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PARALLEL SESSION B : FRONTIER DOWNSCALING TOOL
B2: HUMAN-CLIMATE REGIONAL INTERACTIONS, TOWARDS RESMS

Contributions of anthropogenic and external natural forcings to climate changes over China based on CMIP5 model simulations

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Based on observations and historical simulations from the fifth phase of the Coupled Model Intercomparison Project (CMIP5) archive, the contributions of human activities (including greenhouse gases (GHGs), anthropogenic aerosols (AAs), and land use (LU)) and external natural forcings (Nat) to climate changes in China over the past 50 years were quantified. Both anthropogenic and external natural forcings account for 95%–99% of the observed temperature change from 1951–1975 to 1981–2005. In par-ticular, the temperature changes induced by GHGs are approximately 2–3 times stronger than the observed changes, and AAs impose a significant cooling effect. The total external forcings can explain 65%–78% of the observed precipitation changes over the past 50 years, in which AAs and GHGs are the primary external forcings leading to the precipitation changes; in particular, AAs dominate the main spatial features of precipitation changes in eastern China. Human activities also dominate the long-term non-linear trends in observed temperature during the past several decades, and, in particular, GHGs, the primary warming con-tributor, have produced significant warming since the 1960s. Compared to the long-term non-linear trends in observed precipita-tion, GHGs have largely caused the wetting changes in the arid-semiarid region since the 1970s, whereas AAs have led to the drying changes in the humid-semihumid region; both LU and Nat can impose certain impacts on the long-term non-linear trends in precipitation. Using the optimal fingerprinting detection approach, the effects of human activities on the temperature changes can be detected and attributed in China, and the effect of GHGs can be clearly detected from the observations in humid-semihumid areas. However, the anthropogenic effects cannot be detected in the observed precipitation changes, which may be due to the un-certainties in the model simulations and to other issues. Although some results in this paper still need improvement due to uncer-tainties in the coupled models, this study is expected to provide the background and scientific basis for climate changes to conduct vulnerability and risk assessments of the ecological systems and water resources in the arid-semiarid region of China.

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