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CLIMATE IN CENTRAL EUROPE  
IN THE LAST 1000 YEARS

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SOLAR ACTIVITY, AURORAE AND CLIMATE IN  
CENTRAL EUROPE IN THE LAST 1000 YEARS

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*Резюме: Солнечная активность, полярные сияния и климат средней Европы в последнем тысячелетии. На основании подготовленного всемирного каталога северных полярных сияний диапазона широт  $<55^\circ$  авторы обсуждали задачу векового колебания солнечной активности с начала второго тысячелетия до конца XIX. века. Первая часть содержит 91 полярных сияний собранных из чешских литературных источников до сих пор невоходящих в каталоги. Вторая главная часть содержит каталог 3 878 полярных сияний и обработку этого каталога с точки зрения колебаний векового появления сияний. Обнаруженные результаты совпадают с колебаниями числа солнечных пятен наблюдаемых невооруженным глазом и негативной кривой изотопа углерода C 14 в годовых кольцах старых деревьев по Стуйверу. В третьей части обсуждаются обнаруженные результаты связи с колебаниями климата в средней Европе.*

*Summary: The authors have attempted to elucidate a problem which has widely been discussed in recent years, i. e. the fluctuation of the solar activity in the past centuries, i. e. from the year 1 000 to the end of the 19th century; for this purpose, they have used a catalogue of auroral observations compiled from all the catalogues (or their corrections) hitherto published, sets of observations and their own supplement of hitherto uncatalogized or unknown observations of the aurorae, extracted from the most various historical sources found in the Czech Lands. The supplement contains 91 aurorae from Bohemia and is presented in Part I. This catalogue gives the ordinal number of the aurora, the date, the description in the original language and the English translation. The world catalogue and its elaboration which regard to long-term variations of aurorae is in Part II, and contains 3 878 northern aurorae from latitudes  $<55^\circ\text{N}$ . Part III deals with the relation between the fluctuations of the secular solar activity, in terms of occurrence of aurorae, and the fluctuations of the climate, with particular regard to Central Europe and Bohemia.*

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## 1. INTRODUCTION

The question of the nature of the variability of solar activity in the period before sunspot began to be observed systematically by telescope (prior to the year 1705 [1]) remains open and, in recent years, it has again become highly topical after Eddy's studies [2] were published. Eddy came to the conclusion that, in the 2nd half of the 17th century, solar activity failed to exert its usual influence to cycle. Eddy associates this phenomenon with the so-called minor glacial period, in northwestern Europe roughly at the same time.

It seems that the existence of long intervals (around the year 1310, 1450 and 1645 to 1710) with very low solar activity is indubitable; evidence of this has been furnished by the results obtained from a series of mutually independent methods (evidence of large sunspots observed by the naked eye [3], aurorae [4], C 14 content in the year-rings of trees [5] and the concentrations of argon 37 and 39 produced by cosmic radiation in meteorites [6]).

It is becoming increasingly evident that the climate in the separate regions of the Earth fluctuates and varies; the fluctuations over several centuries are very distinct, and the changes in climate, which can change large regions of the Earth covered with vegetation into desert, are very large. There is a large number of factors which may affect the fluctuations and changes of climate. They are of natural and human origin. One of the natural factors is doubtlessly the variability of solar activity which is capable of affecting with its variable emissions the Earth's atmosphere, stratosphere directly and, intermediately also the troposphere [7, 8].

One does not have to emphasize the practical importance of studying the fluctuations of solar activity and climate in the course of the past centuries either. If periodic or quasiperiodic changes and relations were discovered, the facts about these changes and fluctuations could be extrapolated in terms of prognoses into the future.

## 2. THE PURPOSE OF THIS STUDY

The authors intended to, firstly, elucidate the question of the fluctuations of solar activity over the past centuries, frequently discussed in recent years, i. e. between the year 1 000 and the present using a catalogue of auroral observations which was compiled from all the catalogues hitherto published (e. g. [9-14]) and their own supplement of hitherto unpublished descriptions of aurorae extracted from the most various historical sources found in the Czech Lands. The supplement contains 91 aurorae. The complete catalogue, including the supplements, which contains 3 878 aurorae, was prepared so that periods of high solar activity (with frequent aurorae) and of low solar activity (with a small number of aurorae) were quite distinct. At the time of high solar activity, characterized by mighty flares on the Sun, the Earth's magnetosphere is perturbed by solar emissions of plasma and the corpuscles penetrate into the Earth's atmosphere (occurrence of aurorae), not only in the polar regions, but also in the moderate geographical (more accurately, geomagnetic) latitudes. At the time of low solar activity (small flares) aurorae occur only at high polar latitudes but quite frequently. The initial catalogue was compiled of the aurorae observed at latitudes of up to  $55^\circ$ , in order to characterize the degree of solar activity.

