**Long-term forecast for surface temperature in some circumpolar cities in the Russian Federation**

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The process of how surface temperatures are formed is a complex, multi-component, and dynamic one that is influenced by many factors. These factors are generally well-known, but their interactions are highly variable, making it an important research task to identify their specific characteristics.

One of the most important factors is the solar radiation that reaches the Earth's surface. This radiation plays a crucial role in determining the thermal balance between the surface and the atmosphere. S. P. Khromov highlighted the importance of considering solar activity in long-term forecasts.

Multiyear measurements of temperature provide valuable data for long-range forecasting. The methodological basis for such measurements was established as early as 1975. This work has led to the development of algorithms that can predict long-term temperature trends based solely on data collected over a 10-100 year period.

This paper presents the results of a long-term forecast of surface temperature in three cities located in the circumpolar regions of the Russian Federation: Murmansk, Verkhoyansk, and Magadan. The forecast is based on temperature data collected from meteorological stations in these cities over the period from 2013 to 2023.

The extrapolation of the temperature data began in 2018 and continues until 2038. In this paper, we present a forecast for up to 30 years. All three cities show an increasing trend in their long-term components.

The results of the extrapolation of temperature data are in good agreement with the solar activity forecast for the same period. The long-term components of surface temperatures or low-frequency components reflect multidecade or climatic variations. They also determine whether winters and summers are cold or warm, whether there is an ice age, or if there is a period of global warming.

The low-frequency component of temperature fluctuations serves as a sign of unusual temperatures. Although its range is smaller than that of daily and yearly variations, ranging from one to four degrees, it is crucial for long-term forecasting.

This component is currently indicative of climate warming and the unusually warm winters of 2024–2025. It correlates with the peak of solar activity during solar cycle 25.Due to the active cyclonic activity in the Gulf Stream region, temperatures in Murmansk, located on the coast, experience significant variations of the moderate cyclone type. The long-term forecast shows fluctuations around 0°C, with positive temperatures prevailing.

In Verkhoyansk, which is at the same latitude, not only the minimum values are recorded, but also the smallest temperature fluctuations of the anticyclonic continental type. In coastal Magadan, the temperature and its fluctuations increase as you get closer to the ocean. The average temperatures in these two cities, which are located in the permafrost zone, are always below zero. However, in 2025, temperatures are expected to rise everywhere, with a further decrease expected at the beginning of 2026. This is based on the unusually warm winter of 2025.