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Comparison of CAM3 parameterization errors in different regions and for different regimes

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We compare the performance of the Community Atmosphere Model (CAM3) parameterization suite in different climate regimes and different regions of the globe, including those of several GEWEX CSEs. We concentrate on periods when the convective parameterizations are active. The parameterizations are examined in a weather forecast mode when they are applied to the true atmospheric state, rather than examining them in a climate simulation when the modeled state might have errors and false balances. This approach has been developed as the CCPP-ARM Parameterization Testbed (CAPT). The short forecast errors are shown to be relevant to the climate simulation errors by comparing composite forecast errors to averaged simulation errors at each location and regime. In some regions and periods the parameterization errors can be established by comparing the parameterization tendencies to estimates based on rather complete field campaign data such as provided by the ARM variational analysis during IOPs. We argue that given such knowledge at those locations we can infer something about the parameterization errors in other regions with less complete data, although some auxiliary data are needed beyond NWP analyses or reanalyses. We will show that the deep convection parameterization tends to have a common error in different regions. In other regimes the shallow convection parameterization and prognostic cloud water parameterization tend to partially compensate for errors in each other. A change in the formulation of one leads to a different tendency from that component, but it is balanced by a compensating change in the tendency of the other. The total parameterization tendency and the error of the total tendency is unchanged.