The second task was to throw light on the question of the relations found

between the secular extremes in climate (especially as regards precipitation) and the secular extremes in solar activity over the last 150 years, as well as in the earlier centuries, even before regular meteorological observations were made. The question of the climatic effect of very low solar activity in the years 1640–1710 (the so-called Maunder minimum) on the climate in Bohemia at the time of the minor glacial period in northwestern Europe [2] was studied separately. Attention has also been devoted to the so-called climatic optimum of the 11th and 12th centuries which, as it seems, was caused by an exceptionally high solar activity of longer duration.

Finally, an attempt was made to reconstruct the actual level of fluctuation of aurorae between the years 1000 and 1520 (before the discovery and use of printing) using historical records of aurorae of that time.

The study has been divided into three parts: Part I contains newly discovered descriptions of auroral observations from Czech sources, Part II contains the comprehensive catalogue of occurrence of aurorae and their long-term fluctuations, Part III is concentrated on the relation between the secular solar activity in terms of occurrence of aurorae and the fluctuation of the climate, with particular regard to Central Europe.

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## PART I

## UNKNOWN OBSERVATIONS OF AURORAE FROM BOHEMIA

I-1. A FURTHER CONTRIBUTION TO THE CATALOGUE OF AURORAL  
OBSERVATIONS FROM CZECH SOURCES

By analysing Seydl's catalogue of aurorae [10], we arrived at the conclusion that the number of 402 aurorae published in the catalogue, especially those observed in the 2nd half of 16th and in the 17th century, is relatively small and clearly does not correspond to reality. We, therefore, attempted to add to this catalogue of 402 aurorae. It should be emphasized that not even after this investigation and accumulation of 91 cases, is the catalogue complete, because the sources, of which we assume that they could contain reports on aurorae, especially of the 16th and 17th centuries, have not been exhausted by far.



Fig. 1. Representation of an aurora on the woodcut in the report "Very strange and terrible sights and miracles" (*Welmi diwna a y hrozna widienij a zázracy*) published by Melantrich of Aventyn (Prague) in 1562. It was then quite usual to depict an aurora as soldiers fighting with spears and running blood. This picture refers to the aurora of the night from march 13th to 14th, 1562 (according to the Julian Calendar).

Our supplementary catalogue gives the literal text in the original language, and its English translation in the case of Czech version, to enable the reader to create his own idea of the course the observed phenomenon took, as well as about the choice of words of the language then used to describe, more or less realistically, the phenomenon involved. It is also possible to judge whether the



Fig. 2. Aurora on a woodcut presented in exceptionally realistic form in the report "Very strange and terrible sights and miracles" (*Welmi diwnaa y hrozná wídienij a zázracy*), published by Melantrych of Aventyn (Prague) in 1562. Here the aurora is represented in sober form; it had the shape of ray-like drapes running as far as the horizon. The cloudy formations at the upper margin of the picture probably do not belong to the aurora, but are clouds. The picture refers to the aurora of the night from March 13th to 14th, 1562 (according to the Julian Calendar).

phenomenon was in fact an aurora or another event, e. g. the flight of bolids or some atmospherical optical phenomenon. The descriptions of these quite different phenomena are usually similar in older records. Originally, a much larger number of descriptions of events was accumulated as candidates of auroral

phenomena, and several analyses were made to eliminate, as far as possible, uncertain events and "false" aurorae.

A number of records are being published for the first time. These records were mostly discovered in the memoir originals of manuscripts. Records of aurorae, which were already included in other catalogues, but observed at other locations, have been included in the presented list exceptionally. The different records from several localities is certain to aid the complex analysis of the phenomenon and its extent.

