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New perspectives in buoyancy and velocity scaling for deep moist convection in statistical equilibrium

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Buoyancy and velocity scales for dry convection in statistical equilibrium were derived long ago by Prandtl (1910, 1925), but the question of convective velocity and buoyancy scales, as well as the topic of fractional area coverage of convective clouds, are still unresolved in moist convection. In this work, high resolution simulations of an atmosphere in radiative convective equilibrium are performed using the WRF model, a three-dimensional, nonhydrostatic, convection-resolving, limited area model. Prescribing different constant cooling rates to the system, we characterize the velocity and buoyancy scales for moist convection in statistical equilibrium. The influence of domain size on radiative convective equilibrium statistics is assessed. The dependence of fine scale spatio-temporal properties of convective structures on numerical and physical details such as horizontal grid spacing and microphysics is investigated. As further assessment of the reliability of the results and of the proposed scalings, some comparative analyses are performed using the Lokal Model (DWD).