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# Airflow and scalar transport around a single fractal tree based on large-eddy simulation

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Vegetation is an important component for modulating urban air quality. It can affect scalar transport, which is one of the most concerning processes in urban environment, by organizing the airflow around. In previous urban environment studies, the morphological characteristics of vegetation were usually parameterized as porosity or leaf area index (LAI), performing a spatially uniform aerodynamic behaviour. Whereas, a vegetation element has complex multi-scale structures. Predicting the scalar transport around the vegetation accurately is challenging due to the simplified parameterization. The transport processes around multi-scale vegetation should be further studied.

In this study, a fractal tree model is built to preserve the length scales of sub-branches. The large-eddy simulation (LES) is employed to investigate the scalar transport around the multi-scale tree. The spatial distribution of aerodynamic behaviour and scalar transport after and over the tree is determined. The scalar transport characteristics are compared with previous studies, demonstrating the importance of preserving sub-scales in urban air quality research.