The authors of the records come from the most varied social layers. In the written records made on the eve in the course of the Thirty Years War, one can nearly always identify the effort to give the records a prognostic significance related to the contemporaneous political situation. The whole record of the phenomenon was sometimes subject to this effort (marching soldiers, battles, armorial animals, etc.). We are thus faced with the question if the observed events were described really faithfully and to what extent they were influenced by phantasy. The answer is in the analysis of the source as a whole. One can claim, drawing on the description of other natural phenomena, e. g. meteorological, that the authors were exceptionally experienced and acute observers. If one ignores the superstitious tint, tributary to their time, one is justified in assuming that the descriptions were realistic.

In identifying a night in our catalogue we only give the first date. The calendar reform was introduced in the Czech Lands with a delay, i. e. on January 6th, 1584, and exceptionally later in some regions. The dates in the Julian calendar prior to 1584 have not been reduced to the new Gregorian calendar.

The observations of the aurorae are number in the temporal sequence of our catalogue, the date used is given, up to 1584 according to the old Julian calendar, later according to the new Gregorian calendar.

The texts published in the various references were not checked in most cases against archival material, nor was it possible to do so. Sometimes errors were discovered and these were corrected in the text. These errors mostly related to dating and stemmed from the old custom of relating the dating to a signified event in the life of one or another saint, or because there were several saints of the same name (e. g. Anthony, Gregory). In these cases, the text preceding and following the report itself had to be taken into account in calculating the date.

The names used to identify aurora, not always mentioned, varied. From the most usual "chasma" to the pretty Czech name "světlice" (flare). However, although these names were used, this does not mean an aurora was involved, as usually followed from the following description. Sometimes the record of the phenomenon is vague, because the observer did not always differentiate between aurora and the flaring of a large meteor (fireball) and a distant intensive night storm (lightning storm), and the glare of a distant fire, or some types of atmospheric optical phenomena. In some cases, in which there was suspicion

that an aurora was not involved, the observation was not included in our catalogue. Even so, however, a very small number of the listed phenomena need not have been aurorae, and some of the aurorae, which were described unsuitably, were omitted.

The authors wish to thank Dr. Z. Horský of the Astronomical Institute in Prague for his exceptional help and interest.

A note added in proofs (July 1988): During the last years the present part of Catalogue of polar aurorae from Bohemia has been supplemented. The supplement will be published later.

## I-2. CATALOGUE

### Julian calendar up to the year 1584

Number year month day

1. 1416 IX 26 Kříž červený s hadem a Mečem krvavým v prostřed nebe [15].  
A red cross with a snake and bloody sword in the middle of the sky [15].
2. 1529 Téhož Léta widjno bylo nad Prahou Nebe Otewřenéné, a w něm Lidé zbrognj a ohniwj, spolu se potegkagjcy [16].  
That same summer an open sky was seen over Prague and on its armed and firely people, fighting each other [16].
3. 1548 III 1 Lew a Orel se potýkat na Nebi widjni [15].  
The lion and eagle were seen to be fighting in the sky [15].
4. 1554 II 15 Dwa krvawý Kříže na Obloze nebeské widjni byli [15].  
Two bloody crosses were seen in the sky [15].
5. 1570 Roku 1570 spatřeny byly metly nad Prahou a přesně obdužné kopí na západ Slunce, tak světlé jako blesk Měsíce a tak trvaly po půl hodiny [17].  
In 1570, birch rods were seen over Prague, crossed by a lengthly spear to the west of the Sun as bright as the flash of the Moon, lasting half an hour [17].



6. 1571 VIII 26 1571. Okolo třetí hodiny na noc 26. srpna předcházející nad Prahou spatřené byly metly a přes ně obdlaužné kopí na západ Slunce tak světle jako blesk Měsíce, kteréžto vidění za půl hodiny vymizelo [18].

Around the third hour of the night of August 26, birch rods crossed by a lengthy spear were seen to the west of the Sun as bright as the flash of the Moon, disappearing after half an hour [18].

7. 1572 I 17 1572 v noci, která osmnáctý den ledna měsíce předcházela, na mnoha místech v Čechách od hodiny osmé až do hodiny desáté strašlivé vidění na obloze nebeské ukázalo se: neboť mezi dlauhými bílými čarami neb slaupami počernalý plamen ohnivý od východu Slunce k straně půlnoční se vznášel i také se ukázal velký oblak krvavý a mnoho jasně hořících sem tam se zmítajících plamenův, kteří tu noc velice osvětlovali a lid na to se dívající velmi děsili [18].

