Old Mountain Meteorological Station Milesovka (Donnersberg) in Central Europe

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Abstract

The foundation of the old mountain meteorological station Milesovka (Donnersberg) in western Bohemia and its operation since 1904 is described with special reference to its unique location in central Europe. The data presented might serve as important documentation of the intense industrialization of the surrounding region during the past 80 years.

Milesovka (Donnersberg)—837 m above mean sea level (MSL) 50°33'N, 14°56'E—belongs to the family of old mountain meteorological stations in central Europe that played an important role in characterizing the climate trends for almost a century. Among the oldest of those stations are Snezka (Schneekoppe), at 1603 m MSL (operating since 1881), Fichtelberg, at 1203 m MSL (since 1891), and Zugspitze, at 2962 m MSL (since 1900). One can also mention the more distant old mountain stations, such as Hohenpeissenberg and its more than two centuries of history, or Sonnblick as a high mountain observatory in operation for more than 100 years. The Milesovka observatory started observations in October 1904. Its data provide important evidence of both regional- and larger-scale fluctuations in climate and climate change, as well as local climate alteration effected by the intense industrialization of the surrounding region over the past 88 years (Fig. 1).

The foundation and operation of the observatory Milesovka is closely related to its unique location. The isolated, conically shaped mountain, highest in the region, offers a unique view on all sides (Fig. 2). Immediately to the northwest lies a deep, populous valley with industrial plants and coal mines; at a distance lies the Krusné hory (Erzgebirge) mountain chain. Many small isolated mountains and hills of volcanic origin can be seen to the south and north. Southeastward, there is an open view of the flat plain that extends from the Labe (Elbe) River toward the Bohemia capital, Prague. One of the first notes about the unique site for observations at the mountaintop was made by Balbin in his work *Miscellanea Historica Regni Bohemica* (1679). While ascending the mountain, he was attracted by special cloud forms in that region, which, in his opinion, could be used for weather prediction. Among frequent visitors to the mountain's top, one can find the name of Alexander von Humboldt, who accompanied (around 1830) the king of Prussia, Friedrich Willhelm III, during the ascents. In 1900, the love of nature and the rare flora in the environment finally led members of the local mountain club (Bergverein) in Teplice (Teplitz) and the industrialist R. Czermack to the decision to build the observatory, which could serve both as a meteorological station and a tourist center.

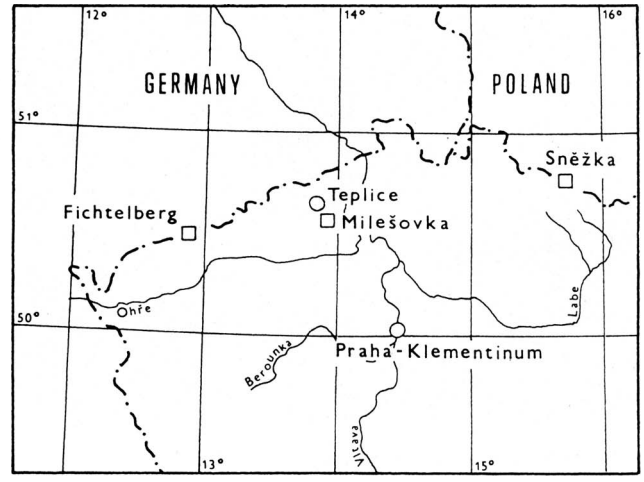

FIG. 1. Location of the mentioned meteorological stations in Central Europe: Milesovka (Donnersberg), Snezka (Schneekoppe), Fichtelberg, Praha-Klementinum, Teplice.

