

CLUBB+MF in CAM6: implementation and evaluation of shallow convection cases

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An eddy diffusivity/mass flux (EDMF) type combination of the Cloud Layers Unified By Binormals (CLUBB) and JPL stochastic multi-plume mass flux schemes has been implemented in the National Center for Atmospheric Research Community Atmosphere Model version 6 (CAM6). In this implementation, termed CLUBB+MF, CLUBB uses a double-Gaussian representation of the sub-grid thermodynamic probability density functions (PDFs) while the MF plumes represent extremely skewed events associated with the convective tail of the PDFs. Using archetypal single column model case studies of non-precipitating shallow convection, we demonstrate the improved performance of CAM6 CLUBB+MF with respect to reference LES solutions in terms of vertical fluxes, boundary layer depth and cloud macrophysical properties. Specifically, the MF component increases vertical transport, thus accelerating boundary layer growth and cloud penetration.