



The Ocean's Lead in Continental Climate Change and Variability

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One of the most characteristic features of global warming during the recent decades and in future climate change scenarios is the so-called land-sea contrast, with stronger warming over land than over oceans. Recent studies find the land-sea contrast also in equilibrium global change scenarios, indicating it is an inherent feature of global warming. In this study it is illustrated that this land-sea contrast is a reflection of the ocean's lead in global warming. Temperatures over continents respond to sea surface temperature (SST) changes with enhanced magnitude due to the water vapour feedback. General circulation model (GCM) experiments illustrate that continental warming during the last century is mostly forced by the contemporaneous ocean warming and not by local radiative forcing. The relative contribution of the SST to the change in continental surface temperatures in global warming scenarios amounts to about 80-90%. Thus, prescribing historical SST changes explains a large fraction of the continental climate change in atmosphere model simulations and large-scale decadal SST variability will have larger amplitudes for land surface temperature, than in the SST itself.