

## **A MILLENNIUM OF WEATHER, WINDS AND WATER IN THE LOW COUNTRIES**

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### **INTRODUCTION**

In 1995 under the auspices of KNMI the first volume of a series of 6 books was published, where in some 4000 pages the weather in the Low Countries (present-day Benelux) for the period 1000 to present is depicted and classified. In the books<sup>1</sup>, the course of the weather during both the winter and summer season as well is followed from year to year and placed in a historical context. In summer 2000, Vol. IV, covering the era 1575-1700, will appear which with the non-instrumental period is covered. Vol. V (to be published in 2001) and Vol. VI (2002) will deal with the instrumental period.

The reconstruction of the weather in the Low Countries is based on sources that are related to the area geographically covered by the present Netherlands and neighbouring areas of the southern part of the North Sea; Gt. Britain, Northern districts of France, the downstream basin of the Rhine, Westphalia and Northwest Germany. If relevant, remarkable or extreme weather in Middle Europe or even Northern Italy is also considered.

The major part of the text is devoted to detailed, well-documented, annotated descriptions and analyses of the weather in the past. Numerous compilations and classifications however offer a structured base for further interpretations. Without being complete the following are mentioned: sources per era and per area, climatology per 25 year period, harvest data, ice on major rivers, tree-ring data, classifications of winter and summer temperature, wet and dry seasons, storms and storm surges.

The books are written in the Dutch language and therefore not easily accessible to the international research world. It is for this reason that we present here in a brief overview some of the issues: the historical sources used, pitfalls that threaten dating due to the different types of calendars that were in use and the way the historical evidence could be classified into instrumental winter temperatures.

The most important publications from Volumes I-III are listed in the *References for the Period 763-1575*.

The *appendix 1200-1250* contains an integral translation of the book text for 1248-1249, a table of the seasonal and annual temperatures of the first half of the 13th century, and a list of the most important historical documentary sources for this period.

## SOURCES

Sources that provide useful information about the weather in the past can be subdivided into two main categories: the tangible sources and the non tangible sources like toponyms, folk customs, traditions legends and songs. The analyses of the past weather are predominantly based however on tangible sources. These sources yield essentially two types of data: direct, mostly written observational data of the weather and indirect or proxy data, within which the effects of weather and climate are recorded. In judging the liability of the sources it is of importance to be aware of the number of levels of transmission – that can introduce noise - between observer and the historical fact. The evidence of a primary source, as provided by the observer himself or a contemporary, and only slightly transformed by transmission is potentially more reliable than that of a secondary source with a large distance in space or time between the historical fact.

The analyses of the weather in history of the Low Countries are based upon the following types of sources:

### **Instrumental observational series**

Detailed descriptions of the course of the weather in the historical instrumental period (ca. 1700-1850) will be based on the digitised KNMI historical data-set with the more than 2,5 million three times a day readings, carried out at some 12 historical observational stations, of air temperature, pressure, wind-speed and –direction, precipitation, state of the sky and some astronomical observations. Stationdictionaries with comprehensive descriptions of the instruments used, observers, conditions of observations and other relevant metadata have been composed for these and some 125 more other observational locations in the Low Countries<sup>2</sup>. Descriptions from 1900 onwards will originate from the modern KNMI information systems. For the in between period 1850-1900 the “not yet digitised” information from the so-called KNMI Yearbooks serves as the source.

### **Weather diaries and Weather journals**

Weather diaries, offering daily qualitative descriptions of the weather, are popular from the beginning of the 17th century onwards. In the instrumental period they are often mixed with instrumental readings. The oldest weather diary – as far the author knows as – is written by William Merle<sup>3</sup> from England, covering the period 1337-1344. Clergyman David Fabricius<sup>4</sup> (1564-1617) from East Friesland composed the oldest diary from the Low Countries. The Dutch barrister at fiscal law Anthonis Duyck<sup>5</sup>, witnessing prince Maurice and his army, wrote an important daily weather journal with notations for the weather from 1590-1602. Other rich sources are the diaries of Isaac Beeckman<sup>6</sup>, giving the weather from day to day in Zeeland (1612-1615) and the weather observations carried out by the probably oldest weather observatory in the Netherlands at Dordrecht (1627-1637). Fabio Chigi (1599-1667) was papal nuncio at Cologne, Munster and Aachen and became well known as Pope Alexander VII. As an Italian he was fascinated by the cold northern climate and he noted down all frost, ice, snow and rain but paid no attention at all at sunny and warm days. We owe him an inheritance of descriptions of the weather for more than 2600 days<sup>7</sup>.

## Accounts

Useful proxies of the weather are the series of accounts of townships, ship cargos, agriculture, water- and windmills and specially the accounts of river tolls.

In the middle ages and long after that period trade and traffic were hampered by tolls at both overland routes and rivers. Tolls were quite numerous, at least on the continent because they were abolished in England by order of the Magna Carta (1215). They were initiated by Landlords with the aim of benefitting river trade and were legalised by the so-called *royal stream prerogatives*. The oldest preserved toll accounts<sup>8</sup> date from the 14th century. They offer us very important information about situations hampering movement as heavy ice, low water levels and extreme weather conditions such as storms. Most important tolls were located along the Rhine (Cologne, Lobith, Arnhem), Meuse (Roermond), IJssel (Zutphen) and the Waal (Nijmegen, Tiel, Zaltbommel). Comparable weather information is hidden in the registers of the ship canal companies. Towboats were popular as public transport in the Low Countries from the 16th century onwards. The economist De Vries<sup>9</sup> compared the ship canal data with the De Bilt temperatures for the periods 1634-1757 and 1814-1839, yielding a reconstruction of winter-temperatures back to 1634.

In the past centuries a dense network of some 10.000 mills covered the Low Countries. Many of them were water windmills and watermills. A very complete and long series of accounts (1445-1540) with numerous annotations of the weather is found in the archives of the township of Zutphen<sup>10</sup>, which exploited the watermills at the small river, the Berkel.

## Letters

The majority of the writers of the thousands of letters that were examined considered the topic of weather as quite vulgar and did generally not spend many words on it. There are some notable exceptions however. The letters of Mr. Adriaen van der Goes<sup>11</sup> (1619-1686), lawyer at the Court of Holland, are one of the major sources of descriptions of the weather for the period 1659-1673. As a farmer his main interest was in harvests and working the soil. Weather related matters were important to him and he often described them in detail.