In 1572, on the night that preceded the 18th day of the month of January, a terrifying sight appeared in many places of Bohemia in the sky between the eight and tenth hour: between long white lines or columns a blackish firey flame hovered to the north of east and also a large bloody cloud appeared as well as many brightly burning, flames, dithering to and fro which lit up the night and greatly terrified the people who watched them [18].

8. 1572 I 14 Téhož léta po ochtabu tří králů ve čtvrtek na pátek v noci byli vidíni úkazové ohniví metající sebou sem i tam [19].

That same summer, after octavo days of three kings', on the night between Thursday and Friday, firey phenomena, flung to and fro were seen [19]

9. 1572 III 3 Opět ohnivě znamení dne 3. března v noci nad Prahou i jinde v Čechách se ukázaly a mnoho nepřijemných věcí budaucích předcházely i významávaly [18].

26. srpna před-  
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Again flaming sings were observed over Prague and elsewhere in Bohemia on the night of March 3rd, preceding and predicting many future unpleasant matters [18].

1572 III 3

Téhož léta po neděli reminiscere vidíni byli slou-  
pové ohniví ten čtvrtek v noci na pátek, rozchá-  
zeli se různě a zase se v hromadu sráželi a to  
trvalo několik hodin pořád [19].

That same summer, after Reminiscere Sunday, firey columns were seen on the night between Thursday and Friday, spreading in various directions and drawing together again and this lasted for several hours [19].

10. 1572 VI (12)

Téhož léta ukázal se hrozný zázrak jasný na  
nebi, předivé sloupy, některé jasné, některé tem-  
né nad městem Prahou, ve čtvrtek na den sv.  
Antonína po šesté hodině na noc a to v měsíci  
červenci [17].

(Datum neidentifikovatelné. Antonína není  
v červenci.)

That same summer, there appeared a terrible bright phenomenon in the sky, very peculiar columns, some bright, some dark, over the city of Prague, on Thursday on St. Anthony's day, after the sixth hour in the evening to the night in the month of July [17].

(Date cannot be identified. There is no day of St. Anthony in July.)

11. 1575 II 14

14 (Februarii) v noci světlo veliké ukázalo se  
k straně půlnoční... [20]

On the 14th (of February), a great light was seen to the north at night... [20].

12. 1575 IX 28

Codicillus z Tulechova: Chasma portetosum Ao  
1575, Sept. 28, conspectum, Pragae 1575 [21].

13. 1582 IV 1

1582, 1. Aprilis v sobotu na neděli iudica okolo  
osm hodin až do dne vidíni sloupové ohniví,  
plápolající... [20]

1582, April 1st, between Saturday and iudica Sunday between the hour of eight and lasting till daytime, firey, flaming columns were observed ... [20].

14. 1582 VII 2 L. P. 1582 2. dne července měsíce na úsvitě i ráno záře na nebi hrozná, že kde se na věži nebo domy opřela. Kdo jest znenáhla rozhlídal, domníval se, že někde hoří. [22].

1582 A. D., at dawn and in the morning of the 2nd day of the month of July, a terrible glare in the sky, reflected on the tower or houses. Those who watched though there was a fire somewhere. [22].

15. 1583 IX 2 Téhož létha Pánie 1583 v pondieli po svatým Jiljí po první hodinie na noc ukázalo se znamení na nebi strašlivé a hrozné: Nejprve od pólnoci a západu až k vejchodu byli vidíni sloupové, kteří se často a z husta dielali a po stranie k západu nebe červený jako krev stálo. Potom pak přede dnem všudy po všem nebi od spodku jakoby dejm černej a popelatej vzhůru vystupoval. Vejšeji pak z toho dejma niaká jasnosť jako voheň vyskakovala, a tak všudy ze všech stran bylo jakoby všechno nebe hořelo. A tak se to zableskovalo, jakoby fochroval. A všecken i ten voheň vzhůru k jednomu místu a ode všech stran se zacházel a z toho potom velcí i malí červení a popelati a niekdy černí sloupové velcí i malí se dielali. A tak to stálo celou noc až právie do bílýho dne. A celou noc sietlo velmi bylo, jakoby když slunce má z hory vycházeti ... [24].

