Joseph Stepling and windstorms in Europe from 17-19 February 1756

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Being referred to as the "astronomus regius", Joseph Stepling is one of the most prominent personalities in the history of natural science in the Czech Lands of the 18th century. He was born in Regensburg to a married couple of mixed nationalities on 29 June 1716. His father, secretary of imperial legation, came from Westphalia and his mother was born Czech. As the father died soon after the son had been born, the mother and the little Joseph moved to Prague. The boy was educated at Jezuitical schools and admitted to the order when reaching 18 years of age. Jezuits send him to study mathematics (in which he showed a remarkable genius) and theology. He was ordained in 1745 and seven years later appointed a director of mathematic and physical studies at the Prague University. The office and the chair of professor were left to him even after the Jezuitical order had been abolished in 1773.

Professor Stepling gained recognition for the establishment of an astronomical observatory in the Prague Klementinum. In 1751 he became its first director and held the post until his death on 11 July 1778. As an astronomer at royal service he was lively interested in mathematics, physics and meteorology. His name connects with the first systematic meteorological measurements and observations in Prague, which were not the first instrumental observations in Bohemia – as we know today (those connect with the personality of J.C. Rost who carried out daily measurements of air temperature and pressure, making also records on wind direction and accompanying weather in northern Bohemia for a period of four months in 1720). Nevertheless, they were the first systematic measurements of atmospheric pressure and temperature carried out and recorded in the course of a whole calendar year (1752), which were added records on the measurement of atmospheric precipitation, oldest in the Czech Lands (Pelzel 1782, Munzar 2000, Kr_ka-_amaj 2001).

Results of Stepling's meteorological observations in 1752 were presented to the expert public at a lecture in May 1753 and a short time later they were published in Latin as an excerpt in a study of extensive title: "Barometrical, thermometering and raingauging observations carried out in the year 1752 by Joseph Stepling, Jezuitical priest, director of the imperial-royal faculty of arts in Prague, presented at a philosophical congregation on the tenth day before the June calends of the year 1753"(Stepling 1753).

A considerable part of the discourse is devoted to Stepling's views about the usefulness and general benefit of the meteorological observations and the reasons of low attention given to them such as labouriousness of every-day measurements, with the benefit not being of instant nature but should rather be enjoyed only by the following generations. Main results are added a brief description of the used instrumentation. The study presents only the monthly extremes or aggregates (primary daily data used by him for the compilation were unfortunately lost).

Atmospheric pressure data are presented as the monthly maxima and minima (with a note about accompanying weather) and their differences. The mercury barometer had the "Parisian" scale. Similarly, air temperature is presented only as the monthly maxima and minima. The mercury thermometer was made by Stepling himself and hung in front of a window with a northern aspect. Unlike in thermometers used today, its scale was "reversed" (with water boiling point marked as zero) and divided into 150 parts, which indicates that the ciphers were growing with the decreasing temperature. The monthly precipitation totals are

published only for eleven months (from February to December 1752) with the total precipitation for January being presented as an estimate, allegedly due to an unspecified failure of the raingauge whose placement or type are unknown.

The windstorm of 17-19 February 1756 in Prague

Research workers dealing so far with the work of Joseph Stepling have been overlooking results of another published meteorological record from the beginning of the year 1756, which was briefly brought to attention by the author of this paper five years ago (Munzar 1999). The article is again written in the language of the then science – Latin – and its title reads as follows (free translation): "Meteorological measurements from 15 to 19 February 1756, when an unusual windstorm was observed to rage, carried out by using a simple barometer and a Réaumur mercury thermometer, together with comments" (Stepling 1763). It consists of three parts: a table of the results of measurements and observations, a verbal description of the weather course in Prague (with data on the regional extent of the windstorm), and concluding notes about the likely causes to the occurrence of the extreme meteorological phenomenon.

The introductory table has 5 columns : day and hour of the observation, atmospheric pressure, wind direction, wind force and "sky status", i.e. weather. Wind records are just four, presented as two pairs of data on its direction and force. Direction is specified by the until present used marking (SW, SSW). Wind force is indicated altogether by four ciphers – 2, 3, 4 and 3_. Although there is no explanation of the scale in the work itself, it seems that a consideration of Stepling having used a scale of four parts constructed in 1723 by the English physician and physicist James Jurin (1684-1750), which was adopted also by the Mannheim Meteorological Society (Societas meteorologica Palatina) in 1780, cannot be cast any doubt upon.

