



Temperature and precipitation changes in the Altai Mountains against the background of global climate changes

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Climate change in the Altai Mountains located over the central Eurasia in a distance from the ocean requires consideration against the background of climate changes in the Northern Hemisphere, high and middle latitudes. This research focuses on compare climate changes in regional and global scale and on search an impact of the atmospheric circulation and cloud-radiation factor on climate change in the Altai region. The 1935-2004 time series of the seasonal air temperature and precipitation from 14 weather stations were statistically analyzed. To extend the time series over the past 400 years, mean summer temperature was reconstructed applying dendroclimatological methods and using the Swiss Federal University dendro data set and ARSTAN program. Comparing to the Northern Hemisphere, over the Altai Mountains the tendency of air temperature increase in the second half of 1900s has been observed generally earlier, since 1950s in winter and transitional seasons. From the mid-1950s the warming rate in the Altai Mountains region ranges from 0.21°C in summer to 0.77°C in winter with spring and fall seasons in between. High statistically significant correlation between seasonal mean temperature time series over the Altai region and the middle and high latitudes as well as over the entire Northern Hemisphere was revealed in summer and spring from the mid-1970s. In winter when the meridional air exchange is most intensive, there are several years of abrupt cooling over the Altai Mountains corresponding to the low zonal circulation in 60°-80°N. During summer the role of radiation factor comes to the fore that controls statistically significant negative correlation between temperature and precipitation with correlation ranging from -0,36 to - 0,63 for the different station locations. The dendrochronological analysis was employed to range the tendency of the mean summer air temperature over the pre-instrumental period. There were intervals with similar warming rate as during the present time, for example, in the second half of the 1800s. The temperature increase, especially from the mid-1900s, in the Altai Mountains region results in treeline rise, permafrost and glacier degradation.