In 1583 A. D., on the Monday after St. Giles, after one o'clock at night, a terrible and terrifying sign appeared in the sky: First, from north and west and extending to the east, columns were seen, which frequently and in great numbers split and stood to the west of the sky, red as blood. Then, before dawn, as if black and ashy smoke rose upwards across the whole sky. Higher yet, a brightness, as if a flame, sprung from the

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smoke and the sky looked as if it were burning all over. And it flashed and flamed. And all this fire rose upwards from all sides into one place, and from there large and small red and grey and sometimes also black columns spread outwards. And this went on the whole night until the very dawn of day. An there was much light throughout the night, as if the Sun were to rise from the mountain ... [24].

## Gregorian Calendar

16. 1588 XII Téhož létha před svátky vánočními po niekoľiko noci vokazovalo se na nebi znamení: svietlost veliká a sloupy se potom z toho dielaly bílý sem i tam, rovníe jako před morem ukazovalo v ti stranu k Roudnici ... [24].  
That sam year, before Christmas, a sign was seen in the sky for several nights: great brightness from which white columns spread here and there, just as seen before the plague, in the direction of Roudnice [24].
17. 1589 VII Téhož také létha přitom času a před tím ukazovalo se znamení na nebi takový jako léta 82 před morem, též i v tu stranu ... [24].  
That same year, at the time and before, a sign appeared in the sky as in the year 82 before the plague, also in the same direction [24].
18. 1589 XI 17 Téhož létha v pátek po svatým Martinie v noci ve 2 hodinie na sobotu ukazovalo se znamení na nebi: od půl noci velmi hustí sloupové nehrubě dlouzí nepodobni k rytířskejm svícem vždycky jednák mījeli a hned zase jiní dielali. A to na mnoha místech na horu kolmo k prostředku nebe se vyskytovali. Potom pak prýčnie jakoby jiní černí dlouzí sloupové právie křížem se dielali a taky zase mizeli. A to tak trvalo až k 7 hodinie. A velmi svietlí a jasní ti sloupové byli, jakoby niekde vopodál velký voheň hořel a potom po 7 hodinie z tich sloupů dielalo se jakoby hořelo, a dejm z nich vycházel, vždy se fochrovalo vzhůru velmi často, a to trvalo do 9 hodin ... [24].  
That same year, on the Friday after St. Martin, at 2 o'clock at night on the Saturday, a sign appeared in the sky: very dense, not very long solumns, akin to knight's candles passed across the sky and others immediately following. And they occurred at many places vertically above towards the centre of the sky. And then other black long columns appeared crosswise and also

mi po niekoľko  
amení: svetlosť  
dielaly bíly sem  
ukazovalo v ti

, a sign was seen  
great brightness  
and here and there  
in the direction

před tím ukazo-  
valo léta 82 před  
dříve, a sign  
appeared 82 years be-  
fore the year  
[24].

Martinie v noci  
o se znamení na  
sloupové nehrubě  
více vždycky  
dielali. A to na  
k prostředku  
prýčnie jakoby  
křížem se dielali  
až k 7 hodinie.  
ové byli, jakoby  
šel a potom po  
jakoby hořelo,  
vychrovalo vzhů-  
hodin ... [24].  
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aturday, a sign  
not very long  
passed across  
following. And  
vertically above  
And then other  
differently and also

vanished. And this lasted until the 7th hour. And these columns were very bright as if a large fire was burning at some distance, and then after the 7th hour, these columns as if caught fire, and smoke rose from them, always rising upwards at short intervals, and this lasted until the 9th hour ... [24].

19. 1590 III 7

Téhož léta na konec masopustu kometa, hviezda vocasatá spatřována, ale ne veliká. Též potom hned při počátku postu znamení na nebi se ukázalo: sloupové velmi jasní z ty strany od Roudnice [24].

That same year, at the end of Shrovetide, a comet, a star with a tail, but not large, was observed. And after that, immediately at the beginning of Lent a sign appeared in the sky: very bright columns from the direction of Roudnice [24].

