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Scaling of co-spectra in grid turbulence with a mean cross-stream temperature gradient CARLA BAHRI, GILAD ARWATZ, MARCUS HULTMARK, MICHAEL MUELLER, Princeton University — Scaling of grid turbulence with a constant mean cross-stream temperature gradient is investigated using a combination of theoretical predictions and DNS. Conditions for self-similarity of the governing equations and particularly the scalar co-spectrum are investigated, which reveals necessary conditions for self-similarity to exist. These conditions provide a theoretical framework for scaling of the temperature flux spectrum, which offers new insights into the interaction of the turbulent velocity field with the scalar field. One necessary condition, predicted by the theory, is that the co-spectrum must vary as $\propto^2$ for a self-similar solution to exist. DNS results are used to validate the theoretical predictions and good collapse of the co-spectrum is observed, which validates the self-similarity theory.

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