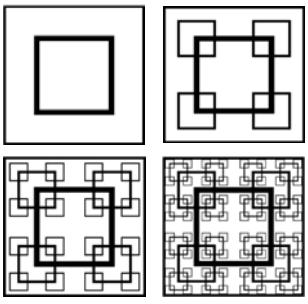
Fractal grid turbulence

Abstract

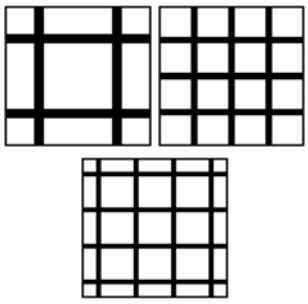
In this study, we clarify the property of turbulence generated by fractal grids. From our experiments, following distinctive properties, which are not confirmed in regular grid turbulences, were revealed: 1.strong turbulence intensity, 2. constant length scales in the downstream direction, 3. non-equilibrium energy cascade. By using these properties, we aim at developing efficient industrial devices.

Hot wire measurement of turbulence properties after Fractal grid

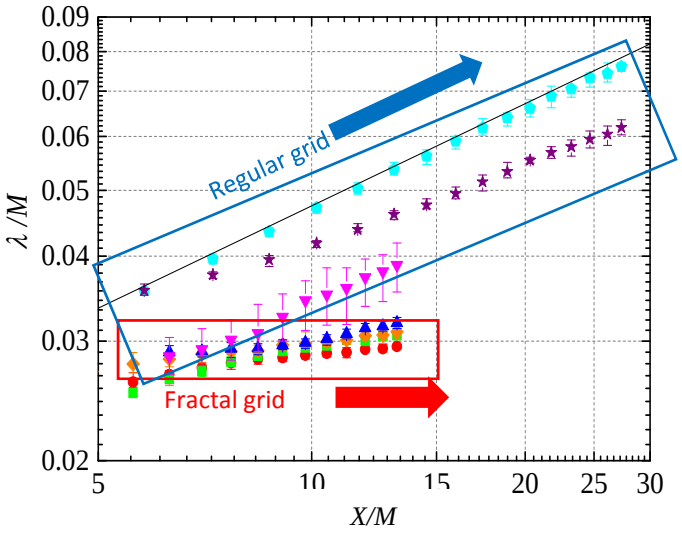
Square wind tunnel



Fractal grid



Regular grid



Development of length scale in downstream direction

Length scale is constant in the downstream direction

- Zhou et al., On the evolution of the invariants of the velocity gradient tensor in single-square-grid-generated turbulence," Phys. Fluids (2015)
- Zhou et al., Relevance of Turbulence behind the Single Square Grid to Turbulence Generated by Regular- and Multiscale-Grids, Phys. Fluids (2014).
- Zhou et al., Development of Turbulence behind the Single Square Grid, Phys. Fluids (2014).
- Nagata et al., Turbulence Structure and Turbulence Kinetic Energy Transport in Multiscale/Fractal-Generated Turbulence , Phys. Fluids (2013).