Another impulse for building the observatory came from the German University in Prague, especially from the director of its Institute for Cosmic Physics and Geodynamics, R. Spitaler. These efforts were strongly

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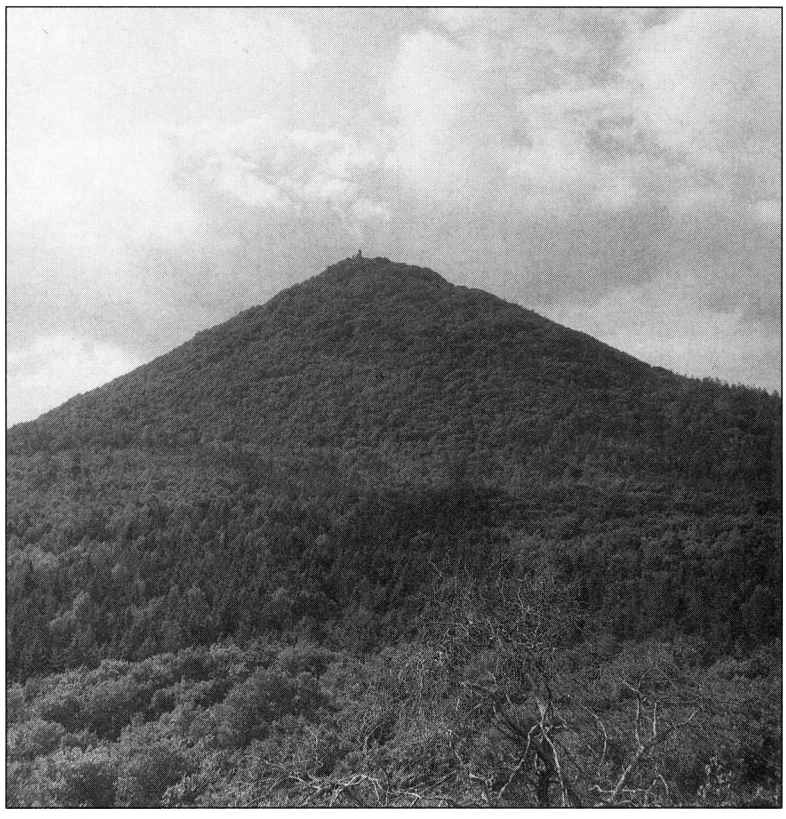

FIG. 2. Milesovka mountain with the meteorological observatory (837 m MSL, 50°33'N, 14°56'E).

supported by the director of the Zentralanstalt für Meteorologie und Geodynamik in Vienna, J. M. Pertner, who recommended its construction for the investigation of the free atmosphere physics and comparison of its data with four ground meteorological stations operating within a distance of 20 km from Milesovka at that time. The construction was completed in the middle of 1904, and in January 1905 the station started regular daily observations at 0700, 1400, and 2100 LST. The instrumentation used at that time was a dry- and wet-bulb thermometer, hair hygrometer, Assmann aspiration psychrometer, maximum–minimum thermometer, ground minimum thermometer, hygrothermograph, barometer, barograph, anemograph, Campbell–Stokes heliograph, and ombrometer.

Spitaler, who, as director of the university institute, also directed the mountain observatory, published between 1905 and 1929 several studies and yearbooks listing the measured meteorological elements, their mean values, and their relationship to atmospheric pressure and wind-vector components. In 1929, his successor, L. W. Pollak, also from the German University, included the measurements of the UV component of solar radiation and of the geomagnetic field. Pollak had a very broad interest in atmospheric physics, including several aspects of atmospheric optics such as polarization of sky light and visibility. Experience he gained while at Milesovka was probably used in the design of the famous Pollak (or Nolan–Pollak) condensation nuclei (Aitken nuclei) counter following his emigration to Ireland in 1939. His greatest achievement, though, important for practical application in meteorology, was in the development of an automatic processing (punch-card) system for meteorological data. During World War II, the observatory Milesovka was administered by the "Reichsamt für Wetterdienst," first as a civil and later as an air force observatory.

Several events during the observatory's existence affected the quality of the observations. The high quality of the observations over the period 1920–1945 is explained by the fact that only three experienced observers served during the whole period. One observer, E. Mildner, worked at the observatory almost 26 years. However, major political events in central Europe led to inhomogeneities in the Milesovka records—in the temperature series, for example. A very short interruption in January 1915 during World War I was caused by the lack of heating material (coal); some temperature data from December 1916 and January 1917 are missing. Illness prevented the observer from making two sets of observations in February 1929 during an extremely hard winter. Most of the temperature data of September 1938 are also missing. After comparing the instrument readings in the old shelter outside the observatory (6 m above the ground) and those taken in a new standard shelter on the little meadow close to the observatory, a new series of readings started on 1 September 1940 (Fig. 3). Estimates of the missing temperature records for the specific day and hour mentioned above were computed using the method of temperature pseudogradients deduced from the temperature measurements for similar situations at neighboring meteorological stations—in particular, Teplice-Sanov (232 m MSL, distance 11.5 km) and Fichtelberg (1214 m MSL, distance 75 km). Another element of the potential inhomogeneity, introduced by the use of daylight saving time in summer over the period 1940–1945, has been analyzed and corrected.