## Diaries and Journals

Whilst diaries have a personal character predominantly, journals are to be considered as more or less official notes. These contemporaneous witnesses are dominated mostly by the personal or professional interest of the author. Though covering a relatively short period (1491-1498) the diary of Rombout de Doppere (the Brave) registrar of the Minster of St. Donatius<sup>12</sup> (Brugges) gives us very important and quite detailed information about the weather conditions.

Ship journals are well known sources of weather (wind-speed and -direction, state of the sky) information in the past. As The Netherlands developed in the course of the 17th century as the world's most important trading country, thousands of journals were officially kept by their captains, serving for instance the *Verenigde Oostindische Compagnie* (VOC, 1602). Though they are mostly filled with information from far away (West and East Indies, African coasts), less relevant within the context of the climate in the Low Countries, many records reflect the sometimes long periods the ships lay at home, for instance the Dutch isle of Texel waiting for favourable winds or melting of obstructing floating ice in winter times.

Journals of war-vessels offer similar information. Many military journals are available from the sea wars between England and the Netherlands as those from 1652-1654, 1665-1667 and 1672-1674. It is quite probable that a complete and detailed reconstruction of

wind and state of the sky, covering the areas of the coasts of Holland and Zeeland and the southern part of the North Sea could be based upon these ship-journals.

Diaries from farmers make mention of early and late frost, snow, dry and wet periods, storms, lightning, wind gusts and hail, all related to the crops, yields and prices. Crop data have a high potential as proxy data.

As many in the 16th and 17th century were inclined to explain the course of the weather by the constellation of sun, moon and stars, their astrometeorological journals can be considered as weather diaries, including the ephemerides. A well-known example is that from Isaac Beeckman<sup>6</sup>.

### Annals and chronicles

Annals and chronicles are quite simple forms of historiography. Annals originated from Easter tables, long standing tables of Easter dates, illustrated with annotations of various events during the years. Annals and chronicles are quite popular from the Middle Ages onwards. In contrast to the above summarised sources, they generally witness only partly the own observations and experiences of the author. The distinction between both is that annals mostly are anonymous tabular lists of dates and events (earthquakes, storms, comets) and composed by various authors, for own use mainly, whereby chronicles often (but not always) are written by one and the same author, more extensive and narrative and often popular as can be deduced from the many copies and prints. Town chronicles, predominantly from those nearby main rivers offer many weather related events as times of famine, storms, high and low waters and ice.

## CALENDARS

After the conquest of Rome in the 6th century BC, the Romans introduced the *Roman Republican Calendar*, based, as was usual, on the phases of the moon with a length of 355 days. In order to prevent a shift of the seasons, the Romans introduced the *intercalans*; every two years the last five days of February were replaced by a period of 27 or 28 days. The beginning of the year was decreed on the first of March: the date on which the new consuls started their duties. Calendar and seasons thus got out of step. Advised by the Alexandrian astronomer Sosigenes, Julius Caesar settled affairs in 46 BC; he introduced a corrective intercalans of 67 days, in order to put the seasons in the right place and turned over to the solar calendar with an average length of the year of 365 days and 6 hours. Every four years the 24th of February was doubled as an intercalary day. This was the *Julian Calendar*.

In the Julian Calendar the vernal equinox and the winter solstice fell on the 25th of March and the 25th of December respectively. Every century is, according to the Julian

**Table 1. From old style to new style**

Period	days
700 - 899	+ 4 days
900 - 999	+ 5 days
1000 -1099	+ 6 days
1100 -1299	+ 7 days
1300 -1399	+ 8 days
1400 -1499	+ 9 days
1500 -1582	+ 10 days

Calendar, 18 hours too long. Gradually vernal equinox and solstice shifted forwards in time. As the vernal equinox was needed for the calculation of the date of Eastern the *Council of Nicea* ordered this date to be fixed on the 21st of March. The astronomical

vernal equinox did not obey this rule and in the 16th century the real astronomical vernal equinox fell on the 11th of March and the 'legal' equinox was still the 21st of the same month.

In 1563 the *Council of Trent* authorised the pope to carry a reform. Pope Gregorius XIII announced on 24 February 1582 by the *Bull Inter Gravissimas* the *Gregorian Calendar*. The date October 4, 1582 was immediately followed by October 15, to compensate the lag of 10 days between astronomical and formal vernal equinox. Furthermore every four centennials the leap year was abandoned.

The catholic countries accepted this new calendar (*stilus novus*, new style) quite soon but the Protestant countries, on the contrary, kept the old calendar (*stilus vetus*, old stile) sometimes for even more than a century. As a consequence in the Low Countries two calendars were in use that differed 10 days: an important fact when we have to judge our sources.

In the descriptions of the weather dating from before 1582, the old style is applied consistently, afterwards the new style. The differences (in days) of both styles are listed in table 1.

## CLASSIFICATION OF WINTERS

Often historical quantitative evidence can be found of the coldness of the winter season as descriptions of the length of the period of frost or no evidence of frost at all, ice drift on the rivers, days that no toll could be charged.

In the KNMI books the method of IJnsen<sup>13</sup> is adopted for a quantitative classification of the winter temperatures, based upon the number of frost days ( $v$ ,  $T_{min} < 0^{\circ}\text{C}$ ), ice days ( $y$ ,  $T_{max} < 0^{\circ}\text{C}$ ) and very cold days ( $z$ ,  $T_{min} < -10^{\circ}\text{C}$ ). With these numbers, known for the winter season (November-March) at De Bilt (central Netherlands) from 1850 onwards the so-called *frost index*<sup>14</sup> ( $V$ ) is calculated as:

$$V = 33\frac{1}{3} \cdot \left( \frac{v^2}{12100} + \frac{y}{50} + \frac{z}{30} \right)$$

For the instrumental period 1706-1850 only monthly temperatures for De Bilt were available<sup>15</sup> and so it was not possible to calculate directly the frost index. Therefore IJnsen developed a formula for what he called the *winter-number* ( $H$ ) that characterises the coldness of the winter season, November-March. This formula is based upon  $T_f$ : average temperature November-March,  $T_h$ : average temperature December-February and  $T_k$ : average temperature of the coldest month where:

$$H = 74.88 - 4.61 \cdot T_f - 3.32 \cdot T_h - 2.3 \cdot T_k$$

$H$  was calculated for the period 1707-1990. Over the overlapping period 1851-1990  $H$  and  $V$  are functionally related by the equation:

$$V = \exp[5,1592 \cdot \tanh(0,01346 \cdot H)], 0 \leq H \leq 100,$$

with correlation coefficient 0.97. This makes it possible to extend  $V$  back from 1850 to 1706.

