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**Turbulence Enhancement by Fractal Square Grids: Effects of the Number of Fractal Scales** ALEXIS OMILION, MOUNIR IBRAHIM, WEI ZHANG, Cleveland State University — Fractal square grids offer a unique solution for passive flow control as they can produce wakes with a distinct turbulence intensity peak and a prolonged turbulence decay region at the expense of only minimal pressure drop. While previous studies have solidified this characteristic of fractal square grids, how the number of scales (or fractal iterations N) affect turbulence production and decay of the induced wake is still not well understood. The focus of this research is to determine the relationship between the fractal iteration N and the turbulence produced in the wake flow using well-controlled water-tunnel experiments. Particle Image Velocimetry (PIV) is used to measure the instantaneous velocity fields downstream of four different fractal grids with increasing number of scales (N = 1, 2, 3, and 4) and a conventional single-scale grid. By comparing the turbulent scales and statistics of the wake, we are able to determine how each iteration affects the peak turbulence intensity and the production/decay of turbulence from the grid. In light of the ability of these fractal grids to increase turbulence intensity with low pressure drop, this work can potentially benefit a wide variety of applications where energy efficient mixing or convective heat transfer is a key process.

Alexis Omilion
Cleveland State University

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