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Poster
We evaluate the representation of dynamic sea surface height (SSH) fields of 33 global coupled models (GCMs) contributed to the fifth phase of the Coupled Model Intercomparison Project (CMIP5). We use observations from satellite altimetry and basic performance metrics to quantify the ability of the GCMs to replicate observed SSH of the time-mean, seasonal cycle, and inter-annual variability patterns. The time-mean SSH representation has markedly improved from CMIP3 to CMIP5, both in terms of overall reduction in RMS differences, and in terms of reduced GCM ensemble spread. Biases of the time-mean SSH field in the Indian and Pacific Ocean equatorial regions are consistent with biases in the zonal surface wind stress fields identified with independent measurements. In the Southern Ocean, the latitude of the maximum meridional gradient of the zonal mean SSH CMIP5 models is shifted equatorward, consistent with the GCMs' spatial biases in the maximum of the zonal mean westerly surface wind stress fields. However, while the Southern Ocean SSH gradients correlate well with the maximum Antarctic Circumpolar Current transports, there is no significant correlation with the maximum zonal mean wind stress amplitudes, consistent with recent findings that the eddy parameterisations in GCMs dominate over wind stress amplitudes in this region. There is considerable spread across the CMIP5 ensemble for the seasonal and interannual SSH variability patterns. Because of the short observational period, the interannual variability patterns depend on the time-period over which they are derived, while no such dependency is found for the time-mean patterns. The model performance metrics for SSH presented here provide insight into GCM shortcoming due to inadequate model physics or processes. While the diagnostics of CMIP5 GCM performance relative to observations reveal that some models are clearly better than others, model performance is sensitive to the spatio-temporal scales chosen.
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