Temperature Trends in Antarctic Atmosphere Detected by the Method Based on the Using of Hourly Observations

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Linear trends in time series of temperature anomalies at the standard isobaric levels calculated by the method based on the using of hourly observations with taking into account the possible time correlations of observations [Alduchov et al, 2006] are presented for different months, seasons and for year for eight coastal Antarctic stations

Radiosonde sounding data from CARDS [Eskridge et al, 1995] for eight stations: Bellingshausen (1970-1999 years), Halley (1966-2001 years), Novolazarevskaya (1969-2001 years), Syova (1969-2001 years), Mawson (1969-2001 years), Davis (1970-2001 years), Mirny (1969-2001 years), Casey (1969-2001 years) were used for research of climatic changes in Antarctic atmosphere.

The results are presented at the figure 1 and figure 2. The significance of the trends is not less than 50%.

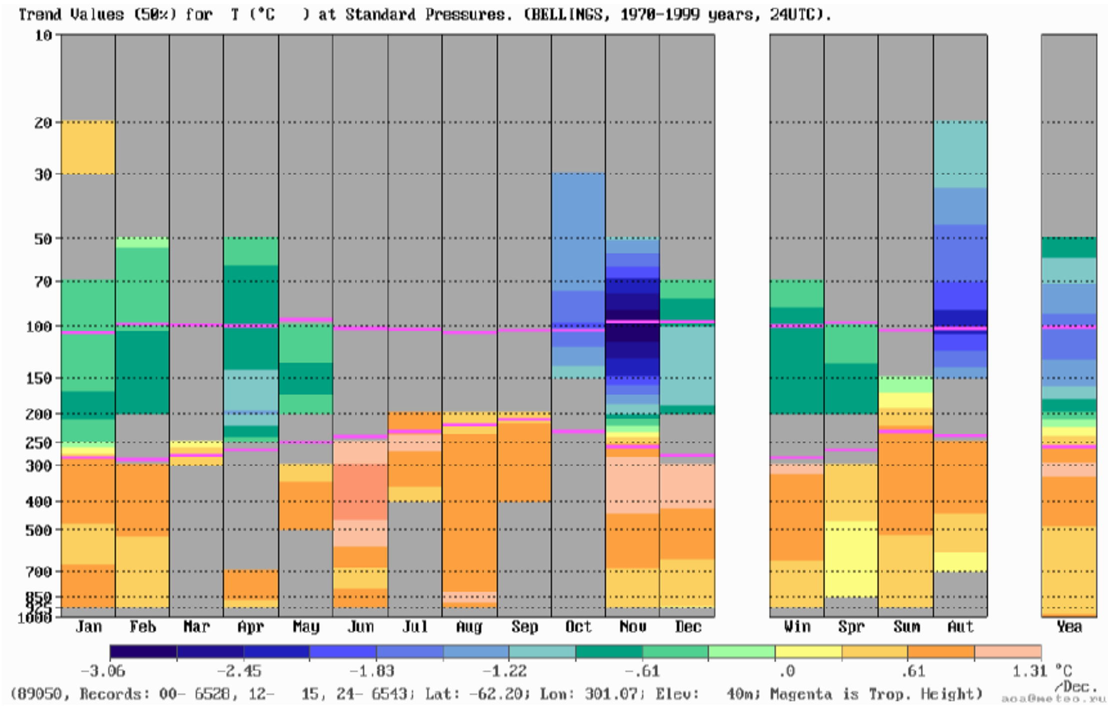

Figure 1. Linear trends for temperature anomalies (ºC) at the isobaric levels calculated on the base of hourly observations with taking into account the time correlations of observations for different months (at the right), season (in the center; winter – December, January, February) and for year (at the left). The significance of the trends is not less than 50%. The first and second tropopause is marked by pink lines. Bellingshausen. 1970-1999 years. CARDS.

Figure 1 and figure 2 show that climatic changes in Antarctic atmosphere are inhomogeneous in the time and space.

Warming in troposphere for all months (with exception October), seasons and for year is detected over Bellingshausen station only. Warming in middle and high layers of the troposphere is bigger than it is in low troposphere for all season and year.

Warming in troposphere for Australian winter (marked at the figures as “sum”) was detected for all studied stations with exception Mirny station.

Warming in troposphere for year in total was detected over Bellingshausen and very small warming was detected over Halley and in some layers of troposphere over Mawson, Davis, and Casey.

Small cooling was detected in some layers of troposphere over Novolazarevskaya and Syova stations.

