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Inversion of land-air temperature difference by using remote sensing data over the North Tibetan Plateau

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Time series of MODIS land surface temperature (LST) and normalized difference vegetation index (NDVI) products, combined with digital elevation model (DEM) and meteorological data from 2001 to 2012, were used to map the spatial distribution of monthly mean air temperature over the Northern Tibetan Plateau (NTP). A time series analysis and a regression analysis of monthly mean land surface temperature (Ts) and air temperature (Ta) were conducted using ordinary linear regression (OLR) and geographical weighted regression (GWR) methods. The analyses showed that the GWR method, which considers MODIS LST, NDVI and elevation as independent variables, yielded much better results (Adjusted R2 > 0.79, and root mean square error (RMSE) between 0.51 °C and 1.12 °C) associated with estimating Ta compared to those of the OLR method (Adjusted R2 = 0.40∼0.78, and RMSE=1.60∼4.38 °C). In addition, some characteristics of the spatial distribution of monthly Ta and the difference (dT) between the surface and air temperature are as follows. According to the analysis of the 0 °C and 10 °C isothermals, Ta values over the NTP at elevations of 4000∼5000 meters were over 10 °C in the summer (from May to October), and Ta values at an elevation of 3200 meters dropped below 0 °C in the winter (from November to April). Ta exhibited an increasing trend from northwest to southeast. Except in the southeastern area of the NTP, dT values in other areas were all larger than 0 °C in the winter.