$V$  has no dimension and ranges from  $V=0$ : a winter without frost to  $V=100$  for the most severe winter. The benefit is that, though calculated from figures for De Bilt,  $V$  has the

expectance of the regional character of a winter, for an area with corresponding climatological characteristics: the Low Countries.

**Table 2.** Classification of winters according to IJnsen

Category $C_v$	Frost Index $V$	Definition	Frequency in %	Temp. °C Winter (DJF)	Temp. °C Nov.-March
1	$\leq 3.2$	Extremely mild	1.0	6.2	6.8
2	3.3-5.7	Very mild	3.8	5.4	5.6
3	5.8-9.7	Mild	11.1	4.3	4.9
4	9.8-16.6	Fairly mild	21.0	3.3	4.2
5	16.7-28.4	Normal	26.2	2.3	3.5
6	28.5-44.3	Cold	21.0	1.2	2.7
7	44.4-73.0	Severe	11.1	-0.1	1.7
8	73.1-82.0	Very severe	3.8	-1.8	0.5
9	$\geq 82.1$	Extremely severe	1.0	-2.4	0.1

The median of  $V$  amounts to 21.51, so that the category 'normal' can be subdivided in the sub categories '5-' for:  $[16.7 \leq V \leq 21.5]$  and '5+' for  $[21.6 \leq V \leq 28.4]$ , respectively 'on the mild side and 'on the cold side'

Based on the frequency distribution of the frost indices of the 284 winters covering the period 1707-1990, a symmetrical division into 9 categories (1-9), with 5 as centre, is made in which the frost indices are grouped and labelled with a definition.

In table 2, this classification is given together with the expected frequency of occurrence (in %) of the various strengths of winter. To provide thermal information, the expected mean temperature of the climatological winter - the months December, January and February - and the one for the cold season November up to March inclusive for De Bilt are given with each category.

With the help of this classification into categories it is now possible, with the non-instrumental information, to characterise winters. In order to do this a procedure is followed, based on awarding marks to the following three aspects, which are significant for many winters:

- $A_t$ : *thermal aspect*. The whole cold season (November-March) - if possible - is examined, with emphasis on the climatological winter months December, January and February and special emphasis on the coldest month.
- $A_d$ : *aspect of duration*. A measure for duration is the number of days with frost from November till March or a comparable parameter; in many cases it will only be possible to make a rough estimate.
- $A_i$ : *aspect of intensity*. The intensity is low if there are only a few days with frost (or a comparable parameter), high if there are many very cold days. In the instrumental era, intensity is understood to mean the quotient of the frost index and the number of days with a minimum temperature below 0 °C.

With the many uncertainties and the often rough and concise character of the historical evidence in mind, the intervals of the subdivision of the three aspects should be wide. The scoring table (table 3) is derived from the historical evidence of well-known winters from 1850 onwards. The outcomes of the scoring are tested for the period 1901-1987. The sum of the scores for the three aspects in the majority (84%) of the winters exactly equalled the number of the category ( $C_v$ ) of the winter in concern.

Based on the qualitative historical descriptions of the weather, categories have been estimated independently by Buisman and IJnsen as well. The two series appeared to be very comparable.

**Table 3.** Estimate of the category of the winter-season by means of aspects

Thermal aspect ( $A_t$ )	Points	Frost Index ( $V$ )
Very mild	1	$\leq 5.0$
Mild	2	5.0 – 15.0
Normal	3	15.1 – 30.0
Cold	4	30.1 – 75.0
Very cold	5	$\geq 75.0$
Aspect of Duration ( $A_d$ )	Points	Number of Frost Days ( $v$ )
Short	0	$\leq 47$
Moderate	1	48-88
Long	2	$\geq 89$
Aspect of Intensity ( $A_i$ )	Points	Intensity ( $V/v$ )
Low	0	$\leq 0.18$
Moderate	1	0.19 – 0.55
Strong	2	$\geq 0.56$

These series were compared with several other series for overlapping periods: generally they showed excellent correlation (correlation coefficients range from 0.79 to 0.98, IJnsen<sup>16</sup>). For this reason, the following series contributed to the estimates of the frost indices:

- 1591-1613 Number of days with frost in East Friesland, according to David Fabricius
- 1613-1626 Records of the diary of Isaac Beeckman
- 1621-1650 Number of days with frost and extensive periods with frost per winter in the Kassel series from Hermann van Hessen<sup>17</sup>
- 1634-1706 Number of days with ice on the canals Harlem-Amsterdam and Harlem-Leiden
- 1660-1706 Central England monthly temperatures from Manley<sup>18</sup>

### CLASSIFICATION OF SUMMERS

Historical evidence of warmth of the summer is less abundant than of coldness of the winter. In history weather in summer had – in the Low Countries – less impact on society than the weather in the winter season. The witnesses were mostly more interested in summer drought than in summer warmth. Also an observable and distinct thermal level – as icing when temperature drops below °C – is absent. The classification that was developed for summer temperatures (IJnsen<sup>19,20</sup>) is based on a single parameter – the *summer-number*  $S$ , which is, analogous to the winter-number  $H$ , a function of the temperature sum (i.e. the monthly temperature times the number of days per month)  $S_w$  of the warm season May-September, the temperature sum  $S_z$  of the climatological summer (June-August) and the temperature sum of the warmest month  $S_m$ :

$$S = 0.0489 \bullet S_w + 0.0670 \bullet S_z + 0.1573 \bullet S_m - 246.2$$

On the basis of the frequency distribution of  $S$ , calculated from monthly temperatures at De Bilt for the period 1706-1990, the summers were classified into 9 categories  $C_s$  (1-9), with 5 as centre.

Table 4 shows this classification, together with the expected frequency of occurrence (in %).

