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Influence of circulation and radiative factors on temperature variability over different regions of the Asian territory of Russia

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In this study the variability of spatial-temporal distribution of temperature is investigated for the Asian territory of Russia (ATR) (45 - 80ºN, 60-180ºE) for the period of global warming 1979-2008. Positive trends of annual averaged surface temperature were revealed over the territory of understudy. Annual averaged trend value was 0.34°C/decade by observational data and in general for the period of 1979-2008 temperature increased by 1.0°C, whereas using reanalysis data the following values were obtained for this period: using CFSR – by 0.96°C, using NCEP/DOE AMIP and JRA-25 – by 1.4°C.
The main purpose is to reveal the reason of such temperature variability during last decades.
The most important role in the weather and climate formation belongs to atmospheric circulation and radiative balance elements at the top of atmosphere and at the surface.
The average fields of radiative and heat balance and the fields of their linear trends were calculated and constructed for the period of 1979 - 2008 for several regions: ATR, West Siberia, East Siberia and Far East. Slight decrease of radiative balance ($\sim$2W/m2) is observed and we can suppose that the tendency of regional climatic system cooling is possible; it can decelerate the growth of air temperature at the surface. Estimations of radiative balance elements were calculated using JRA-25 reanalysis data and then compared with satellite data (CERES and ERBE).
To determine temperature variability over ATR, we used a regression model, which relates surface temperature anomalies with short-wave radiation anomalies, longwave radiation anomalies, calculated for clear sky, anomalies of latent, sensibility heat, heat flux into the ground, and with cloudiness anomalies. These anomalies describe from 47% to 71% of temperature variability in different months. The contribution of each predictor in the regression analysis to the total variability of air temperature was also calculated.
To describe global circulation some teleconnection indices were used: NAO – North Atlantic Oscillation, AO – Arctic Oscillation, SCAND - Scandinavian Pattern; SOI - South Oscillation Index. In general, basic circulation mechanism, forming temperature regime over ATR, is described by SCAND almost during a year. NAO has significant influence on the air temperature variability over the territory of under study only in several months of cold season. Regression analysis has shown, that in general variability of global circulation processes describe about 40-60% of surface air temperature variability over ATR.
Regression models allow to describe up to 65% of temperature variability if we take into account both circulation and radiative factors. Relative part of these two groups is varied for different regions of ATR.