) Contours of vorticity ω_z (PIV). (e-f) Contours of age of air (CFD). (g-h) CFD simulations of natural ventilation: (g) Computational grid (about 5.5 million cells). (h) Contours of non-dimensional velocity (U/U_{10}) (U_{10} = 5 m/s, wind direction φ = 196°).