

# BUILDING AERODYNAMICS

BME GEÁT MW08

(BUILDING & ENVIRONMENTAL AERODYNAMICS)



Dr. Goricsán István, 2008  
Balczó Márton, Balogh Miklós, 2009  
Budapesti Műszaki és Gazdaságtudományi Egyetem, Áramlástan Tanszék

Science of the atmosphere

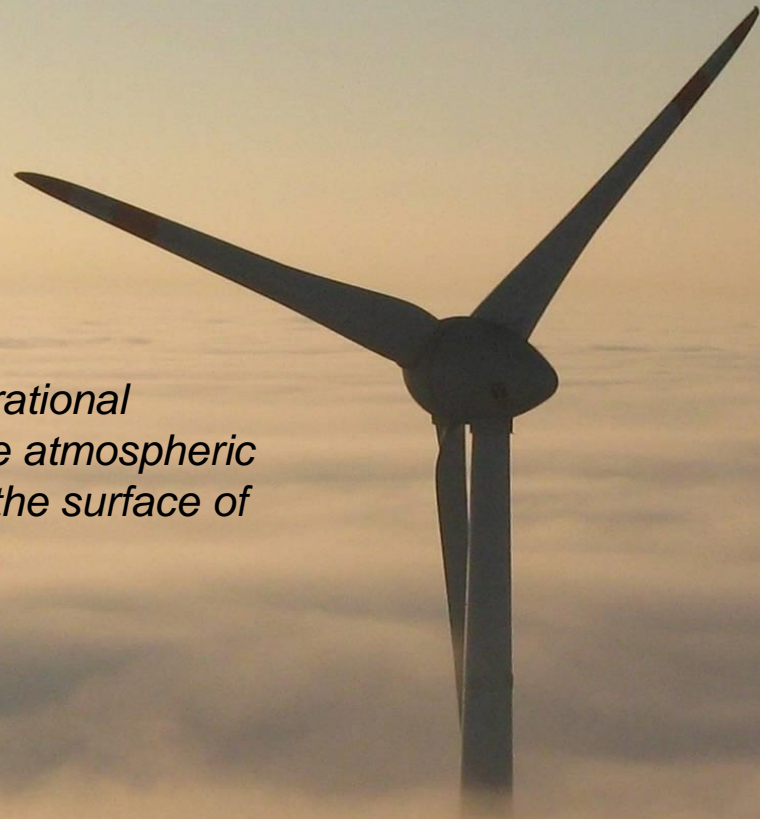
= METEOROLOGY



Building Aerodynamics  
Environmental Aerodynamics

= WIND ENGINEERING

*Wind engineering is best described as the rational treatment of interaction between wind in the atmospheric boundary layer and man and his works on the surface of Earth ( Jack Cermak, 1975)*



# Building Aerodynamics



Balczó M., 2008

Elastic model of a bridge  
(Von Kármán Institute)



Span Systems Inc.

Tensioned membrane roof  
(St Augustine, Florida, USA)

# Building Aerodynamics



stadia

# Building Aerodynamics



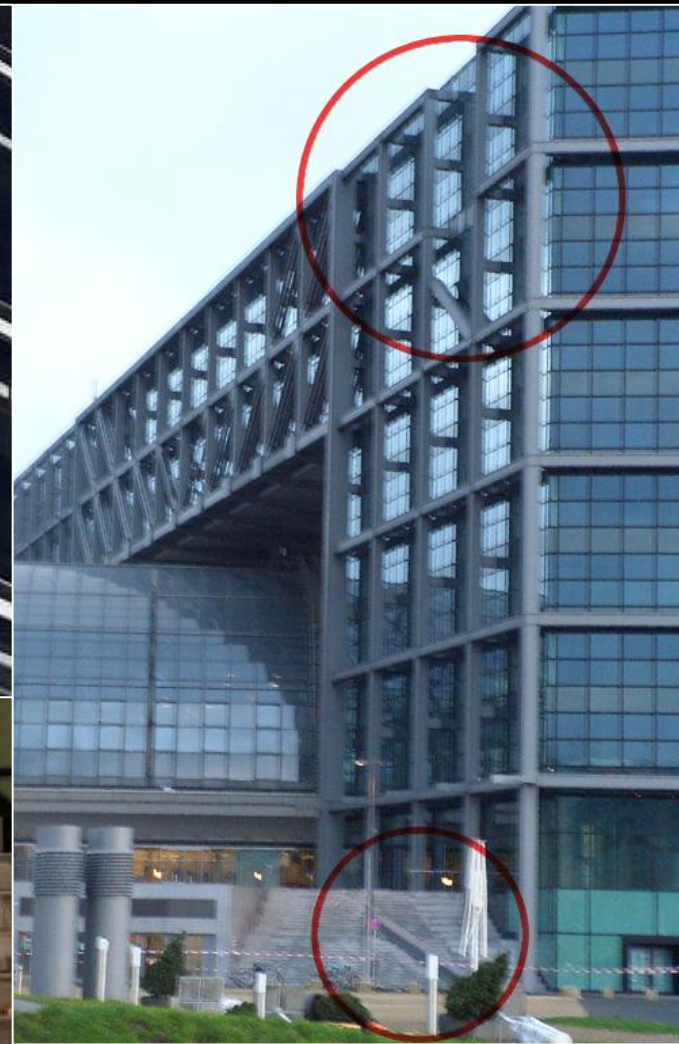
Wind damage, Mannheim train shed  
9th August, 2018



