Internship offer - M2

Title	**Modelling the pressure coefficient of building facades for buildings located in urban areas**
Student level	M2 research
Starting date **Duration**	February/March 2023 5 to 6 months
City, Country	Le Bourget du Lac, FRANCE
Laboratory	LOCIE - Laboratoire Optimisation de la Conception et Ingénierie de l'Environnement *https://www.univ-smb.fr/locie/*
Internship description	Context Building energy and building internal pollution are impacted by the building's ability to renew its air. The building air renewal can be driven by mechanical ventilation systems or / and by natural ventilation occurring due to pressure difference between the building and its surrounding facades. To better account for natural ventilation, the wind speed and wind direction around the building of interest need to be known. This means solving the effect of obstacles on the wind field. Many numerical models have been developed to account for the effect of buildings and trees on the wind but they are rather complex to use and calculation intensive. A new model called URock (https://github.com/j3r3m1/urock_processing), based on Geographical Information System and inspired from the proprietary software QUIC-URB (Brown et al., 2013), has recently been developed by the University of Gothenburg and the LOCIE. A first batch of validation has been performed showing that the accuracy is worse than classical CFD models but quite quicker. Objectives The objective of the intern (in descending priority order – no worries if not all fullfilled before the end of the training period) will be to: 1. investigate different ways of calculating pressure coefficients using the wind field resulting from URock (e.g. Gowardhan et al., 2005; Gowardhan et al., 2010; Brown et al., 2018) 2. identify datasets that can potentially be used for comparison / validation of the pressure coefficients when this new calculation option will be implemented in URock (e.g. Brown et al., 2018) 3. code the new model in URock (based on result of step 1) and compare the results from URock to the datasets identified step 2
Candidate	The candidate should have a taste for numerical modelling of fluid dynamic. Knowledge of scripting in Python would also be an advantage for step 3.
Traineeship grant	Legal internship gratification (~546 €/month)
Supervisors	Jérémy Bernard / Martin Thebault

	(Gothenburg University, LOCIE – Le Bourget du Lac)	(LOCIE – Le Bourget du Lac)
Deadline	Send CV + Cover Letter to *jeremy.bernard@gu.se* deadline 7th December	
References	Brown, Michael J., Akshay A. Gowardhan, Mathew A. Nelson, Michael D. Williams, et Eric R. Pardyjak. « QUIC transport and dispersion modelling of two releases from the Joint Urban 2003 field experiment ». *International Journal of Environment and Pollution* 52, n° 3-4 (1 janvier 2013): 263-87. https://doi.org/10.1504/IJEP.2013.058458. Brown, Michael John. « Quick Urban and Industrial Complex (QUIC) CBR Plume Modeling System: Validation-Study Document ». Los Alamos National Lab. (LANL), Los Alamos, NM (United States), 19 octobre 2018. https://doi.org/https://doi.org/10.2172/1479898. Gowardhan, Akshay, Michael Brown, D. DeCroix, et Eric Pardyjak. « EVALUATION OF THE QUIC PRESSURE SOLVER: COMPARISON TO WIND-TUNNEL MEASUREMENTS ON CUBICAL BUILDINGS ». *AMS Atmospheric Sciences and Air Quality Conference, San Francisco CA*, 26 avril 2005. Gowardhan, Akshay, Michael Brown, et Eric Pardyjak. « Evaluation of a fast response pressure solver for flow around an isolated cube ». *Environmental Fluid Mechanics* 10 (13 juin 2010): 311-28. https://doi.org/10.1007/s10652-009-9152-5. Gowardhan, Akshay, Michael Brown, et Eric Pardyjak. « Evaluation of a fast response pressure solver for flow around an isolated cube ». *Environmental Fluid Mechanics* 10 (13 juin 2010): 311-28. https://doi.org/10.1007/s10652-009-9152-5.	