

CLIMATE CHANGE AND ITS IMPACT ON ATMOSPHERIC CHARACTERISTICS ALONG 120 E MERIDIAN

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In this study, we discuss the character of air temperature changes within the troposphere and stratosphere. Analysis of accumulated data on atmospheric temperature shows that the air warms up unevenly not only regionally depending on the incoming solar energy, but also by altitude above the ground. The tendency of tropospheric air warming up changes at an altitude of about 9–10 km in the middle latitudes of both hemispheres has increased slightly in the last ~80 years. At the altitude of the lower stratosphere ~12–15 km, a decrease in temperature was observed. The air of the upper stratosphere also tended to cool. Since 2000, in the Northern and Southern hemispheres the temperature tendency to decrease in the stratosphere began to change towards stabilization and in the last few years one can observe an increase.

We show that changes in stratospheric temperature are accompanied by a long-term increase. The most pronounced increase in temperature changes corresponds to the period from 1948 to 1998. At present, in the stratosphere, on the time scale from 1999, a secondary weaker increase and, subsequently, a certain stabilization of the temperature field are observed. In addition, a transition to stratospheric warming is noted in certain months within different latitudinal zones. As we assume, the period of transition from the phase of stable stratospheric cooling (in average values) to certain stabilization and warming should have a longer duration compared to the estimated one: from 1999 to 2024. Considering the trend of temperature change, the period of temperature growth in the stratosphere will most likely be observed until 2030.

We should also note an important feature of temperature change along 120 E at altitudes of 10 hPa in the Southern Hemisphere. At these altitudes, a sharp increase in air temperature is observed over a four-year period (from 1976 to 1979). Moreover, this increase is accompanied by a further systemic decrease in air temperature. The amplitude of the increase depends on latitude, the mean value is 2.5°. Warming of the stratospheric layers can affect a number of geophysical characteristics of the middle atmosphere, such as the height of the upper layers, including the ionospheric layer. Changes in air temperature lead to a shift in the position of atmospheric layers: up to 20 km or even more.

The study of modern features of climate warming is relevant not only for the development of ideas about geophysical processes in the lower, middle and upper atmosphere, occurring on different spatial and temporal scales, but also for deepening the understanding of changes in individual atmospheric characteristics of the atmosphere, including the parameters relevant for astronomical telescopes. In particular, changes in the temperature field in the lower atmosphere lead to a restructuring of dynamic processes in the atmosphere and are accompanied by changes in diffuse light.

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