

Evaluate the CMIP6 marine stratocumulus cloud albedo using satellite and reanalysis data

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Based on 12 years (2003–2014) of monthly data from multiple satellite and reanalysis data and eighteen Atmosphere Model Intercomparison Project (AMIP) simulations outputs of the Coupled Model Intercomparison Project Phase 6 (CMIP6), we evaluate the performance of current models in reproducing the marine stratocumulus cloud albedo, as well as examine the impact of different aerosol types and meteorological factors on cloud albedo in five marine stratocumulus regions. On the basis of predecessors' method, we calculate the long-term and monthly regional mean cloud albedo. It is found that the CMIP6/AMIP simulations agree with the observation well in both the monthly mean cloud albedo and correlation between albedo and cloud fraction, however, the new generation of models are not superior to CMIP5. Statistical results show that the temporal correlations between simulated and observed monthly cloud albedo are low (<0.30) for all models in all regions, even some correlations coefficients are negative. It indicates that the CMIP6/AMIP models are difficult to capture the cloud albedo changes. For the cloud albedo seasonal cycles, all the regions display obvious seasonal variations and single peak. And all the regions reach to peak value in winters. i.e., the cloud albedos reach to max in January and December months (NH), and June and July months (SH). It may links to the seasonal changes of aerosol loading, especially the biomass burning aerosols seasonal changes. The model ensemble mean (MEM) can captures the cloud albedo seasonal cycle well and the temporal correlations between simulated and observed cloud albedo seasonal cycles are highly positive in all regions (>0.6), except for the Canarian region, where the correlation is significant negative (-0.54).

Keywords: CMIP6, cloud albedo

