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Can temperature extremes in China be calculated from reanalysis ?

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Based on daily maximum, minimum and mean surface air temperature derived from two reanalyses, the trends in twenty indices of temperature extremes are examined for China during 1958-2011. The consistency between reanalyses and observations in terms of index values and their temporal trends are assessed. Both National Centers for Environmental Prediction/National Center for Atmospheric Research Reanalysis (NCEP/NCAR) and European Centre for Medium-Range Weather Forecasts (ECMWF) are selected. ECMWF includes ERA-40 for the period 1958-2001 and ERA-Interim during 2002-2011. During 1958-2011, in most cases, temperature indices from NCEP/NCAR and ECMWF are in good agreement, illustrating the inter-decadal transition in the late 1970s. From both reanalysis since 1980, cold days and cold nights have decreased, while warm days and warm nights have increased. Temperatures of coldest days/nights and warmest days/nights significantly increase significantly over all of China but diurnal temperature range demonstrates slight variations; growing season length, summer days, tropical days have increased, consistent with a decrease in numbers of frost days and ice days. Furthermore, heat wave duration and warm spell days have increased while consecutive number of frost days are reduced. Meanwhile, consecutive summer days, cold wave duration and cold spell days from NCEP/NCAR have decreased and consecutive frost days have increased, while these indices from ECMWF turn to the opposite directions. Compared with observations, temperature extremes from both reanalyses have small relative bias and root mean squared errors, and correlation coefficients between equivalent indices (NCEP/NCAR vs ECMWF) are positively high. Thus both reanalyses can reproduce the variability of temperature extremes obtained from observations to some extent, although biases do exist due to assimilation differences.