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Marek Nowosad, Mateusz Dobek,
Adam Kieliszek, Krzysztof Siwek

Meteorology and Climatology Department
Maria Curie-Skłodowska University
Al. Kraśnicka 2cd, 20–017 Lublin, Poland
marek.nowosad@umcs.pl

SOME REMARKS ON THE HIGHEST WIND SPEED VALUES IN LUBLIN

Abstract: This paper presents and analysis of the highest wind speed values recorded at the Meteorological Observatory of the Maria Curie-Skłodowska University in Lublin. The study uses values recorded data (3 times a day) for the period 1981–2005. During the 25 years of the study period there were 19 occasions of wind speed ≥ 10 m·s^{-1} and 14 cases of winds gusting at or over 20 m·s^{-1}. Both kinds of situation were noticed most often in January and did not occur in May, June, July or August.

Key words: gust of wind, wind speed, Lublin

Introduction

Reports from July 1931 tell us about the catastrophic damage wreaked by very high winds in the city of Lublin and the surrounding areas[1] (Trąba powietrzna… 1931; Wieczór… 1931). A number of people were killed, dozens of trees uprooted (some with diameters of over 70 cm), and over 30 freight railcars were overturned. A detailed study of this tornado was carried out by Gumiński (1936). These information makes clear, that occurrence of the large speeds of wind in Lublin region took place in history.

[1] One of the photographs showing results of this tornado, was published in Lublin (*Lublin in Records*) p. 245, Wydawnictwo Lubelskie 1976.

Short review of literature

Analyses of wind speed and direction have been carried out by several researchers. Gumiński (1952) used data from 8 meteorological stations located in the central and eastern parts of Poland, while Zinkiewicz and Warakomski (1959) focused specifically on data from Lublin stations. Several articles and atlases provide information on wind characteristics in the Lublin region (Wierzbicki 1968; Wierzbicki, Bartkowski 1970; Wiszniewski 1973; Zinkiewicz, Zinkiewicz 1975; Lorenc 1996). The mean wind speed over the Lublin Region in the period 1971–2000 exceeded 3.5 $m \cdot s^{-1}$ (Lorenc 2005).

Piasecki (1952) analysed data from 60 stations throughout Poland during the period 1928–1938 with a view to examining maximum wind speeds, and noted speeds of 15 $m \cdot s^{-1}$ in Lublin and 17 $m \cdot s^{-1}$ in both Chełm and Tomaszów Lubelski. Zinkiewicz and Warakomski (1959) noted that during the period 1952–1956 there were 40 occasions on which winds reached speeds of higher than 20 $m \cdot s^{-1}$. Wind data from Lublin meteorological stations provided the basis for an analysis of variability of wind direction (Warakomski 1984, 1991 and 1992).

Data

This paper will provide a description of the approximate range of occurrence of the highest wind speed values on the basis of results of 3 times a day observations in the Meteorological UMCS Observatory in Lublin on Plac Litewski in the city centre. The anemometer is placed about 24.5 m above ground level (about 4.5 m above the roof level of the observation tower – Fig. 1).

Measurements of wind speed and wind direction have been recorded since 1951. Wild's wind anemovane was used between 1951–1975 and improved anemometers were subsequently used in the following years. In our opinion the comparison of the results obtained using Wild's wind vane and more precise anemometers is very difficult, especially with regard to maximum values of wind speeds. Thus at the outset we decided to limit the study period to 1976–2005. Out of the whole 30-year study period we found that more than 47% of situations with wind speeds ≥ 10 $m \cdot s^{-1}$ and more than 75% of situations with wind gusts ≥ 20 $m \cdot s^{-1}$ occurred during the 4-year period 1976–1979. This distribution of the frequency is difficult to explain. Finally, the study period was reduced to 25 years 1981–2005, in case the wind data were not homogeneous.

Fig. 1 The anemometers at the Maria Curie-Skłodowska University Meteorological Observatory in Lublin (photo by A.F. Gluza)

Results

The average wind speed during the years 1981–2005 was 2.6 $m \cdot s^{-1}$. This is a little less than the value 2.9 $m \cdot s^{-1}$ calculated for the period 1952–1956 for the UMCS station (Zinkiewicz, Warakomski 1959). The highest mean speed that obtained from the speed values recorded at noon (3.2 $m \cdot s^{-1}$), while the lowest mean was from the evening values (2.3 $m \cdot s^{-1}$).

