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Detection, simulation, modelling and loading of thunderstorm outflows to design wind-safer and cost-efficient structures

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Wind actions are crucial for the safety and cost of structures. The wind climate of Europe and many parts of the world is dominated by synoptic cyclones and by mesoscale thunderstorm outflows. Thunderstorms are frequent phenomena that cause wind speeds often higher than those of cyclones. In spite of an impressive amount of research on this topic, there is not yet a thunderstorm model like that established for cyclones in the early 1960s [1]. This happens because the complexity of thunderstorms makes it difficult to develop realistic and simple models. Their short duration and small size make available data poor. There is a great gap between the research in wind engineering and atmospheric sciences.

THUNDERR (www.thunderr.eu), Detection, simulation, modelling and loading of thunderstorm outflows to design wind-safer and cost-efficient structures, is a project funded by European Research Council (ERC) - under the European Union's Horizon 2020 - through an Advanced Grant (AdG) 2016. It starts from the above premises and pursues three main objectives: 1) formulating a novel, interdisciplinary and unitary model of the thunderstorm outflow, with the prospect of being itself a scientific result, and a good basis for engineering analyses; it would be the counterpart of the synoptic wind model shared worldwide; 2) developing a method that may have the same impact that the gust factor technique had for cyclones and the response spectrum technique had for earthquakes; it would encapsulate the classic method for cyclones and the new method for thunderstorms into a novel wind loading format easily transferable to engineering and codification; 3) spreading the results throughout the international community to strengthen a renewed culture on thunderstorm phenomena and their actions on structures.

This paper provides the general framework of the THUNDERR project, illustrates the results obtained up to this moment (e.g., [2-6]), describes the perspectives of the research currently undertaken and their potential impact on the civil, structural and wind engineering fields.

References

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