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Climatic nowcasting: incorporating model-simulated climate change to estimates of present and near-future climate

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Weather services base their operational definitions of "present" climate on past observations. Commonly, a 30-year normal period such as 1971-2000 or 1961-1990 is used. Where data availability allows, baseline periods extending further to the past may be used for some purposes, particularly when focusing on the statistics of extremes which are difficult to estimate from short time series. In a world with ongoing global warming, however, past data give a biased estimate of the actual present-day climate. Here we aim to correct this bias with a "delta change" method, in which model-simulated climate changes and observed global mean temperature changes are used to extrapolate past observations forward in time, to make them representative of present or future climate conditions. In a hindcast test for the years 1991-2005, the method works well for temperature, with a clear improvement in verification statistics compared to the case in which the hindcast is formed directly from the observations for 1961-1990. However, no improvement is found for precipitation, for which the signal-to-noise ratio between expected anthropogenic changes and interannual variability is much lower than for temperature. An application of the method to the present (around the year 2010) climate suggests that, as a geographical average over land areas excluding Antarctica, 8-9 months per year and 8-9 years per decade can be expected to be warmer than the median for 1971-2000. Along with the overall warming, a substantial increase in the frequency of warm extremes at the expense of cold extremes of monthly-to-annual mean temperature is expected. For example, the record-high annual mean temperature observed in Helsinki, Finland, in the year 2008 (+7.6^{o}C) had a return period of about 200 years when estimated directly from 20th century observations. When adjusting the observed temperatures for global climate change, however, the return period is reduced to approximately 15 years. *** The method is described in more detail by R‰is‰nen and Ruokolainen (2008a;b: Climate Dynamics 31: 573-585; Geophysica 44: 45-65). ***