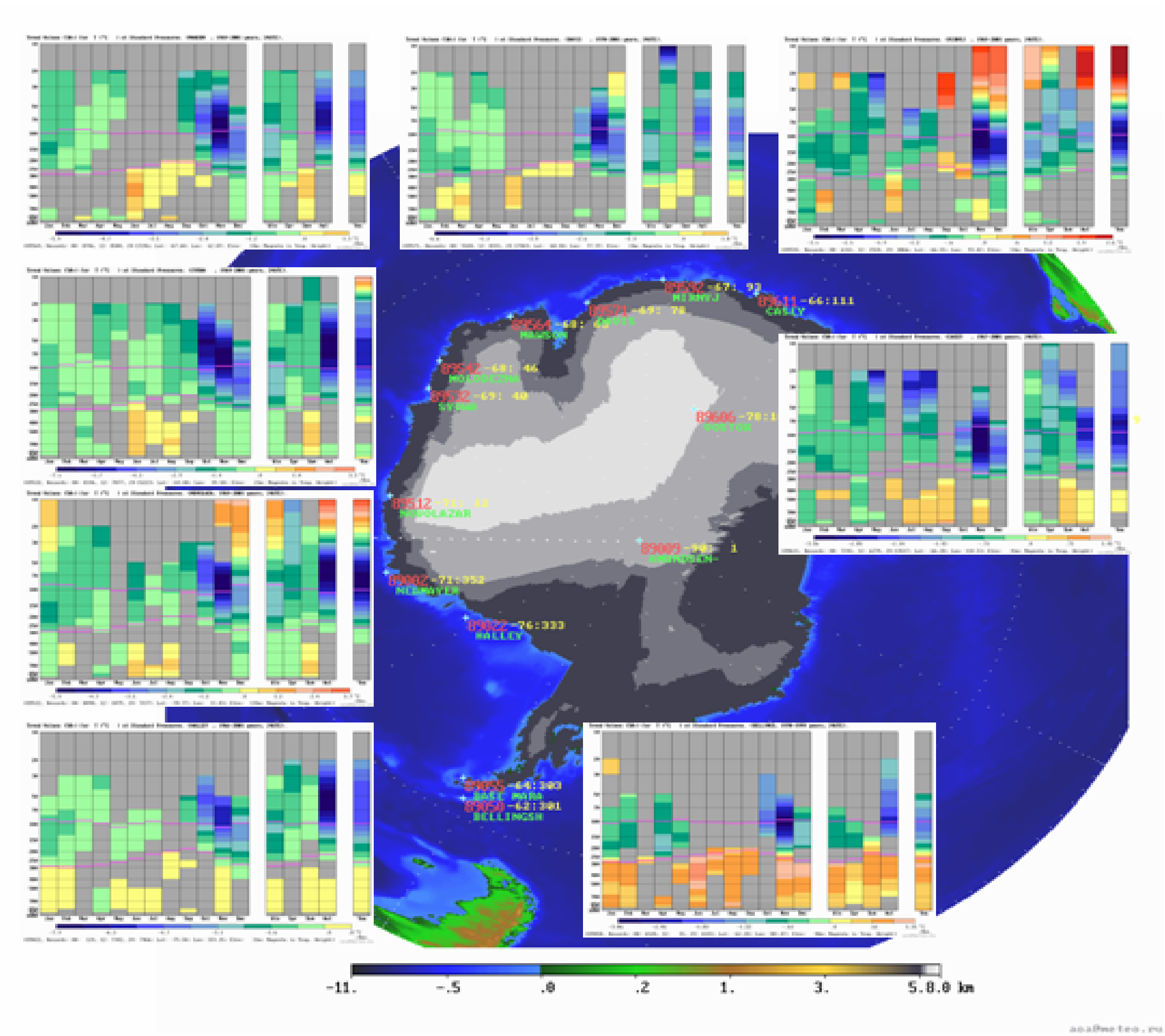

Figure 2. Corresponding linear trends for temperature anomalies (ºC) at the isobaric levels calculated on the base of hourly observations with taking into account the possible time correlations of observations for different months (at the right), season (in the center; winter – December, January, February) and for year (at the left) for Antarctic stations (from right bottom to clockwise): Bellingshausen, Halley, Novolazarevskaya, Syova, Mawson, Davis, Mirny, Casey. The significance of the trends is not less 50%. The first and second tropopause is marked by pink lines. CARDS.

Cooling in the low stratosphere was determined over all stations. But figure 2 shows the warming in high layers of stratosphere for some station (Novolazarevskaya, Syova, and Mirny). The improving of sounding system may be one of the reasons of determined cooling in stratosphere. Now sonde may up higher for more cold weather condition.

Very like that change of cloudiness is one of the reasons of Antarctic troposphere warming [Turner et al, 2006].

The results can be used for modeling of climate change, for comparison with results obtained on base other data sets.

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