



The role of aerosol in producing non-linear trends in CMIP5 historical simulations

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Variations in aerosol emissions have been implicated in producing variability on decadal timescales in the global temperature record. In this study, we apply the technique of Ensemble Empirical Mode Decomposition (EEMD) to the historical simulations from the CMIP5 models. Those that include a representation of the indirect effect of aerosol more closely reproduce historical global-mean near-surface temperatures, particularly the cooling in the 1950s and 1960s, compared to models with only a representation of the direct effect. Analysis of the available single forcing runs shows that this cooling is the result of a combination of natural and anthropogenic aerosol forcing. Models with the indirect effect also show a more pronounced decrease in precipitation in this period. This demonstrates the importance of representing aerosol, and their indirect effects, in general circulation models. We also discuss issues raised by the diversity of aerosol load and interactions in the CMIP5 models.