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Effect of systematic mode reduction on cloud formation and buoyancy transport in a model of moist turbulent convection[1] JOERG SCHUMACHER, TU Ilmenau, THOMAS WEIDAUER, Dynardo GmbH Weimar — The insufficient parametrization of low clouds which are caused by shallow convection remains one of the biggest sources of uncertainty in large-scale models of global atmospheric motion. One way to overcome this lack of understanding is to develop simplified models of moist convection which allow for systematic studies of the cloud formation in different dynamical regimes. They provide an ideal testing bed for systematic and stepwise reductions of degrees of freedom. Such systematic reductions are studied here for a recently developed moist Rayleigh-Bénard convection model in the conditionally unstable regime. Our analysis is based on the Proper Orthogonal Decomposition (POD). The resulting reduced-order dynamical systems which are obtained by a projection of the original equations of motion onto the most energetic POD modes are found to reproduce important statistical quantities such as the cloud cover, liquid water fluxes and the global buoyancy transport to a very good degree. The number of modes can be compressed significantly before the POD models break down and cause significant deviations of essential mean transport quantities from the original fully resolved simulation data.

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