



Tropical Atlantic influence on Pacific variability and mean state in the 20th century in observations and CMIP5

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This paper investigates the influence of the tropical Atlantic on the tropical Pacific interannual variability and mean state in the 20th century. It is demonstrated that observational datasets show a significant time-delayed impact of the tropical Atlantic on tropical Pacific sea surface temperatures, leading to an anticorrelation between the tropical Atlantic and the eastern Pacific if the Atlantic is leading by about 10 months. This result is robust across different sea surface temperature reconstructions. There is no robust correlation between the tropical Atlantic and the eastern Pacific when the Pacific is leading, although in recent decades a positive correlation between the two basins is more dominant. An analysis of the surface pressure response to the tropical Atlantic indicates an atmospheric bridge and a modification of the Walker Circulation as the likely trigger for the teleconnection, and this result is consistent with recent observational and modelling results for the recent decades. 16 out of the 45 analyzed World Climate Research Program's Coupled Model Intercomparison Project Phase 5 (CMIP5) models show lead-lag correlations broadly similar to the observed, whereas the majority of the models show either too strong correlations when the Pacific is leading or very weak correlations for all lags. The atmospheric bridge mechanism seems also valid in the selected CMIP5 models. In these models a stronger warming of the tropical Atlantic compared to the global mean is associated with a La Nina-like mean state change in the tropical Pacific. However, the ensemble mean of these models still shows a weakly El Nino-like trend, which is associated with a relatively weak Atlantic warming compared to the global mean and the observations