Since 1945, the observatory has been operated by

FIG. 3. Meteorological observatory Milesovka's standard instruments on the little meadow in front of it and on the observatory's tower.

the Institute of Meteorology of the Charles University in Prague. Besides standard meteorological measurements, the investigation of global radiation was introduced in 1950 and ten years of measurements were evaluated and analyzed.

The foundation of the Czechoslovak Academy of Sciences (CAS) in 1953 and the transfer of the observatory to this institution represented an expansion of the observatory's activities. The observatory, administered first by the CAS Institute of Geophysics and since 1964 by the CAS Institute of Physics of the Atmosphere, was remodeled and expanded, and the number of permanent employees increased to five. F. Rein, who was responsible for the observatory's operation, directed special measurements of the temperature profile along the mountain's northern slope within 590 and 857 m MSL (Rein 1966), and collected and evaluated the measurements of temperature, humidity, sun radiation, wind vectors, and the observations of clouds and thunderstorms for the years 1946–1955. Most of these studies are published in the Czechoslovak journal *Meteorologické zprávy* during the years 1955–1957. The complete list of articles related to the observatory Milesovka and its operation until 1952 was published by O. Menzl (1952), who worked at the observatory during World War II. Since 1956, the CAS Institute of Physics of the Atmosphere has regularly published yearbooks summarizing all of the observatory's climatological measurements and observations, including values of temperature, humidity, and wind extracted from recording instrument charts.

The yearly temperature means during the time period 1905–1990 for the mountain observatory and two ground stations, Teplice-Sanov and Praha-Klementinum (Fig. 4), are very interesting. The first is an old station 11.5 km from the mountain observatory, and the second is the oldest meteorological station in central Europe, where systematic, meteorological observations started in 1775. The temperature curve at all three stations is very similar; however, some peculiarities can be observed by more detailed evaluation (Stekl 1992). The mean monthly temperature differences between Milesovka and Teplice or Prague show some similarity from March to September, with larger variability during the winter months. From the comparison of the two 35-yr sets of temperature measurements at Milesovka, it is evident that, on average, temperatures over the period 1946–1980 were higher than the period 1905–1939. The average difference was 0.30°C for the months March to August and 0.28°C for May to July.

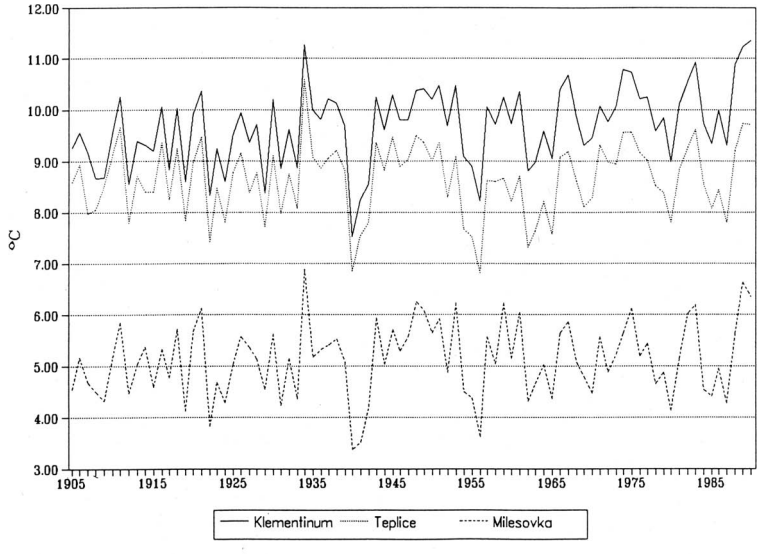

FIG. 4. The yearly temperature means plotted from the measurements performed on Milesovka and at two ground reference stations, Praha-Klementinum and Teplice, during the years 1905–1990.

