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Experiments in the use of stochastic scaling in moist physics parameterizations for models of the atmospheric -5/3 range

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The problem of parameterization of physical process in large scale numerical models of the atmosphere has until recently focused upon modeling the 'average' or mean tendencies and the models developed for the average tendencies have been almost exclusively developed from idealized process models. Sub-grid physical processes have made little use of the observed spatial scaling structure in atmospheric turbulence in the development of parameterizations. This is complicated by the observation that the atmosphere has two distinct scaling ranges: -3 for planetary to synoptic wave numbers and -5/3 for mesoscale wave numbers and beyond.

I will describe some efforts and strategies aimed at moving beyond the use of averaged process models for the computation of the sub-grid tendencies due to sub-grid effects of moist processes (precipitation and clouds). Stochastic fractal interpolation will be used to refine coarsely resolved field variables important for moist processes in order to investigate whether moist physics is necessary to explain the existence of the Nastrom-Gage -5/3 spectral range in atmospheric Kinetic energy or merely amplifies and maintains this spectrum in the atmospheric mesoscale and beyond.