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Tempered Fractional LES modeling of Turbulent Flows: A Priori Analysis MEHDI SAMIEE, ALI AKHAVAN-SAFAEI, MOHSEN ZAYERNOURI, Michigan State University — Nonlocal behavior of small scale motions and their cumulative effects on the large scale dynamics in isotropic turbulent flows shape the underlying coherent structures and the associated spatial intermittency. Filtering the Navier–Stokes equations in the large eddy simulation of turbulent flows would further enhance the existing nonlocality, emerging in the corresponding subgrid-scale (SGS) fluid motions. Such long-range effects and anomalous behavior urge the development of nonlocal SGS models. Following [Samiee, M., et al., 2020. *Physics of Fluids*], we outline a framework to model small scale motions at the kinetic level using a tempered *Lévy* stable distribution and derive the model at the continuum level. Within this framework, the divergence of SGS motions emerges as a tempered fractional Laplacian of the resolved field. Attention in this study is focused on capturing *two-point* high-order structure functions, governed by the Karman-Howarth equation in isotropic turbulent flows. Through a *statistical a priori* analysis, we study the predictability of the proposed model and the role of tempering fractional model in capturing loss of energy at the dissipation range.

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