On attribution of regional decadal changes in the climate system using univariate methods.

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Abstract

A previously used univariate methodology for detecting and attributing regional climate trends is reviewed. Observed trends over a given period (e.g., 30 years) are compared to distributions of trends from climate model simulations with various historical external forcings, such as natural forcings-only or anthropogenic and natural forcings combined. The methodology does not explicitly use pattern information, but is a gridpoint-by-gridpoint based assessment of observed trends. Observed trends are classified according to whether they are likely outside the range of natural variability, at least partly attributable to anthropogenic forcing, or consistent with modeled trends or not.
The methodology depends on having reliable: observations; model simulations of internal climate variability; modeled response to external forcings; and specified external forcing changes over time. Comparison of the observed (residual) estimate of internal climate variability with model-simulated internal variability at the regional scale is a further critical test of model performance. Some examples are shown for regional temperature, precipitation, and sea level pressure variability and trends. For the Atlantic Meridional Overturning Circulation, CMIP3 and CMIP5 model-simulated internal variability appears be deficient, with implications for assessing Atlantic Multidecadal Variability.

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