20. 1591 IX 8

Téhož léta v nedielni den památný narození blahoslavené panny Marie ukazovalo se znamení na nebi. Hned počalo po první hodinie na noc. Spatřeni byli nejprve vod východu letního a západu sloupové velicí, zhůru se dávající, velmi jasní. A tak se zdálo, jakoby niekde daleko hořelo. A potom se vždy více sloupů malejch, jasnejch po vši téměř nebi zdielalo, naposledy od půlnoci k poledni, vrchu nebe šel velikej jasnej sloup, anebo jakoby niáká cesta byla; v prostředku pak nejvýš nebe v tom sloupie se vichrovalo, jakoby se dejm hnal jeden za druhejm. Avšak skrze to předce hviezdy viděti bylo, neb té noci velmi jasno beze všech mračen bylo ... [24].  
That same year, on the Sunday commemorating the birth of the blessed Virgin Mary, a sign appeared in the sky. It began immediately after the first hour at night. First, large columns, very bright and rising upwards, were observed to spread from summer sunrise and sunset. And it seemed as if a fire were burning far away. And then always more small and bright columns

spread across the sky, lastly from north to south; a large bright column extended upward into the sky, as if marking a way. In the middle, highest in the sky, as if a gale were blowing in the column and one smoke plume followed another. But the stars could nevertheless be seen through this, because the night was very bright and cloudless ... [24]

21. 1591 X 12 A. 1591, 12. Octobris duo exercitus pugnantes in aere visi [25].

22. 1593 I Při počátku roku tohoto zázrakové na obloze nebeské vidíni byli, o čemž vuobec tištěno bylo: totiž kříž a meč krvavý v jasných oblacích, přitom hřmot a křik v oblacích: Běda! Běda! Běda! [26] At the beginning of this year, miracles were seen in the sky, about this was printed: a cross and bloody sword in bright clouds, and thunder and cries in the clouds: Woe! Woe! Woe! [26]

23. 1593 X 30 1593 den 30. Oktober Nachts um 10 Uhr sah man am Horizont ein sonderbares Phänomen, feurige Flammen, wie gespitzte Pfeile, eststanden in der Luft, die sich in der Höhe zusammenzogen und wieder verschwanden [26].

24. 1598 III 1 T. 1. v něděli Laetare v noci na pondělí vidíny tři sloupy nad Ranskou horou a při nich hvězda veliká, jako by se ti sloupové spolu potejkali; a když ta hvězda k těm sloupům měla dojíti, spadla dolů 1 d. m. března [19]

In that year, on Mid-Lent Sunday, on the night to Monday, three columns were seen above Ranska Mt. and next to them a large star, and the columns were as if struggling with one another; and as the star was approaching these columns, it fell down on the 1st day of the month of March [19]

25. 1598 VII 13 1598 13. iulii ve čtvrtek po sv. Vavřinci povětrí přišlo v noci s velikým blýskáním a dív té noci na

from north to south;  
upward into the  
middle, highest  
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th one another;  
these columns,  
the month of

avřinci povětrí  
a dív té noci na

nebi z zámku Krumlova naproti Domorajcím  
vidín [20].

In 1589, on Thursday 13th July after St. Lawren-  
ce's day, a storm came in the night with great  
lightning, and a sign was seen from the Krumlov  
Castle opposite Domorajice in the sky [20].

26. 1601 IX 17

T. 1. v pondělí po Povýšení sv. Kříže okolo  
4. hod. na outrej bylo místy zemětřesení s veli-  
kým zázrakem na nebi [19].

27. 1601 IX 24

T. 1. v pondělí po sv. Matouši od druhé hodiny  
až do osmé na outerý div na nebi sloupové velicí  
byli [19].

28. 1602 XI 10

Brzy po vydání mandátu císaře Rudolfa proti  
pikartům spatřovali se onde i onde v Čechách  
rozmanití úkazové zázrační a zvláště času noční-  
ho ... Desátého zajisté dne měsíce listopadu ...  
ponocní staroměstští viděli na rynku září veli-  
kou, domnívajíce se, že někde v městě hoří. Pro-  
čež volali na pověžného, aby pozoroval, zdali  
kde oheň spatřuje, a když on neuměl jim dáti  
zprávy dokonalé, chtěli dáti udeřiti k šturmu, ale  
on srazil je z toho pravě, že táž zář pochází  
z něčeho jiného kromě od ohně ... [28].

Soon after Emperor Rudolph issued the royal  
mandate against the heretics (Picards), various  
miraculous phenomena were observed here and  
there in Bohemia, especially at night ... On the  
tenth day of November, the Old Town nightwat-  
chmen saw a great glare in the square and  
thought there was a fine burning in the town.  
They called on the tower guard to look if the  
could see the fire, and when he was unable to

nebi z zámku Krumlova naproti Domorajcím  
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T. 1. v pondělí po Povýšení sv. Kříže okolo  
4. hod. na outrej bylo místy zemětřesení s veli-  
kým zázrakem na nebi [19].

