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# Numerical simulation of snowdrift on a membrane roof and the mechanical performance under snow loads

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**Abstract**

Snow drifting driven by wind will cause unevenly distributed snow on roofs, which may result in the collapse of structures, sometimes even devastating disaster. Long-span structures are more sensitive to unevenly distributed snow loads, especially for tension membrane structures. Thus, an accurate prediction of snow distribution on roof surface is vital to structural design. A numerical simulation method for snowdrift is presented in this study. Based on Euler-Euler method in multi-phase flow theory, this numerical model adopt Mixture model by employing commercial computational fluid dynamics (CFD) software FLUENT, combined with the snow deposition and erosion model, the snow distribution can be obtained. The performance of this numerical model is examined and verified against data form field measurement carried out in previous literature. Then the snowdrift on a long-span membrane roof is simulated, the snow shape factor is given under different wind directions to estimate the worst load case. Furthermore, the mechanical performance of the membrane structure under snow load is studied. The unevenly distributed snow simulated by CFD is applied on the membrane roof, for comparison a uniform snow load case is also considered. The results of finite element analysis (FEA) show that non-uniform snow load is more dangerous and should be considered.

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