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Modeling Biases of Mean Air Temperature Averaged from Daily Maximum and Minimum Temperatures over Global Land

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The true monthly mean temperature is defined as the integral of the continuous temperature measurements in a month(Td0), which is apparently different from the average of the maximum and minimum temperatures(Td1). Unfortunately, Td1 instead of Td0 has been widely used as the monthly mean temperature, which is an indicator of climate change and input parameters of various models. It has already been proved in some researches that the bias between Td0 and Td1 (Tbias=Td1-Td0) can not be ignored, in someplace it could even be very large. It is in great urgent to replace Td1 with the true monthly mean temperature Td0 to eliminate the impacts of the inaccurate monthly mean temperature in related researches. However, Td0 cannot be obtained directly for the lack of the historical observed hourly air temperature. In our study, a Multiple Linear Regression (MLR) based method is created firstly by now to calculate Tbias with the predictor of day length, DTR (Diurnal Temperature Range) and Td1. Then the historical Td0 can be obtained further based on the relationship between Td1 and Td0. The method performs very well with a R-square surpassing 0.57, in arid or semi-arid areas the mean R-square exceeding 0.76. The mean relative importance of day length, Td1 and DTR is 52.8%, 26.3% and 20.9%, respectively. The method can accurately reproduce temporal and spatial variability of the bias of mean air temperature calculated from daily maximum and minimum temperatures (Tmax and Tmin). It can be applied globally to model its long term variability, and provide a new approach to Td0.