

# Simulated and observed diurnal temperature range in CMIP5 model in the Tibetan Plateau

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The diurnal temperature range (DTR), is defined as the difference between the maximum and minimum temperature, which is a useful diagnostic index for evaluating global climate models (GCMs). In this study, the DTR from 17 GCMs available in the fifth phase of the Coupled Model Intercomparison Project (CMIP5) is evaluated in the Tibetan Plateau (TP) by comparison with the observation during 1961-2005. During 1961-2005, the observed maximum/minimum temperature in the TP shows a statistically increasing trend with the annual rates of 0.19/0.36 °C decade<sup>-1</sup>, respectively, leading to the reduction in the DTR (-0.22 °C decade<sup>-1</sup>). Compared with the observation, the mean DTR from the most CMIP5 models is generally underestimated with absolute error ranging from -4.58 °C (GFDL-ESM2M) to -1.36 °C (CESM1-BGC). 15 CMIP5 models have reproduced the overall negative trends of DTR in the TP, with smaller trend magnitudes. Furthermore, a correlative approach is used to investigate the CMIP5 model differences in DTR, which can give an indication of which parameters that are important for the model differences. The differences (SDSRcs-SDSR) between the surface downwelling radiation radiation at clear sky (SDSRcs) and the surface downwelling shortwave radiation (SDSR) can be used to describe the surface shortwave cloud radiative effect. Similarly, the differences (SDLR-SDLRcs) between the surface downwelling longwave radiation (SDLR) and the surface downwelling longwave radiation at clear sky (SDLRcs) are defined to address the surface longwave cloud radiative effect. It is found that the mean DTR in the CMIP5 models has significantly negative correlations with both SDLR-SDLRcs and SDSRcs-SDSR, suggesting that the model differences in DTR in the TP are mainly determined by differences in radiation variables through changes in total cloud fraction in the CMIP5 models.

Key words: diurnal temperature range; observation; CMIP5; Tibetan Plateau