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Conference on European Tornadoes and Severe Storms

Long-term variability of thunderstorms and thunderstorm precipitation occurrence in Cracow in the period 1896-1995

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Due to Poland location in a transitional climate and the prevalence of lowland areas Poland is characterised by large weather variability both during the yearly and year-to-year course. Additionally the climate is modified by the Baltic Sea at the north and the mountains at the south. Therefore the thunderstorms in Poland are not very frequent events (from few days with thunderstorms a year at the north to more that 30 at the south), neither are they very dangerous.

The main aim of presented studies is to elaborate the long-term variability of thunderstorms and thunderstorm precipitation occurrence in Cracow and to attempt to explain the causes of such variability.

Cracow lies in southern Poland, in the Vistula river valley, between Jura Highland at the north and Carpathians at the south. The meteorological station is located closed to the centre of old town. Because of localisation the meteorological observations show the trends formed by natural processes and by the urbanisation.

The analysis is based on daily meteorological observations from the Climatological Station of the Jagiellonian University in Cracow, from the period 1896-1995. The data used in the analysis were:

- number of days with thunderstorm,
- thunderstorm precipitation,
- daily sums of precipitation for days with thunderstorm,
- synoptic situations from Calendar of Synoptic Situation in the upper Vistula River Basin according to T. Niedwied (1998), from the period 1896-1995.

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On that basis it was stated that during the analysed 100 years there were few periods with distinctive increases of number of days with thunderstorm. The increase of annual number of days with thunderstorm and the number of days with thunderstorm in the cold half-year (Oct.-Mar.) was also noticed. For most people thunderstorm means the thunder, strong wind and rainfall. However, it turned out that in Cracow only about 12% of thunderstorm is accompanied by the precipitation, only 5% by hail. Daily sums of precipitation for days with thunderstorm were also used in the analysis. It was found out that in 67% it did not exceeded 10 mm, only in 4% it was higher than 30 mm. The highest precipitation that kind was noticed on 9th Sep. 1963 – 99 mm.

The relation between the thunderstorm and synoptic situation was also studied. It was stated that the largest amount of thunderstorm occur during cyclonic situations (69%) and the advection of air masses from the west and north-west. The smallest number of thunderstorm was observed during the central anticyclonic situation (1%).