Course offered for the PhD program
in Civil, Chemical and Environmental Engineering a.a. 2021/2022
Curriculum in Fluid Dynamics and Environmental Engineering
Curriculum in Structural and Geotechnical Engineering, Mechanics and Materials
Curriculum in Wind Science and Engineering

(possibility of participation for students in other PhD cycles or other PhD courses)

1. Title

Modelling of non-synoptic wind systems

2. Course description

The course starts with an Introduction to fluid mechanics, Navier-Stokes equations and modelling principles, followed by resolve of the mean flow field and the turbulent flow field. It then uses these principles to show how they are applied to non-synoptic winds such as tornadoes and downbursts and illustrates their effects on buildings and structures.

3. Course Organization

The course consists of 6 lectures and exercises.

4. Teachers

Horia Hangan

5. Duration and credits

The course consists of 12 hours of lessons (2.5 credits)

6. Course timetable

Week No.	Day	Date	Time	Room	Zoom link
19	Tuesday	2023-05-09	14-16	INFAL2	link
	Wednesday	2023-05-10	16-18	A4	link
	Thursday	2023-05-11	14-16	INFAL2	link
20	Monday	2023-05-15	16-18	A4	link
	Tuesday	2023-05-16	14-16	INFAL2	link

Join Zoom meeting:
https://us06web.zoom.us/j/85701027287?pwd=RnBTak9lZ0MremtzaTUzb1l3eEQxdz09
Meeting ID: 857 0102 7287
Passcode: 369190

7. Activation mode and teaching period

The course is scheduled every two years, free of charge. The course will be held between the 9th to the 17th of May 2023. The minimum number of participants to activate the course is 5.

8. Deadline for registration

The deadline for applications is May 8. Confirmation can be sent by e-mail to Prof. Massimiliano Burlando (massimiliano.burlando@unige.it).

9. Final exam

Written examination (solution of one or more simple problems) at the end of the course.

10. References

-Hangan H., Kareem K., The Oxford Handbook of Non-Synoptic Wind Storms, Oxford University Press, 2019
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-Canepa F., Burlando M., Hangan H., Romanic D., Experimental investigation of the near-surface flow dynamics in downburst-like impinging jet immersed in ABL-like winds, Atmosphere (2022)
-Canepa F., Burlando M., Romanic D., Solari G., and Hangan H., Downburst-like experimental impinging jet measurements at the WindEEE Dome, Scientific Data Nature (2022)
-Canepa F., Burlando M., Romanic D., Solari G., and Hangan H., Experimental investigation of the near-surface flow dynamics in downburst-like impinging jets, Environmental Fluid Mechanics (2022)
-Kassab, A., Jubayer, C., Ashrafi, A., Hangan, H., Surface pressure measurements in translating tornado-like vortices. *Wind and Structures (2021)*
-Ashrafi A, Romanic D, Kasab A, Hangan H., Nima Z., Experimental investigation of large-scale tornado-like vortices", Journal of Wind Engineering and Industrial Aerodynamics, Vol. 208, (2020)
-Romanic D., Ballestracci A., Canepa F., Solari G., Hangan H., Aerodynamic coefficients and pressure distribution on two circular cylinders with free end immersed in experimentally produced downburst-like outflows, Advances in Structural Eng., (2020)
-Romanic, D., Hangan, H., "Experimental investigation of the interaction between near-surface atmospheric boundary layer winds and downburst outflows", Journal of Wind Engineering and Industrial Aerodynamics, 205:104323, (2020)
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-Junayed C, Jubayer C, Parvu D., Romanic D., Hangan H., "Flow field dynamics of large-scale experimentally produced downburst flows", Journal of Wind Engineering and Industrial Aerodynamics, 188: 61-79, (2019).
-Karami*, M**.,** Hangan, H., Carassale L., Peerhossaini H., "Coherent structures in tornado-like vortices", Physics of Fluids, 31: 085118, (2019).
-Jubayer, C., Romanic, D*., Hangan H**.,** "Aerodynamic loading of a typical low rise building for an experimental stationary and non-Gaussian impinging jet", Wind & Structures, 28(5): 315-329, (2019).
Hangan H**.**, Romanic D., Jubayer C., "Three-dimensional, non-stationary and non-Gaussian (3D-NS-NG) wind fields and their implications to wind–structure interaction problems", *Journal of Fluids and Structures*, 91: 102583, (2019).
Ashton, R., Refan, M., Iungo, V., Hangan, H., "Wandering corrections from PIV measurements of tornado-like vortices", Journal of Wind Engineering & Industrial Aerodynamics 189: 163-172, (2019).
-Refan, M., Hangan, H**.,** "Near Surface Experimental Exploration of Tornado Vortices", J. Fluids Engineering (2018)
-Xu, Z., Hangan, H., Yu, P., Analytical Solutions for Inviscid Gaussian Impinging Jets, ASME Journal Mech, 75, 2 (2008)

11. Short bio

Professor Horia Hangan research is in fluid mechanics with applications in the following areas: Wind Engineering, Bluff Body Aerodynamics, Non-stationary, Non-Gaussian and Non-linear flows, Climatic/Weather adaptation, Turbulence and Control.
He earned his Dipl. Engineering Degree in Aerospace Engineering from Politehnica University Bucharest in Romania, his PhD. In Wind Engineering from the University of Western Ontario, Canada and completed postdoctoral studies at Universite de Poitiers in France.
He obtained several prestigious awards among which: Canada Research Chair Tier 1 in Adaptive Aerodynamics in 2021; Doctor Honoris Causa – University of Construction, Bucharest, Romania in 2019; 2018 American Association of Wind Engineering – Best Paper Award; 2017 American Association of Wind Engineering – Industry Innovation Award; 2016 Canadian Society of Mechanical Engineering (CSME) Fellowship; 2015 ENR News Maker of the Year Award; 2010 ASME Lewis F. Moody Award.