**Table 4.** Classification of summers according to IJnsen

Category <i>C<sub>s</sub></i>	Summer Number <i>S</i>	Definition	Frequency in %	Temp. °C Summer (DJF)	Temp. °C May-Sept.
1	≤ 13.7	Extremely cool	1.0	14.0	13.1
2	13.8-24.1	Very cool	3.8	14.6	13.6
3	24.2-34.5	Cool	11.1	15.1	14.1
4	34.6-44.8	Fairly cool	21.0	15.6	14.5
5	44.9-55.2	Normal	26.2	16.2	15.0
6	55.3-65.5	Warm	21.0	16.7	15.4
7	65.6-75.9	Fairly warm	11.1	17.3	15.9
8	76.0-86.3	Very warm	3.8	17.8	16.4
9	≥ 86.4	Extremely warm	1.0	18.3	16.8

For the pre-instrumental period (i.e. before 1706), the category of a summer is estimated directly from documentary evidence. These estimates are supported by estimates based on the following series that were compared with the De Bilt series for the overlapping instrumental period (IJnsen<sup>16</sup>):

1354-1836 Data start of grape harvest Beaune and Dijon<sup>21</sup>  
 1659-1705 Central England monthly temperatures from Manley<sup>18</sup>

## WINTER AND SUMMER SERIES

All estimates have been combined to continuous series of categories for the pre-instrumental winters and summers that have been coupled to the De Bilt series for the instrumental period. Based on this series a series of annual winter and summer temperatures for De Bilt was calculated for the period 800-present

In the period prior to approximately 1300, evidence is often too scarce to permit a subdivision into 9 categories. For the classification of winters and summers with insufficient data the categories *C<sub>w</sub>* of the winter season were grouped three by three into the three main categories I (*obviously very mild*), II (*about normal*) and III (*obviously very cold*) and the categories *C<sub>s</sub>* of the summer season into the three main categories I (*obviously cool*), II (*about normal*) and III (*obviously warm*).

Figures 1 and 2 show the 25 year means of winter, respectively summer temperature in the Low Countries, expressed as temperatures for De Bilt for the period 800-present. Table 5 contains all annual estimates of the categories *C<sub>w</sub>* and *C<sub>s</sub>* for the same period.

Recently the temperature reconstruction (as LCT: *Low Countries Temperature*) has been analysed and compared with relevant data. It could be concluded that over the period back to the 14th century the LCT reconstruction is consistent with a number of European temperature reconstructions<sup>22</sup>.



Figure 1. Winter (DJF) temperatures Low Countries (De Bilt) – 25 year means

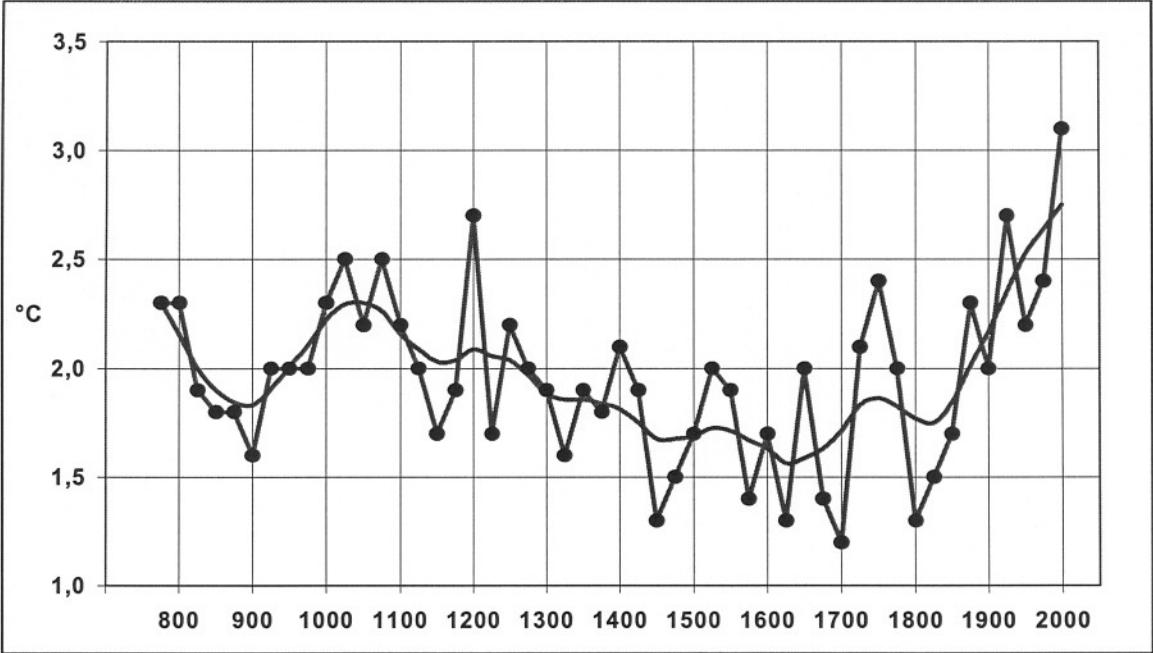
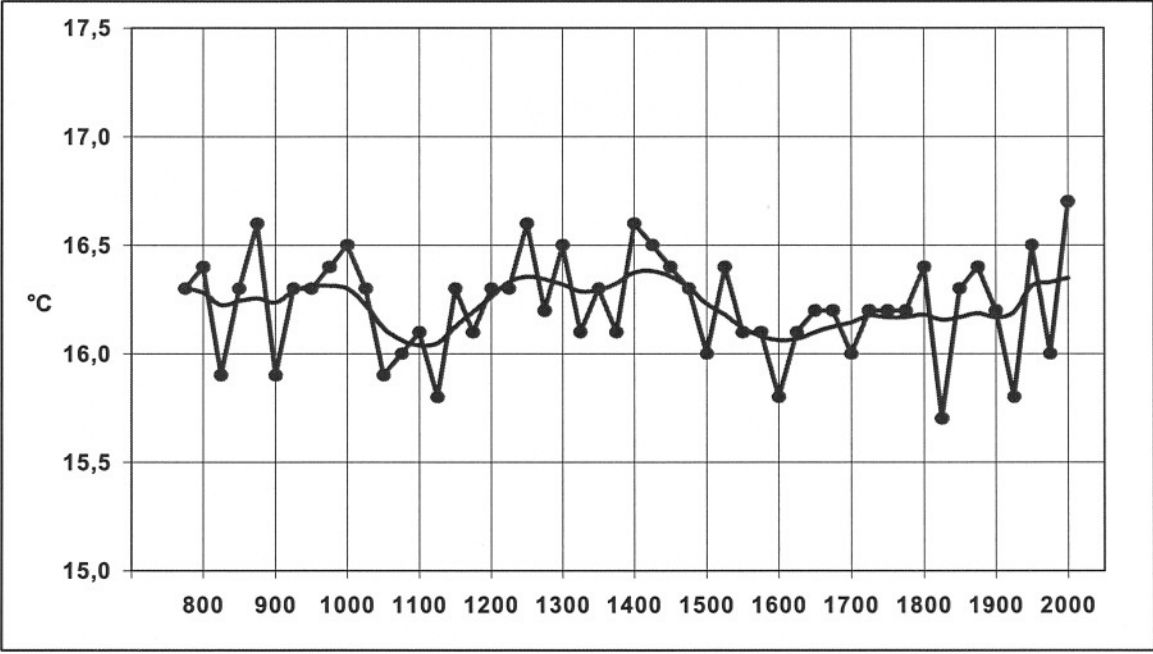


