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Time-invariance of low-cloud albedo feedbacks in CMIP3

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To have confidence in predictions of future climate, we must understand how important elements of the climate system will respond to warming induced by increasing greenhouse gases. Clouds, and their ability to reflect solar radiation, are an important mechanism for modulating surface temperature. Observational studies of low clouds suggest that cloud albedo increases with increasing cloud-top temperature in the midlatitudes, while albedo decreases in the tropics and subtropics. An important question is whether or not models are able to reproduce this behavior, and to better understand why clouds in different regions my respond differently to temperature. We test the control climate from 9 GCMs with data available in the IPCC CMIP3 Archive to determine how the modeled clouds respond to daily temperature variability. Additionally, we utilize equilibrium climate change runs for the same models to determine if there is time scale invariance with respect to the optical depth feedback, and whether observed variability can assist in projections of long-term climate change.