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Interdecadal variability in surface climate during the instrumental period

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Although long-term warming of global mean temperature is robust across different observational datasets, there are interesting features at interdecadal timescales that deserve further investigation. A realistic characterisation of interdecadal variability is critical. It is required for important applications such as the detection and attribution of climate changes and assessment of data-model agreement. Via its role in the slowdown of warming relative to model simulations, interdecadal variability is one of the factors considered in the expert judgement (reported in the IPCC's fifth assessment) that near-term projections of warming are likely to be less than those simulated by the CMIP5 ensemble of climate models. This highlights its relevance to future projections of both forced change and unforced variability.

Interdecadal variability in surface temperatures will be characterised according to their regional and latitudinal structures. Some features differ between datasets, reflecting the structural uncertainty arising from different choices made for addressing inhomogeneities in the observations and incomplete observational coverage, resulting in different degrees of spatial smoothness and completeness. Other features are robust between datasets, representing short-term forcings and unforced variability. The unforced variability is associated with changes in atmospheric circulation, and these changes also drive regional precipitation anomalies. It is informative, therefore, to represent them as modes of variability in circulation-temperature-precipitation "space", but complications arise from the limited coverage of observational data, especially in the 19th century. Changes in data coverage alter the empirical relationship between these climate variables and need to be taken into account when comparing, for example, the decadal trends around the large El Nino events in 1877-78 and 1997-8.