Alkmaar (NL) stadium roof damaged during storm  
10 August, 2019



# RELATIONSHIP TO WIND CODES: INFLUENCE OF NEARBY STRUCTURES



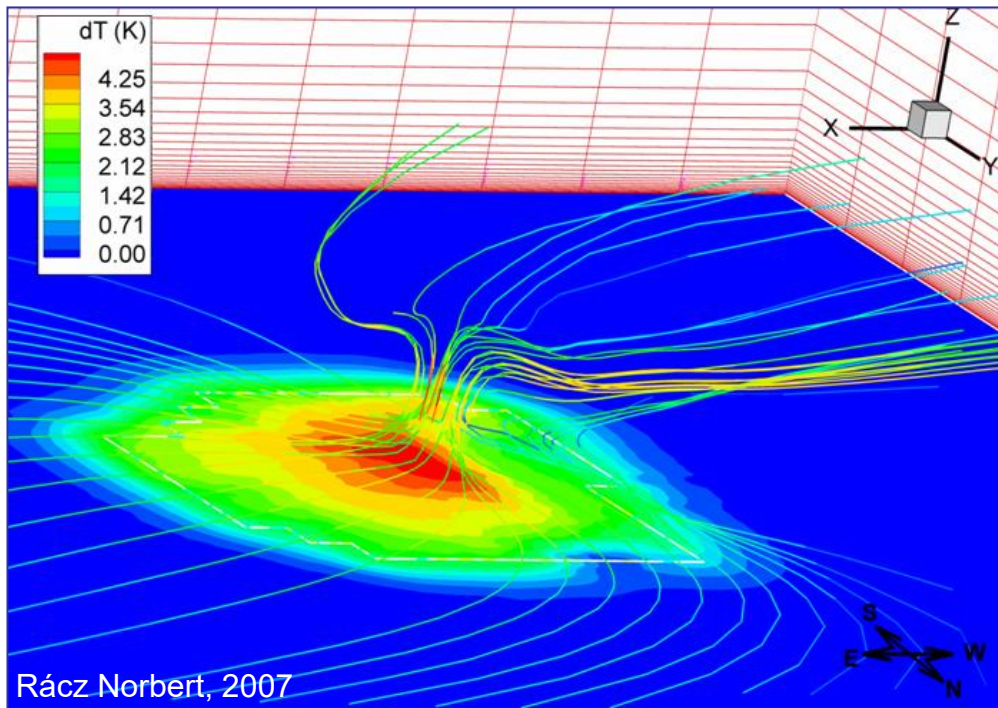
Storm 'Kyrill', 2006  
external skeleton design elements  
lifted by wind





Open air theatre damaged during a hurricane  
(Portsmouth, Virginia, USA)

# Environmental Aerodynamics



Flows Heat island above Szeged (gravity waves)



Wind power prediction

# Environmental Aerodynamics



with the kind permission of Geoff Spivey, 2007

Smoke plume at a factory (Stewartby Lake, England)

# Environmental Aerodynamics



Jet-type release



Release during severe fire



Moving continuous source



Release with explosion blast

# Modelling & measurement techniques (wind tunnel & CFD)



## LECTURES AND LABORATORY

- Final schedule to be announced next week
- Lecture every week from 8:15 to 10:00 (except Oct. 23 – national holiday)
- Lab every 2nd week from 10:15 to 12:00 (AE laboratory)
- **Mid term exams** 8<sup>th</sup> and 14<sup>th</sup> week
- Control questions available on the webpage
- **Homework and lecture activity points** to be added to total

### ***Laboratory:***

- demonstration experiment, lab tour, data processing practice.
- Project: for groups of 3 (4) people.
  - Measurements / simulations to be prepared and done during lab hours & afterwards
  - Project topics and groups to be formed until end of 2<sup>nd</sup> week.
  - **Project report** deadline: 14<sup>th</sup> week
  - **Project presentation:** 14<sup>th</sup> week

## LECTURES AND LABORATORY

General prerequisite:

- Basics of **Fluid Mechanics** (absolutely necessary)

**In lab projects, knowledge of :**

... a general 3D CAD software might be necessary

... a programming language can help in some of the projects

... MATLAB or other mathematical tool can be useful

... and last, some manual skills in measurement projects, model preparation

*If you feel that your previous studies are not enough to successfully accomplish the subject, you should apply for permission to the Central Academic Office to drop the subject until the end of 2nd week!*

*All lectures and material to be downloaded from*

*<http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATMW08>*

*Password to lecture slides: \*\*\*\*\**