Figure 2. Summer (JJA) temperatures Low Countries (De Bilt) – 25 year means



## NOTES

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**APPENDIX 1200-1250**

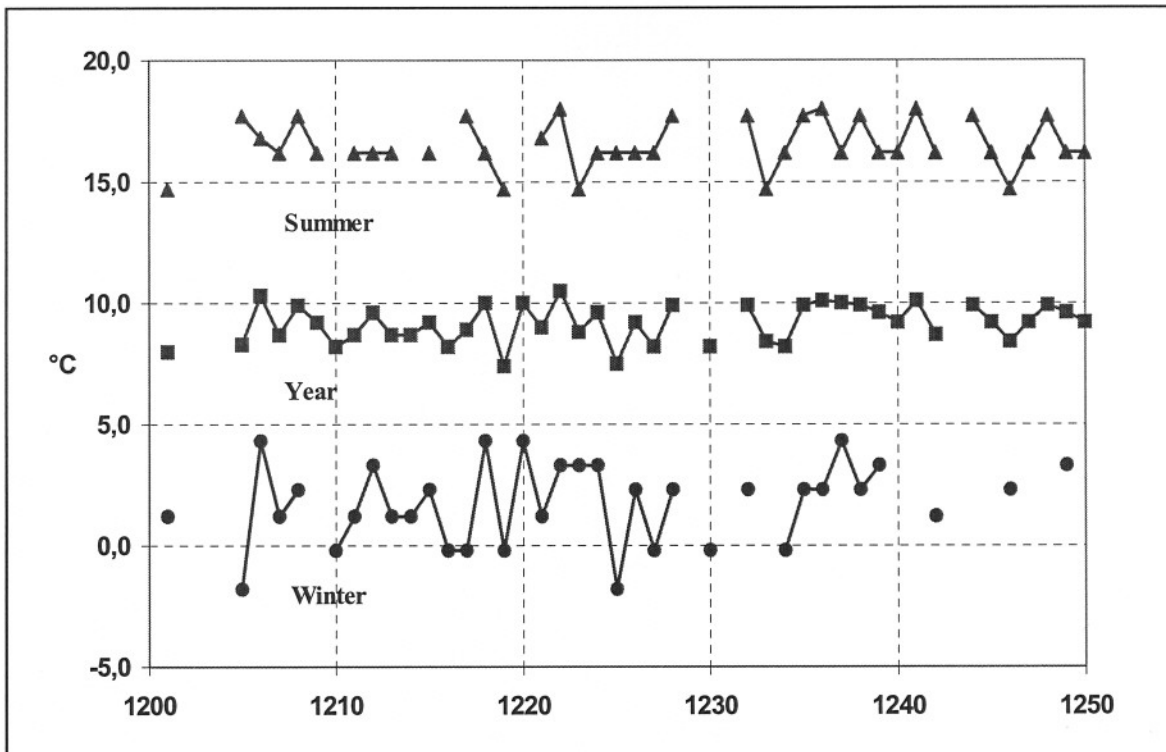
Together with the last 25 year period of the earlier 12th century, the second quarter of the 13th century (1226-1250) experienced annual temperatures with a mean of 9.3 °C, high compared with those of the last millennium with a mean annual temperature of some 9.0 °C. The average summer (JJA) temperature amounts to 16.7 ° (normal 1961-1990 De Bilt: 16,2 °C) and the winter (DJF) temperature to 2.0 °C (normal 1961-1990 De Bilt: 2,6 °C). With these values the Mediaeval Climate Optimum (MCO), as it is manifest in the Low Countries from ca. 1170 to ca. 1430, reaches its optimum in the first half of the 13th century.

During the period 1200-1225 winters are predominantly cold or normal, 6 are severe and three mild. The summers are generally normal or warm; only three summers are cold. In 1214 a storm surge swept the whole coastal area; in the years 1219 to 1221 the northern coasts are hit four times.

During the period 1226-1250 very few winters are cold, but three almost in a row (1227, 1230 and 1234) are severe. All summers except two are normal or warm. Storm surges occur from 1246 to 1249.

The course of the summer and winter temperatures and the averages for the year temperatures – expressed in terms for De Bilt – is shown in figure 3. The values are tabulated in table 6

**Figure 3.** Summer, winter and annual temperatures Low Countries 1200-1250



**Table 6.** Annual temperatures for the winter (DJF), summer (JJA) and year (Nov.-Oct.) Low Countries (De Bilt) 1200-1250

