Abstract

We present a physical parameterization for numerical climate models, which seamlessly unifies the representation of the planetary boundary layer (PBL) and shallow cumulus convection (SCu). While conventional climate models separate the treatment of the PBL and SCu into different computational modules, our approach calls for a single module to handle both processes. Our parameterization is based on a combined eddy-diffusivity/mass flux (EDMF) approach, which utilizes an innovative statistical updraft model. This updraft model lends itself to a physically appealing detrainment closure based on the joint probability distribution of heat, moisture, and vertical momentum of simulated convective updrafts in a model column. Results from single column model experiments are presented over a variety of standard cases