Wind speeds of 10 $m \cdot s^{-1}$ and higher were seldom noted – there were only 19 of them throughout the 25-year period, amounting to only about 0.07% of cases (Fig. 2). Of these, the wind speed exceeded 10 $m \cdot s^{-1}$ on only 4 occasions, while in the remaining 15 observations the speed was precisely 10

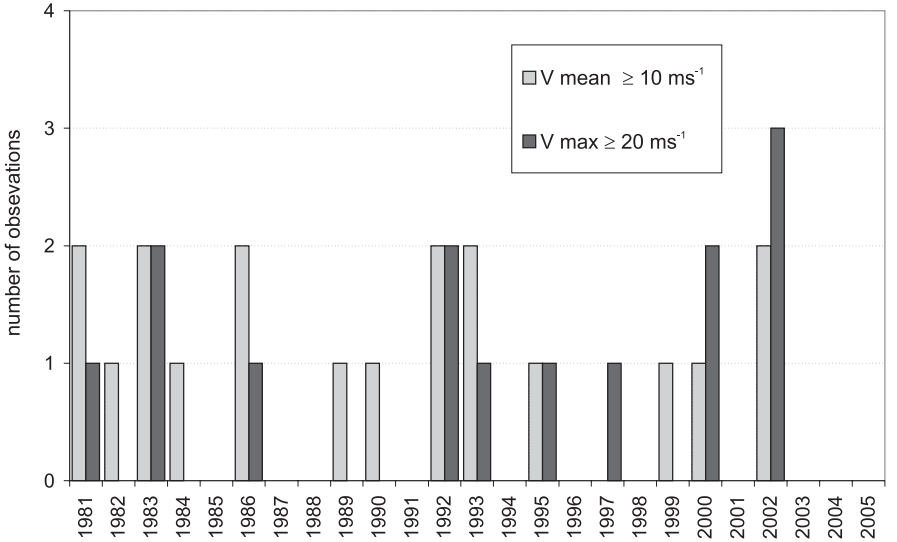

Fig. 2 Occasions on which wind speeds in Lublin reached 10 ms^{-1} or more and the gusts of wind reached 20 ms^{-1}

m·s^{-1}. Within these 19 observations, 10 were recorded in January (10). In the period from 16th April to 5th September no wind speeds of ≥ 10 m·s^{-1} were noted in the recordings at the observatory. The highest wind speed – 12 m·s^{-1} – occurred 3 times: on 1st January 1981, 2nd November 1981 (both during evening observations) and on 20th January 1986 (during the noon observation). The daily average wind speed reached 8.0 m·s^{-1} on only 7 occasions during the 25-year period (6 of them during the month of January). The daily average wind speed exceeded 10 m·s^{-1} only once (on 20th January 1986 – 10.3 m·s^{-1}).

Wind gust speeds of ≥ 20 m·s^{-1} were noted on 14 occasions in the study period. Eight of these cases were noted at noon, 5 in the evening, and only 1 case during the morning observations. Seven of these 14 cases took place in January. No gusts of wind ≥ 20 m·s^{-1} were noted between 12th April and 27th October.

The strongest wind gust in Lublin-Radawiec reached a speed of 31 m·s^{-1} on 14th March 1994 (Lorenc 2005). The maximum wind speed recorded at

the UMCS Meteorological Observatory (located in the center of Lublin) on this day reached only 10 $m \cdot s^{-1}$.[2]

Discussion and conclusions

In our opinion, the most accurate and effective analysis of the high wind speed values needs data from a lot of meteorological stations, with only very short intervals between the measurement times. Just three wind measurements per day are insufficient for a full analysis of extreme events. Also problematic is the number of meteorological stations and their locations. The network of meteorological stations in the Lublin region is too sparse to provide the necessary information with which we can draw accurate conclusions concerning high wind speeds. There were no meteorological stations in the tornado way in July 1931, when the tornado struck (Gumiński 1936). On the other hand, some accidents have been caused near Lublin by very high speed winds, one example being the death of several members of the Świdnik volleyball team when the bough of the tree hit in front of their bus on the road from Warsaw to Lublin near village of Bogucin in the early morning of October 17th 2004 (Inne wydarzenia 2004). The highest wind speed noted at the UMCS Meteorological Observatory was only 4 $m \cdot s^{-1}$ on the evening of 16th October and 5 $m \cdot s^{-1}$ on the following morning.

On the basis of observations made 3 times a day, we can state that wind speeds of 10 $m \cdot s^{-1}$ and higher in Lublin occurred only in about 0.07% cases during the study period. On the other hand the extremely windy situations can bring tragic aftermaths. The best known occurrence of a tornado in Poland was in Lublin on 20th July 1931.

The highest frequency of the occurrence of wind speeds of ≥ 10 $m \cdot s^{-1}$ was in January, as was the highest frequency of gusts of wind of ≥ 20 $m \cdot s^{-1}$. The months of May, June, July and August in Lublin during the study period did not see wind speeds of ≥ 10 $m \cdot s^{-1}$ or gusts of wind ≥ 20 $m \cdot s^{-1}$.

Further investigations into maximum values of wind speed in Lublin and the surrounding area should take into account both the results of measurements noted by automatic stations as well as the interpretation of satellite images.

[2] It is difficult to compare the maximum gust of wind in Lublin-Radawiec with the maximum of measurements 3 times a day in the UMCS Observatory in Lublin as Lorenc did not state how much data she used to reach her conclusions.

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