°C	winter	summer	year	°C	winter	summer	year	°C	winter	summer	year
1200				1217	-0.2	17.7	8.9	1234	-0.2	16.2	8.2
1201	1.2	14.7	8.0	1218	4.3	16.2	10.0	1235	2.3	17.7	9.9
1202				1219	-0.2	14.7	7.4	1236	2.3	18.0	10.1
1203				1220	4.3		10.0	1237	4.3	16.2	10.0
1204				1221	1.2	16.8	9.0	1238	2.3	17.7	9.9
1205	-1.8	17.7	8.3	1222	3.3	18.0	10.5	1239	3.3	16.2	9.6
1206	4.3	16.8	10.3	1223	3.3	14.7	8.8	1240		16.2	9.2
1207	1.2	16.2	8.7	1224	3.3	16.2	9.6	1241		18.0	10.1
1208	2.3	17.7	9.9	1225	-1.8	16.2	7.5	1242	1.2	16.2	8.7
1209		16.2	9.2	1226	2.3	16.2	9.2	1243			
1210	-0.2		8.2	1227	-0.2	16.2	8.2	1244		17.7	9.9
1211	1.2	16.2	8.7	1228	2.3	17.7	9.9	1245		16.2	9.2
1212	3.3	16.2	9.6	1229				1246	2.3	14.7	8.4
1213	1.2	16.2	8.7	1230	-0.2		8.2	1247		16.2	9.2
1214	1.2		8.7	1231				1248		17.7	9.9
1215	2.3	16.2	9.2	1232	2.3	17.7	9.9	1249	3.3	16.2	9.6
1216	-0.2		8.2	1233		14.7	8.4	1250		16.2	9.2

## HISTORICAL SOURCES PER REGION, 1200 -1250

The locations of the principal sources that were used are shown in the map of figure 4. In the following paragraphs these sources are listed per country.

### Low Countries

#### Luik/Liège [1194-1221]

*Annales S. Jacobi Leodiensis*, ed. G.H. Pertz, M.G.H. SS 16 (1859) 635-680

#### Hoei/Huy [1230-1237]

*Chronica Albrici monachi Trium Fontium, a monacho Novi Monasterii Hoiensis interpolata (Adnotationes Hoyenses)* ed. P. Scheffer-Boichorst, M.G.H. SS 23 (1874) 674-950

#### Wittewierum in Groningen [1219-1276]

*Kroniek van het klooster Bloemhof te Wittewierum*, intr., ed. and translation H.P.H. Jansen, A. Janse (Hilversum 1991)

#### Egmond [1248-1250]

*Annales Egmondenses, De jaarboeken van Egmond*, first Dutch translation by A. Uitterhoeve, Alkmaarse Cahiers, Vol. I (Alkmaar, 1990)

### Britain

#### St.-Albans [1214-1236]

*Rogeri de Wendover Chronica, liber qui dicitur Flores Historiarum (ab A.D. 1154)*, ed. H.G. Hewlett in R.B. SS, 84, I, II, III (London 1886-1889); Engl. Translation, 2 Vols, ed. Bohn (1849)

#### St.-Albans [1236-1259]

*Matthaei Pariensis monachi Sancti Albani Chronica Majora*, ed. H.R. Luard, R.B. SS, 57, I-VII (London 1872-1884); and: The Weather, 1236-59, from *Chronica Majora*, trsl. J.A. Giles, *Matthew Paris' English History*, 3 Vol's. (1852-4), English historical documents, gen. Ed. David C. Douglas III 1189-1327, ed. Harry Rothwell (London 1875) 806-823

**Coggeshall [1066-1223]**

*Radulphi de Coggeshall Chronicon Anglicanum (1066-1223)*, ed. J. Stevenson, R.B. SS 66 (London 1875) 1-208

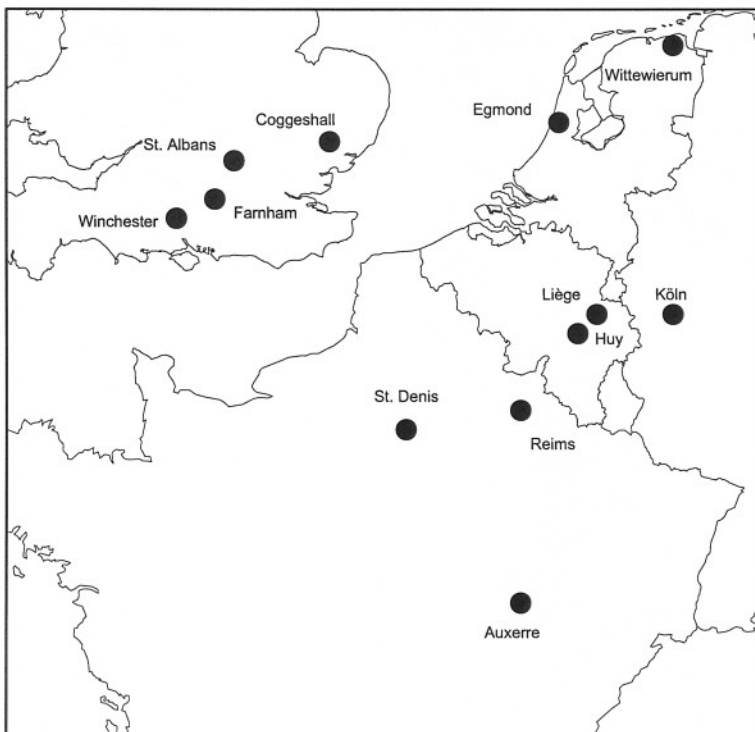
**Winchester [1209-1350]**

J. Titow, *Evidence of weather in the Account Rolls of the bishopric of Winchester, 1209-1350*, in: *The Ec. Hist. Review*, ser. S, vol XII, 1-3 (Utrecht 1959-1960)

**Waverley [-1291]**

*Annales monasterii de Waverleia (-1291)*, ed. H.R. Luard, R.B. SS 36 II (London 1865) 127-411

**Figure 4.** locations of the principal sources Low Countries and surroundings 1200-1250



**Germany**

**Köln [-.]**

*Annales S. Pantaleonis Coloniensis maximi*, ed. G. Waitz, M.G.H., S.R.G. 18 (1880)

**France**

**St.-Denis [1113-1368]**

*Chronique latine de Guillaume de nangis de 1113 à 1300 avec les continuations de cette chronique de 1300 à 1368*, ed. H. Géraud, S.H.F. (1843). Also: *Continuatio S. Dionysii*, ed. Fr. Delaborde, S.H.F. (1882) 300-333

**Auxerre [-.]**

*Roberti canonici S. Mariani Autissiodorensis Chronicon*, ed. O. Holder-Egger, M.G.H. SS 16 (1882) 226-276 and *Continuatio S. Mariano Autissiodorensis*, *ibidem*, 277-286

**Reims [-.]**

*Annales S. Nicasii Remensis*, ed. G. Waitz, M.G.H. SS 13 (1881) 84-87

**[-.]** : scarce and scattered information

M.G.H., SS = Monumenta Germaniae historica, Deutsche Chroniken, Sriptores

M.G.H., S.R.G. = Idem, Sriptores rerum Germanicarum in usum scholarum

R.B., SS = Rerum Brittannicarum Medii Aevi, Sriptores

S.H.F. = Société de l'histoire de France

### Winter making history

The autumn of 1248, according to the monks at *Wittewierum* near *Ten Post* (*Low Countries*), was a dry one<sup>1</sup> The following winter, so it is recorded in the *Annals of the Abbey of Egmond* (*Low Countries*), didn't amount to much till mid February. Only the wind direction created amazement.