In that year, on the Monday after Exaltation of  
the Holy Cross, at 4 o'clock of the Tuesday,  
earthquakes occurred in places with a great mi-  
racle in the sky [19].

T. 1. v pondělí po sv. Matouši od druhé hodiny  
až do osmé na outerý div na nebi sloupové velicí  
byli [19].

In that year, on the Monday after St. Mathew's  
day, between the second and eight hour on the  
Tuesday, large columns appeared in the sky [19].

Brzy po vydání mandátu císaře Rudolfa proti  
pikartům spatřovali se onde i onde v Čechách  
rozmanití úkazové zázrační a zvláště času noční-  
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could see the fire, and when he was unable to



give them a plausible report, they wanted to sound the alarm, but he prevented them in doing so saying that the glare was not due to a fire but something else ... [28].

29. 1603 I 5 Když Václav Budovec z Budova 5. dne ledna ... ve tři hodiny na noc jel do Prahy ... tedy byv blízko u vsi Senčic na vrchu ukázala se mu veliká záře, tak že se všichni přítomní i manželka jeho domnívali, že někde asi dvou nebo tří mil vzdáří veliký oheň jest. A když patřili na ten úkaz nebeský, udělal se nad touž září dlouhý veliký sloup ohnivý, na němž byla jakási libá světlost, kterýžto sloup trval beze vší proměny a pohnutí (což sice nebývá neobyčejné při takových sloupích a světlech v povětří, jenž chasmata slovou) za čtvrt hodiny [28].

When Vaclav Budovec of Budov was travelling to Prague on the 5th day of January at three o'clock at night, close to the village of Senčice he saw a great glare, so that all who were present, also his wife, thought that there was a large fire at a distance of two or three miles. And as they watched this celestial phenomenon, a long, large flaming column formed above the glare, with a kind of pleasant brightness above it, and this column remained unchanged an immobile (which is not usual for such columns and lights in the sky, called chasma) for a quarter of an hour [28].

30. 1603 X 1 Zu nacht 1. 2. (Octobris 1603) wunderzeichen, die ein vorbot seind zu enderung des wetters [29].

31. 1603 XII Zu eingang Decembris 1603 ... ein grimmige kelt den 1. 2. 3. 4. mit starckhen wunderzeichen eingefallen [29].

32. 1604 I 4 ... den 4. 5. wunderzeichen [29].

33. 1604 IV 27 ... den 27. Aprilis ists schwülling worden, wunderzeichen gegeben ... [29].

they wanted to  
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due to a fire but

5. dne ledna ...  
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|-----|------|------|----|--|
| 34. | 1604 | V    | 3  | Den 3. schön, nacht wunderzeichen ... [29]   |
| 35. | 1604 | VII  | 23 | Den 23. schön, nacht wunderzeichen ... [29]  |
| 36. | 1604 | VIII | 19 | ... nachts ein rothes wunderzeichen [29].  |
| 37. | 1606 | V    | 21 | T. 1. v n. d. pam. Trojice svaté mezi 1. a 2. hod. na noc na pondělí mezi vsí Ranou, Postoloprty a Louny spatřín na oblacích div znamenitý. Nejprv vůz komorní s 6 koňmi, se dvěma kočími a 2 osoby na tom voze proti sobě seděly. Potomně za tím vozem 60 vorů francouzských s koňmi a na těch vozích plno lidu vojenského s voštípy, halapartnami a s jinými zbraněmi. [19].<br>In that year, on the day of the Holy Trinity, between the 1st and 2nd hour at night on Monday, a spectacular phenomenon was seen between the village of Rana, Postoloprty and Louny. First, a carriage with 6 horses, two coachmen and two persons sitting in the carriage. These were followed by 60 French coaches with horses and full of military people with spears, halberds and other weapons [19]. |
| 38. | 1613 | IV   | 5  | Anno 1613 den 5. appriel ist am hiemell so ein gross wunderzeichen gewesen, welches die ganze nacht gewehret [23]  |
| 39. | 1613 | X    | 12 | Anno 1613 den 12. october ist ein so gewaltdtig blutzeichen am himmel gewessen und die ganze nacht gewehret, das mahn gemeinet, es were feiher vorhanden [23].   |
|     | 1613 | X    | 12 | Dne 12. měsíce Octobris, totiž v sobotu na neděli Salus populi, divy hrozné byly na Kutných Horách na obloze nebeské, oblakové krvaví v rozdílných místech ze všech stran. Ipse vidi [26].<br>On the 12th day of the month of October, between Saturday and Salus populi Sunday, terrible phenomena appeared in the sky in Kutné Hory, bloody clouds in various places from all sides. Ipse vidi [26].   |

