

**PART II****WORLD LIST OF POLAR AURORAE < 55° AND  
THEIR SECULAR VARIATIONS****II-1.- SUMMARY CATALOGUE OF OCCURRENCE OF AURORAE < 55° N  
IN THE PERIOD 1000-1900**

The our small supplement in Part I of this work and all the published and available catalogues and sets of aurorae observed in extrapolar regions were used to compile a summary catalogue to make available data for the most varied objectives. The catalogue contains 3878 northern aurorae. In a number of papers by J. A. Eddy of recent years [1] the auroral data has been drawn from the limited material of the catalogue published by H. Fritz [2], because it was the most extensive and covered the period from -503 to 1872. The abundant data given in a number of partial catalogues, published within the last thirty years, were taken into account.

Since the study of long-term changes in solar activity in the past has again become a topical scientific problem, the authors are presenting a summary of auroral data for the years 1000 to 1900 in one extensive table, giving references not of the original source in each case, but to the catalogue or summary in which a particular aurora was mentioned.

The authors of the catalogue attempted to give the data of the aurorae up to 1581 inclusive according to the old Julian calendar, and from 1582 according to the new Gregorian calendar. The aggregate difference in the dates around this change in dating amounted to 10 days. Unfortunately, the dating was not changed and adopted in all countries of the then cultural world at the same time; in fact, in some countries the old calendar dating was used in some regions for varying periods of time, depending on the influence the church had. This disunity resulted in uncertainty and confusion in dating some of the recorded natural phenomena. With regard to this dating problem, F. Link [3] wrote: "In the 17th century, the Gregorian calendar, introduced by the Catholic Church on 6/16 October, 1583, was used as well as the old Julian calendar, to which the non-Catholic countries kept until the end of the century, and England even until 1752. This necessarily causes uncertainty of dates and risk of duplicity. Any pair of observations, differing by 10 days and originating in different regions, is suspect of duplicity."

Since phenomena which may but need not have been aurorae were described in the past centuries, the authors of catalogues must have considerable experience to be able to distinguish, on the basis of the description, whether a fireball, meteoric shower, noctilucent clouds, twilight phenomena, etc., had not been

mistaken for an aurora. That is why authors of this catalogue did not adopt all the occurrences of aurorae, given by the authors of the partial catalogues or sets of their observations. This applies particularly to H. Fritz's catalogue [2], which evidently, as already discussed earlier also by other authors, contains erroneous records of phenomena other than aurorae especially in the past three centuries. This is indicated by the fact alone that, according to H. Fritz, there would be more days with aurorae than without them in some of the longer intervals of several months. This also applies to aurorae at latitudes of less than  $55^{\circ}$ . This is clearly illogical. The authors adopted the occurrences of aurorae on the basis of the following criteria: possible recurrence after roughly 27 days, roughly since 1792 (and partly also before) auroral data were adopted provided there was guarantee that they were simultaneously observed in a larger geographical region, i. e. provided they were recorded at a number of stations in Region I or II (i. e. Europe), or in Region I or II and at the same time in Region IV (i. e. America). Fritz's [2] division into regions is as follows: I – south of  $46^{\circ}$ , II between  $46^{\circ}$  and  $55^{\circ}$ , III – from  $55^{\circ}$  to the polar circle, IV – America south of  $60^{\circ}$ , V – high latitudes. If the source of an auroral observation given by H. Fritz [2] was also given by another author, the latter has been mentioned. If the authors of the partial catalogues or sets of observations recorded the occurrence of an observed phenomenon with the interpretation "aurora" according to the degree of certainty or uncertainty, the authors of this catalogue adopted the aurora with the higher degrees of certainty (this applies, e. g. to the catalogue of M. Keimatsu, [4]). Even so, inspite of all the criteria applied and all the existence, a small percentage of phenomena included as aurorae need not have in fact been aurorae and, on the contrary, a small percentage of aurorae omitted, e. g. from H. Fritz's catalogue [2] may have actually been aurorae.

The authors tried to include only those aurorae which occurred at or extended to northern latitudes of less than  $55^{\circ}$ ; this latitudinal limit was adopted from Fritz's catalogue because most of the adopted aurorae, even after critical analysis, originated with H. Fritz. This author was already aware that the occurrence of aurorae in mid and low geographic latitudes was a qualitatively different phenomenon, that the very frequent occurrence of aurorae at latitudes of over  $55^{\circ}$  would not characterize the level of activity of the actual causal source of aurorae, which were already known then, that the occurrence of aurorae at latitudes below  $55^{\circ}$  is connected with geomagnetic storms at mid-latitudes and it is quite frequently time-related to the occurrence of extensive sunspot groups on the solar disk.

In an attempt to preserve homogeneity, the aurorae observed towards the end of the whole period, including those from the southern mid-latitudes, were not taken into account; the sources of data thus originate in the same geographic region (Europe, Asia, North Africa) during roughly the whole period, only North America being an exception.

## II-2. NOTES ON THE FORMAL ARRANGEMENT OF THE CATALOGUE

An aurora on one night, although it may have occurred before and after midnight (i. e. on two dates according to the new reckoning of a calendar day) is only mentioned under one date (usually the date of its beginning). The full date of every aurora is given as far as possible; if the day or month is missing, the source lacked these data. If the year, month or day is in parentheses, it is uncertain, although very probable. If two data are given, separated by a comma, in parentheses next to the month, but more frequently the day, the aurora was not observed on the two days but the date is uncertain and involves one of the two days (or months). If another month or day is given in parentheses, the more probable date is the one without the parentheses. If there is a hyphen between the month or day data, the aurora occurred in the interval between the two. If the date as a whole is in parentheses, the reality of the observation cannot be fully guaranteed.

The reference concerning a phenomenon adopted from a source (or catalogue) is given in the catalogue in the form of the abbreviation of the source or catalogue in question; references to literature according to abbreviations follow the catalogue.

The abbreviations used in the catalogue are as follows:

- (A) ASTRONOMICAL OBSERVATION
- (B) BIBLIOGRAPHY
- (C) CLOUDS
- (D) DUST
- (E) EARTHQUAKES
- (F) FOG
- (G) GLOOM
- (H) HURRICANE
- (I) ICE
- (J) JET STREAM
- (K) KARST
- (L) LIGHTNING
- (M) MIST
- (N) NATURE
- (O) OCEAN
- (P) POLLUTION
- (Q) QUAKE
- (R) RAIN
- (S) SANDSTORM
- (T) TORNADO
- (U) UNIDENTIFIED
- (V) VORTEX
- (W) WIND
- (X) X-RAY
- (Y) YACHT
- (Z) ZEPHYRUS

The abbreviations in parentheses are those which were used in the original sources. The abbreviations in brackets are those which were used in the original sources, but which were not adopted in the catalogue. The abbreviations in bold type are those which were used in the original sources, but which were not adopted in the catalogue, and which were not included in the list of abbreviations.





