*In this same year, from the feast of the Evangelist Luke (18 October) till St Valentine's day (14 February) there was neither snow nor ice to be seen during the whole winter except for one or two nights. The wind was blowing so constantly from the west that it was only seldom that it shifted to the east for twenty-four hours and then - strangely enough - for two or three hours at night at the most.*<sup>2</sup>

Apparently it turned on 15 February, 1249 (Cf. 17 February in *England*). In *Cologne*, the winter of 1249 was very mild, with frost on only two days; furthermore this winter was wet<sup>3</sup>. In *England*, the people enjoyed springlike weather.

*The temperature of winter was entirely changed to that of spring, so that neither snow nor frost covered the face of the earth for two days together; trees might be seen shooting in February, and the birds singing and sporting as if it were April, Matthew Paris, St Albans, reports.*

But, after mid February, the weather did change, according to our diarist<sup>4</sup>.

### Three severe storm surges

The most spectacular events in this extremely mild winter were provided by three storm surges, hitting with regular intervals of about 40 days large areas of the countries adjoining the *North Sea*. *England* was among the stricken countries and the coastal shores of *Flanders*, *Zeeland*, *Holland* and the northern part of the *Low Countries* and also parts of *Germany*. Menko, abbot of *Bloemhof* in *Wittewierum*, *Groningen* is again our crown witness. The first storm surge hit the north coast of the *Low Countries* on or immediately after 20 November.

*In this year [1248], on Friday after the octave of St Martin [20 November], a heavy storm was rising, at first from the southwest, then changing to west and finally to northwest and north-northwest. A storm surge occurred and the sea dykes broke. The waters covered the surface of the earth, so that in *Rozenkamp* (*Low Countries*), where the waves leaped over the dykes at several places, they filled the whole courtyard. And so the flood caused great distress and there was a great deal of lament. While the sea was still seething, the wind changed, via north-northwest, north, and so, contrary to what usual was the case, most damage was done to the dykes facing north and south-southwest. Also winter corn and barley, sown abundantly because of the dry summer and autumn, suffered great damage. When, a short time later, the southern dyke along the sluice called the *Delft* [probably the sluice from *Winneveer* to *Delfzijl*, end of 12th c.] burst, the water flowed into all directions, especially into the southern *Wolden* [*Duurswold*]. A large part of the wheat was lost... This time, the western *Wolden* escaped from the disaster, as the wind did not blow from the east and its dyke remained undamaged.*<sup>5</sup>

Matthew Paris, too, records this surge tide, although his information is probably from hearsay.

*On 24 November (perhaps November 19 is meant; see note 11), in this year, the sea overflowed its bounds to a great distance, and caused irreparable injury to those dwelling near the coast; for when the moon, according to the computation of the calendar, was in its fourth quarter, the tide flowed with swollen waters without any visible ebb or decrease.*

The flood must have been the result of the strong wind, blowing landwards, for the sea level was not particularly high. On the day of our Lord's Advent, the fourth day before



Christmas [22 December ?], *England* was suffering from another earthquake, according to Matthew Paris. He has this from the bishop of *Bath* in whose diocese it occurred. Gaps seemed to have appeared in the ruined walls, and what was most remarkable: while the tops of chimneys, parapets, and pillars were thrown from their places, their bases and foundations were not at all disturbed. At this side of the *Alps*, it was the third earthquake within three years: one in *Savoy*, and two in *England*<sup>6</sup>. The second storm surge happened on 28 December 1248.

*When the year of our Lord 1249 had already begun [Menko is following the custom of beginning the year on Christmas Day], the 86th year after St Juliana Flood, the 55th year after St Nicolas Flood [1196], the 31st year after Marcellus Flood [1219] and the third year after the one that took place on the day of Luke the Evangelist [1246], on the nineteenth day of the lunar month, on the feast of John the Evangelist [27 December, 1248], Zephyr (west wind), quite unlike his accustomed sweetness raging like Boreas (north wind), tremendously increased in strength after evensong. At dead of night he had become so strong, that a roaring sound like this had not been heard in ages. Several houses were unroofed and some houses, even new and solidly built ones, collapsed... Around midnight a flickering light was observed in the sky; according to some it was lightning, but no sound of thunder followed... At the first cock-crow Zephyr made room for Circius [north-northwestern wind], the western neighbour of Boreas and the swirling water destroyed the dykes and overflowed its bounds, covering the country...*

The only fortunate thing was that the changing of wind direction had not happened a bit earlier, when the tide was at its highest, for then hardly anything would have remained of *Friesland*<sup>7</sup>. Probably, the low-lying country alongside the *Elbe* with the city of *Hamburg* was struck, too, on 28 December<sup>8</sup>. It is remarkable that, in *England*, on the same day, the sound of thunder was heard<sup>9</sup>. On 4 February, the third storm surge of this winter followed.

*On the day after the feast of Blasius, the virgil of the virgin Agatha, a thursday [4 February], the wind enormously increased in strength, first from the west and then from north-northwest. Again there was a surge of the sea and again the water overflowed the dykes and covered the country. And since Cirrus kept blowing uninterrupted for three days, the sea was thrown onto the land on each consecutive day. But the tide was not so extraordinarily high that the houses adjoining the shore were destroyed. Therefore not so many people were drowned at that time as were before, during the St Marcellus Flood, when the sea, in one enormous surge, all but emptied itself on the land and surprised many of those dwelling near the coast... As soon as the first flood had spread out over several parts of the country, a second one came, just as is the sea's nature ... , passing the broken dykes easily and not only extending over the coastal region, but penetrating into regions lying further inland; the fact was that there were nine floods without interruption. And then the west dyke, called the "new one", burst [This could have been the Woldijk, but also the Zandsterdijk, the second one east of the Fivel] (Menko, abbot of Wittewierum in Groningen)<sup>10</sup>*

According to the annalist of the abbey of *Egmond*, *Holland* and *Flanders* were also hit.

