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Impacts of modifying the convection scheme in ECHAM6.3 on simulated daily to intra-seasonal tropical precipitation variability

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We implement a Stochastic Multicloud Model (SMCM) in an observationinformed configuration into the convection scheme of the state-of-the-art GCM ECHAM6.3. We show that compared to the ECHAM6.3 standard model, the SMCM-modified version shows improved capacity to simulate features of tropical intraseasonal variability, including MJO-like disturbances, without significantly distorting the mean model climate. This improvement is a result of increased simulated spatiotemporal coherence – or organization/clustering – of tropical precipitation on daily timescales which closely resembles that derived from observational estimates of surface rainfall. The SMCM-modified version of ECHAM6.3 also shows ameliorated coupling of atmospheric convection to tropospheric moisture compared to reanalysis and observations. We attribute these changes in model behavior to (i) the modified coupling of triggering and suppression of deep convective events to the model's largescale environment in the convection scheme and (ii) the observationsinformed closure formulation which leads to an overall reduction of deep convective mass fluxes. Sensitivity tests show that the simulated spatiotemporal coherence of tropical rainfall is an intrinsic property of the convection schemes themselves and not of their parameters. We stress that this study serves as a proof-of-concept and motivates further efforts towards building a novel convection parameterization with the SMCM as a central element.