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PhD student in extreme wind events.

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Above: the Birmingham pulsed wind event (thunderstorm downburst) simulator

Research

The physical modelling aspect of this experiment uses the University of Birmingham thunderstorm downburst simulator, the development of which was funded by the Royal Society. Further information about this unique facility can be found here.

Current research includes:

- Examining the question, how to scale a thunderstorm downburst? This includes work on choosing scalings based on spatial, velocity and temporal scales and examining how they behave when scaling output from the physical simulator to a number of real world events. It is also looking at how various wind engineering parameters, for example turbulence intensity, vary with different scaling parameters.
- Modifying the downburst simulator so that it can be used to simulate the translating aspect of a thunderstorm outflow. A number of investigations will then be carried out including the mapping of the flow field (velocity in three directions and a ground level pressure field) of the simulator and a comparison with real world events. The lateral correlation and coherence of the simulator will then be studied from this data and also compared with real world events. A number of simple structures including a high rise and long span structure will then be placed on the platform and pressure coefficients obtained from around the building. Depending on time constraints interference effects around high rise structures could be studied as well as the effect of varying surface roughness on the downburst outflow.
- In order to aid the validation of the physical simulator a numerical simulation of the physical simulator is also being produced using **OpenFOAM**®. The simulation will use LES to gather more detailed flow field maps as well as to calculate pressure coefficients around structures. A comparison of the physical and numerical models should help to identify potential problems in both which can then be resolved more easily. A comparison of the numerical simulation will also be made to existing meteorological simulations of thunderstorm downbursts. This will help to define the limitations of the "impinging jet" physical simulation technique.
- It is hoped that if good agreement is found between the numerical and physical simulations that a greater understanding of the wind loadings on a variety of simple structures will be found.

This work is being supervised by **Dr Mark Sterling** and **Dr Andrew Quinn**, whose help has been invaluable to the project so far.

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