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Summary. - Observations of atmospheric temperature have been uninterruptedly carried out at Mt. Cimone (2165 m s.l.) since January 1946. Four decades and a half of homogeneous measurements are presented in this paper giving particular emphasis to long-term change: in the yearly temperature averages there is no evidence for secular trend as well as in the winter and summer temperature averages. On the contrary the spring averages show a decreasing long-term trend, while the autumn averages reveal an increasing long-term trend. We find, for the spring season, a global decrease of about \(-1^\circ\text{C}\) and, for the autumn season, a global increase of about \(+1^\circ\text{C}\). A temperature correlation analysis between Mt. Cimone and an area-box of about \((200 \times 700)\) km\(^2\), exceeding the Po Valley, just to the North of Mt. Cimone, is presented. Results show how long-term temperature change, representing the mentioned area, could be powerfully monitored by operating a single station as Mt. Cimone.

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1. – Introduction.

Global climate change of the low troposphere appears as a probable and serious expectation in the next future of the mankind because of the well-known greenhouse effect [1-3]. Only considering the increase in progress of the atmospheric CO\(_2\) concentration, the most important greenhouse trace gas, several numerically based computer models emphasize an imminent global warming of the Earth's surface, as a primary indicator of climate change. A doubling of the pre-industrial atmospheric CO\(_2\) concentration, expected in the first half of the next century, would give a mean increase of the global surface air temperature of about \(+1.5^\circ\text{C}\) up to \(+4.5^\circ\text{C}\) [4-6], while, in the coming decades, models estimate a mean increase of about \(+0.3^\circ\text{C}\) per decade.

Beyond the uncertainity about the degree of reliability of these forecasts, \(i.e.\) how large and how fast the change will be, there actually exists the question if a climate warming is
already in progress. In order to give an answer to this question some studies have been performed [7-9], based on the analysis of long-lasting instrumental records of temperature from thousands of meteorological stations covering the Earth's surface. The results of these studies show that the global climate, however subject to large irregular variations over a time scale of several years, has generally become warmer in the past 100 years, rising by a few tenth of a degree Celsius of temperature.

Unfortunately the exact amount of the temperature increase is not known with a good accuracy because of many disturbing factors as the urban heat island effect and quality changes in the observing procedures occurred during the past.

This paper presents a comparatively long temperature time series, uninterruptedly recorded from January 1946 to July 1991 at Mt. Cimone Observatory of the Italian Meteorological Service. Data analysis is without any pretence to give evidence on global surface air temperature changes, because, for this purpose, it would be necessary to simultaneously consider a very large number of stations displaced in strategical sites all over the world. Our attempt is to make an assessment of long-term temperature behaviour in the first layers of the troposphere over the Northern Italy during the past decades. This is a reasonable aim because of the representativeness of the measuring site, well exposed to air mass inflows and free from anthropogenic local influences. As will be described in the next section, the site, during all the period of measurement, has not undergone any local environment change such as to alter its microclimate; besides the methodology of exposure of the instruments has been kept unchanged in order to maintain the homogeneity of the observational series [10]. Finally the representativeness of Mt. Cimone site has been evaluated by a correlation analysis with temperature change obtained for an area-box of about 200 km per 700 km displaced from 44°N to 46°N latitude and from 4°30'E to 13°30'E longitude, just to the North of Mt. Cimone, as illustrated in fig. 1. Data related to this area-box were made available in digital form, as a part of an analysis of the world surface air temperature for the period 1880-1985 by Hansen and Lebedeff [7].

2. - Measuring site, instrumentation and data file.

The meteorological station is located at the top of Mt. Cimone (2165 m s.l., 44°11′N, 10°42′E), which is the highest peak of the northern Apennines. The summit of Mt. Cimone