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Optimal latitudinal bands to narrow estimates of climate sensitivity using proxy data of the past millennium

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Reconstructions of global or North Hemispheric past temperatures over the past millennium are being used to narrow the estimations of climate sensitivity. One avenue is benchmark ensembles of model simulations, either ensembles of opportunity with General Circulation models, perturbed physics ensembles or ensembles with more simplified models, against ensembles of temperature reconstructions taking into account their inherent uncertainties. However, the global or Northern Hemisphere mean temperature is not the variable that best reflects the changes in external climate forcing. It contains a large portion of internal climate variability that perturbs the benchmarking of climate models and thus widens the estimations of climate sensitivity. To optimize these estimations, the temperature in areas of the globe that most clearly reflect the effect of the external forcing should be overweighted, i.e. those areas that display a higher ratio of forced to internal variability at multidecadal timescales.
In this contribution, several simulations over the past millennium are analysed to identify those areas. It turns out that, despite the well known fact that the temperature response to external forcing is strongest at high latitudes (polar amplification), the signal-to-noise ratio for the mean annual temperature is found in the tropical regions. Conversely, the areas that display higher signal-to noise ratio for mean annual precipitation are the high latitudes.
This feature is not unique to the simulated climate over the past millennium. Scenario simulations conducted for the 21st century that belong to the CMIP3 model suite also show that the ratio between temperature change and intra model ensemble variability is higher for the tropical regions for temperature, and higher at high latitudes for mean annual precipitation.
Realistic pseudo-proxy experiments have been conducted to estimate the potential narrowing of the estimates of the Transient Climate Response (TCR) when using only tropical temperature pseudo-proxies compared to using high-latitude temperature pseudo-proxies. Although the tropical pseudo-proxies are more effective at constraining the estimations of TCR, tropical temperature proxies are less numerous than at high latitudes. It is argued that a targeted increase in the retrieval of tropical temperature proxies would result in a potential large narrowing of estimations of the TCR and of climate sensitivity.