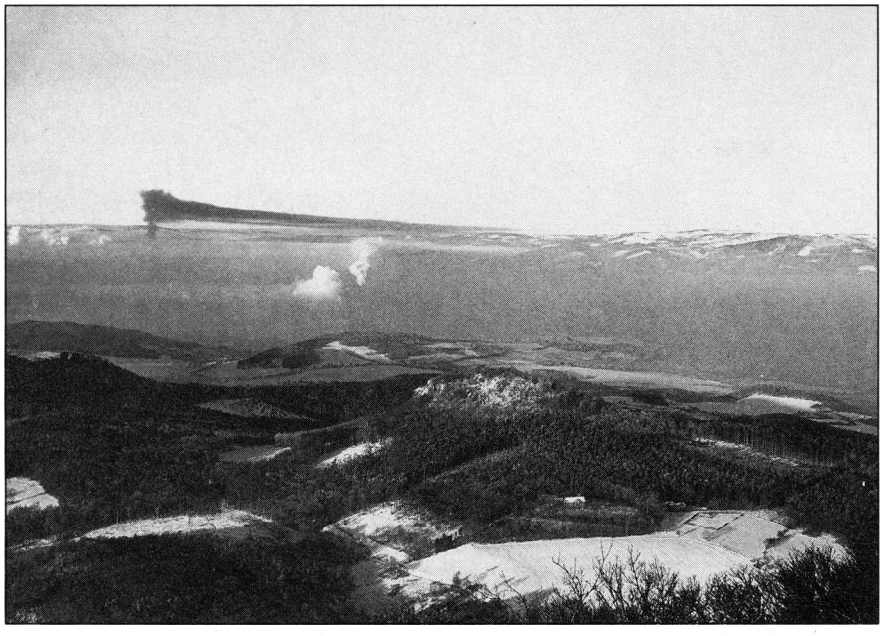

FIG. 5. Haze layer formed over the highly industrialized valley between Milesovka and Krusné hory (Erzgebirge mountains—along the frontier between Germany and Bohemia in Fig. 1). Clearly seen are the stack plumes penetrating the hazy temperature inversion layer.

These may be due, at least in part, to major environmental changes wrought by industrialization and coal strip mining in the vicinity of the mountain observatory during and after World War II. A program was instituted to assess the impact of this change, consisting of special observations and photographs of haze and fog layers as they evolved across the industrial regions. These were taken at selected times and the data were analyzed according to airmass stability (Fig. 5). A considerable boost to the effort to control the environment in the valley and Krusné hory was given in 1967 by the foundation of an observatory with an 80-m-high instrumented meteorological mast, administered by the Institute of Physics of the Atmosphere and closely related to the observatory at Milesovka (e.g., Pretel 1988). The mast is located in the center of the most polluted region, where the concentration of SO_2 exceeds 100 μg m^{-3} and the dry deposition amounts to 254 tons km^{-2} in a year.

The Milesovka observational program goes well beyond that of a simple climate observatory. The German name for the observatory, "Donnersberg," reveals that the observatory is frequently hit by the lightning. It was occasionally recorded that more than five lightning strikes occurred at the observatory during 15 min of intense thunderstorm activity. Besides lightning, systematic measurements of icing on a cylinder placed on a balance were performed there during a winter period. In the winter, the top of the mountain is covered by cloud, fog, or haze. In mean, 20 days with fog are recorded during winter months. The shape and isolated location of the mountain also explains why during two-thirds of the days in a year, the recorded wind speed is higher than 11 m s^{-1} and in one-third, higher than 18 m s^{-1}. For several years (including the International Geophysical Year), samples of rain, snowfall, and accreted ice were collected for chemical analyses.

Future plans for the Milesovka observatory are to expand its participation in cooperative, international atmospheric chemistry and air pollution studies. The climatological records from 1905 to 1989 are available to the international scientific community for scholarly research and also for cooperative projects with other institutions. They, along with relevant metadata, can be obtained on diskettes by writing to J. Stekl at the Institute of Physics of the Atmosphere, CAS, Bocni II/1401, Praha 4-Sporilov, Czech Republic (FAX: 42-2-763745).

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