

**C20C - Climate of the 20th Century: Selected twentieth century climate events**

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We use a simple methodology to test whether a set of atmospheric climate models run under the CLIVAR Climate of the Twentieth Century project with prescribed radiative forcings and ocean surface conditions can reproduce twentieth century climate variability. The methodology identifies three types of model behaviour. The first is that the simulated variable is potentially predictable, forced and well modelled. The second is the simulated variable consists of unpredictable internal variation that is well modelled. The third is that the simulated variable is poorly modelled with at least one missing process or forcing. Globally, rapid land surface warming since the 1970s is reproduced by some models but others warm too slowly. In the tropics, air-sea coupling allows models to reproduce the Southern Oscillation but its strength varies between models. We find a strong relationship between the modelled interannual Southern Oscillation signal in global surface temperature and the rate of simulated global warming which could, in principle, be used to identify models with realistic climate sensitivity. This relationship and a weak response to ENSO suggests weak sensitivity to changes in sea surface temperature in some of the models tested. In the tropics, most models reproduce part of the observed Sahel drought but underestimate its strength. In the extratropics, models tested do not reproduce the full observed increase in the North Atlantic Oscillation over 1965-1995 in response to forcings, through internal variability, or as a combination of both.