40. 1616 VIII 4 1616 4. Augusti když Slunce zapadlo na Západ, spatřjn byl obláček krvavý, sám toliko o sobě, giného žádného viděti tehdáž nebylo; forma geho byla na způsob Lwa, okolo něho z každé strany dlauzý dwa bilj prowazowé táhli se k půlnočnj straně a trwal as za půl hodiny, potom zmizel. A nedaleko geho také vkázal se giný černý na způsob Orla [30].

On August 4th, 1616, when the Sun set in the west, a bloody cloud, all on its own, was seen, no other being seen at the time; it was in the shape of a lion, with two long wide ropes extending on its either side to the north. It lasted half an hour and then vanished. Near it, another black one, shapaed like an eagle, appeared [30].

1616 VIII 4 1616 4. Srpna, když Slunce zapadalo, spatřjn byl na Západ Oblak Krvavý, sám toliko o sobě, forma jeho byla na způsob Lwa a okolo něho z každé strany dlauzý dwa bjly Prowázkowé táhli se k půlnočnj straně a trwalo to za půl hodiny. A nedaleko od něho, vkázal se giný černý na způsob Orla [16]

On August 4th, 1616, when the Sun had set, a bloody cloud, all on its own, was observed, shaped like a lion and on either of its sides two long white ropes extended to the north, lasting half an hour. Not far from its, another black, eagleshaped one appeared [16].

41. 1617 (II) Téhož jsme zakusili (sucha) Léta 1616 a obáwati se 1617, a to předcházel ffochrowánj časté na Nebi Postnjho času, od půlnoci střjlyjý [30].

We experienced the same (draught) in 1616 and feared 1617, and this was preceded by frequent phenomena appeared in the sky, extending from the north, during Lent tide [30].

42. 1621 IX 12 ... das grosse Nordlicht vom 12. September 1621 wieder ganz Mitteleuropa ... in Schrecken zu versetzen vermochte [31].

padlo na Západ,  
a toliko o sobě,  
bylo; forma ge-  
o něho z každé  
vé táhli se k půl-  
hodiny, potom  
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Sun set in the  
vn, was seen, no  
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1616 a obáwati  
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střiljcy [30].  
(ht) in 1616 and  
led by frequent  
extending from

September 1621  
1 Schrecken zu

43. 1624 IX

... toho i následujícího měsíce velmi zhusta po české zemi, ve všech krajích, městech, městečkách a vseh ukazovali se času nočního i bíledně satanové, jako drakové ohniví létající v povětří s nemalým přistrachem a podivením [32].

... in that and the next month, devils, flying like fire dragons in the air were observed in the Czech land, in all regions, towns, and villages, causing great fear and astonishment [32].

44. 1630 I 4

Na auterek v noci, jenž byl den 4. ledna měsíce mezi 8. a 9. hodinou polovičního orloje v povětří nad Prahou vidíno bylo veliké blýskání a fochrování, až z něho lidem hrůza šla ... [18]

On Tuesday night, the 4th day of the month of January, between the 8th and 9th hour of the half horologe, much lightning and unrest was observed over Prague, which caused the people much terror ... [18].

45. 1630 II 1-4

1630 1. 2. 3. 4. Februarii: ... přes celičkou noc div na nebi až do dne veliké fuchrování a nebe krvavé bylo a sloupů mnoho sem i tam bylo [33]. In 1630, on February 1st, 2nd, 3rd, 4th: ..., throughout the night, a phenomenon appeared in the sky lasting until daytime, and the sky was bloody and there were many columns here and there [33].

1630 II 4

1630 4. Februarii bylo hrozné ohnivě fachrování v oblacích v noci v pondělí na úterý, jako ohnivě pruty a sloupy od půlnoční strany pocházející a ku polední straně jdoucí, až do toho světlo pocházelo a to dlouho trvalo [32].

In 1630, on February 4th, terrible fiery apparitions appeared in the clouds in the night from Monday to Tuesday, like rods and columns extending from the north and running to the south, even lighting everything up, and this lasted for a long time [32]