National Institute of Environmental Health Sciences

Anthropogenic influence on long return period daily temperature extremes at regional scales

Author(s): Zwiers FW, Zhang XB, Feng Y
Year: 2011
Journal: Journal of Climate. 24 (3): 881-892

Abstract:

Observed 1961-2000 annual extreme temperatures, namely annual maximum daily maximum (TXx) and minimum (TNx) temperatures and annual minimum daily maximum (TXn) and minimum (TNn) temperatures, are compared with those from climate simulations of multiple model ensembles with historical anthropogenic (ANT) forcing and with combined anthropogenic and natural external forcings (ALL) at both global and regional scales using a technique that allows changes in long return period extreme temperatures to be inferred. Generalized extreme value (GEV) distributions are fitted to the observed extreme temperatures using a time-evolving pattern of location parameters obtained from model-simulated extreme temperatures under ANT or ALL forcing. Evaluation of the parameters of the fitted GEV distributions shows that both ANT and ALL influence can be detected in TNx, TNn, TXn, and TXx at the global scale over the land areas for which there are observations, and also regionally over many large land areas, with detection in more regions in TNx. Therefore, it is concluded that the influence of anthropogenic forcing has had a detectable influence on extreme temperatures that have impacts on human society and natural systems at global and regional scales. External influence is estimated to have resulted in large changes in the likelihood of extreme annual maximum and minimum daily temperatures. Globally, waiting times for extreme annual minimum daily minimum and daily maximum temperature events that were expected to recur once every 20 yr in the 1960s are now estimated to exceed 35 and 30 yr, respectively. In contrast, waiting times for circa 1960s 20-yr extremes of annual maximum daily minimum and daily maximum temperatures are estimated to have decreased to fewer than 10 and 15 yr, respectively.

Source: http://dx.doi.org/10.1175/2010jcli3908.1

Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: IAP FGOALS

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Temperature: Extreme Cold, Extreme Heat

Geographic Feature: ☑

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☑

resource focuses on specific location

Global or Unspecified

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Other Projection Model/Methodology

Other Projection Model/Methodology: single-step attribution (Hegerl et al. 2010) technique

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Medium-Term (10-50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content