The introductory table is followed by a verbal description of the weather course in Prague from 15 to 19 February 1756: "From 9 o'clock on 15 February, atmospheric pressure was steadily falling until 4 o'clock in the morning of 19 February. A total drop was 1 inch and a half line of the Parisian scale (= 37.5 hPa). On 18 February, mercury fell by nearly 6 lines (= 18 hPa) from 4 o' clock in the morning to the evening. Such a rapid decrease is an advance signal of the coming windstorm. The wind arrived approximately from the South-West at about a midnight, it was warm and clouds were driven by it at a high velocity, full moon glinting among them now and then. Wind flow within the upper layers of the atmosphere was permanent and its speed and strength took down many chimneys, carrying them whole away. After the wind had arisen, mercury in the barometer (of pressure) continued to fall until 4 o' clock on 19 February when the force of the wind and its worst raging were culminating. (In the attached table, there is a record to date about wind direction being "approximately that of SW" and wind force of Degree 4). Then the air pressure began to rise again and the wind was gradually calming down."

The windstorm of 17-19 February 1756 in Western Europe

Stepling's description of the windstorm in Prague ends with a statement that he found out from records acquired both from the published sources and from his own observations, that the windstorm affected extensive regions in Germany and Belgium, too. On the other hand, there are no records about its occurrence in Spain, France, England and Italy. He further found out from the supplied information that many localities where the wind started to rage at the night of 18 February recorded an "earth shaking" (earthquake) in the morning of the same day. According to prof. Stepling, the sudden fall of atmospheric pressure was recorded not only in Prague but also in Regensburg; he added, however, that there were doubtlessly also other localities in Germany where it was observed.

The author of this paper has up to now succeeded in obtaining historical results of atmospheric pressure measurements only from the northern Germany (Greifswald) where regular weather observations were made by Andreas Mayer (1716-1782), professor at the local university. These records indicate that from 11.00 PM on 15 February to 08.00 AM on 19 February, the level of air pressure fell by nearly 8/10 inches, i.e. ca. 28.4 hPa. The original wind direction and force of SW and 2 changed into W and 3, respectively, turning to the North-East during the day on 18 February and keeping this direction and force 3 until 19 February 08.00 o' clock AM.

As to concrete regions, according to the information from the Geographical Archives in Leipzig, the historical chronicles contain records about a windstorm occurring from 18-19 February 1756 e.g. in the surroundings of Heidelberg, Bonn, in Thuringia, Lower Bavaria and in Saxony. A region with the occurrence of the windstorm closest to Prague was Upper Lusatia (Zittau). As far as the Stepling's reference to the earthquake that preceded the windstorm at some places is concerned, a record from the town of Aachen has a concrete entry that a tremendous wind, snow and rain arrived after an earthquake that occurred under dead calm and fog with drizzling on 18 February at 8.00 AM. Another source of information is an occasional print of 1756, which among other things describes the onset and course of the windstorm in Stuttgart at the night of 18-19 February in more details (Hellmann 1883, Erschröcklich- und Wahrhaftige Erzehlung … 1756).

The windstorm was documented to have occurred also outside the German territory – in central France, in the town of Bourges where an "ouragan" (i.e. wind of Beaufort scale degree 12) damaged among other things a church vaulting and a big palace gable. And in Switzerland, in the kanton of Zurich a fresh gale was blowing both in the town and in its surroundings, throwing down roofing tiles and even whole chimneys. In the village of Bauma it torn entire new roofs into pieces, in Eglisau blowing down two chimneys and even uncovering whole roofs.

Conclusion

In notes concluding his treatise about the windstorm of February 1756 Stepling briefly contemplates about the reasons, imputing the windstorm occurrence largely to the variable elasticity of atmosphere. In this connection he refers only ones to another scientist, the experienced Halesius, i.e. English physicist and physiologist Stephen Hales (1677-1761), one of constructors of the linear thermometer scale and author of the first measurements made with the use of soil thermometer.

As compared with the "climatological" character of Stepling's weather study of 1752, his article about the windstorm that occurred four years later represents a clear step forward – an attempt at measuring the changes of meteorological characteristics before and after the occurrence of a concrete atmospheric phenomenon for several days. Together with the serious effort to trace the windstorm development in the region, the publication by prof. Stepling, which arrived about 20 years earlier than the initiative of the Mannheim Meteorological Society, can be considered one of pebbles which some time later constituted the mosaic of synoptical meteorology.

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