*In the year of our Lord 1248 around Martinmas [11 November, but perhaps 18 November was meant; see note 11], there were very severe storms and floods - the worst ever experienced within living memory - sweeping all the coasts, but especially those of the counties of Holland, Flanders and East- and West-Friesland [East-Friesland is present-day Friesland]. All along the coast, the sea dykes burst or were swept away. It was dreadful to watch how the beasts of burden and the cattle suffered death by suffocation, while men and women and children were hardly able to escape to higher spots or were sitting on the beams of their houses, till they were taken down, almost lifeless, by compassionate neighbours who put them in boats. In Delft, sea fish (called bullik and rivisk in the vernacular) was caught then with nets in the river<sup>11</sup>.*

We find Melis Stoke, still young in this year, referring to a heavy storm tide in *Flanders* and *Zeeland* and *Holland*.

*Gheschiede ene sware plaghe.  
In dien selven jare mede  
Dorghinc de vloet meneghe stede,  
Vlaendren, Zeelant alte male,  
Ende oec Hollant also wale....  
(Melis Stoke<sup>12</sup>, geb. ca 1235; cf. 1288).*

*Translated freely:  
A great calamity happened  
In this same year  
Many towns were flooded,  
Flanders, Zeeland again...  
And also Holland completely...  
(Melis Stoke<sup>12</sup>, born ca. 1235; cf.1288)*

In the *Westerschelde*, the only recently (1244) dyked (and later to be engulfed again) island *Koezand* was flooded; it had to be dyked again. The village *Vroondijke*, northwest of *Axel* in the shire *Assenede* was destroyed by the flood of 1249; it had to be rebuilt. In later years, the *Braakman* creek would come into being here<sup>13</sup> (See 1375-1376).

As we have already seen (November) *England*, too, was hit by these storm surges, but information is vague and even unreliable, and especially our main source, Matthew Paris, usually so conscientious, is dubious here for he was staying abroad during these months. Apart from the eastern coast, *Holland*, the southern coast of England must have been hit. In the little seaport *Winchelsea*, in particular, the destruction must have been enormous<sup>14</sup>. And in just less than forty years it would again be the victim of the sea's violence and would fare even worse: the village had to be abandoned (cf. 1287-1288).

After the third storm surge, it got wintry again. A general tournament was appointed to be held at *Northampton*, on Ash Wednesday, that is on 17 February, to which many people had been looking forward because of the fine weather. But it all went wrong: on the day in question heavy snow fell and it continued snowing for two days. The tournament was cancelled. On 19 February, the snow covered the earth to the depth of a foot, breaking down the branches of the trees. When the thaw came, there was such an abundance of water that it caused the furrows in the fields, now dilated like caverns, to fill with the rivulets which ran down them<sup>15</sup>.

The water, having risen higher and higher, only slowly got away. In the lower lying parts of the country this made ploughing, around St Liudger (?) (26 March) almost impossible, though the effect of salt and night frost had made the tilling of the fields quite easy. (*Wittewierum, Gr.*)

## Summer (1249)

Early July, after a deluge of rain, floods in the vicinity of *Oxford*. But there was also a period of drought in the *South of England*.

Disappointing corn and grape harvests (*Cologne*). In *Groningen* again a year of hardship, the fourth since 1246.

## NOTES

1. *Kroniek van het klooster Bloemhof*, op.cit. 373
2. *Annales Egmondenses*, Egmond, op.cit. 166
3. Alexandre, 391.
4. Matthew Paris, op.cit. 812, 813. See also 1250-1251
5. *Kroniek van het klooster Bloemhof*, op.cit. 371 ff.
6. Matthew Paris, op.cit. 821. For the dating, see Gottschalk, note 13, below
7. *Kroniek van het klooster Bloemhof*, op.cit. 371 ff
8. Weikinn, I, 110, cites some sources reporting a storm surge on 28 December, 1248, in the *Elbe estuary*, with *Hamburg*. In a *Sächsische Weltchronik* (13th c.), there is mention of a violent southwest storm, even bringing down the trees in the woods. It seemed like an earthquake. Following this there was the storm surge that burst the dykes in the "Niederlanden". Cf. 1396.
9. Britton, 98, quoting contemporary annals of *Tewkesbury Abbey* in *Gloucestershire*
10. *Kroniek van het klooster Bloemhof*, op.cit. 371 ff.

11. *Annales Egmundenses*, op.cit. 166. For the dating see Gottschalk, note 13, below.
12. Melis Stoke, *Rijmkroniek*, ed. W.G. Brill, in: *Werken uitgegeven door het Historisch Genootschap*, nieuwe reeks 40 (1885) 3e boek, 820-824.
13. Gottschalk, I (1971) 174 ff naturally discusses at length the several storm surges. She draws attention to the fact that, possibly, the date in the English source shouldn't read VIII kalends Dec. (= November 24) but XIII.kalends Dec. (= November 19): an error quite easily made by a clerk copying Roman numerals. The *Annales Egmundenses* have "around St Martin" = November 11. If we assume that the word "octave" has been mistakingly left out, then the date becomes ca. November 18. In both cases we arrive approximately at the date mentioned by Menko: November 20. For the account of what happened with Vroondijke see: Gottschalk (1984) 101 ff.
14. Matthew Paris, op.cit. 813-814, 816. Cf. also Gottschalk I (1971) 188-190. In his report of (probably) the years 1250 and 1251 (apparent from the context), Matthew Paris speaks a few times about storm surges. His descriptions are not exactly conspicuous for their accuracy and their clarity and even contain some untruths. Two storm surges can be distinguished with him: one on 1 October (1250(?)) and one in the spring of 1251(?). Of the first many details are given: in the harbour of *Hertbourne* several ships perished, in *Winchelsea*, salt-houses, fisherman's cottages, bridges and mills, more than 300 houses and some churches were swallowed by the sea. *Holland* (Linc.) as well as *Holland* on the other side of the sea and furthermore *Flanders* were hit. The second storm surge supposedly struck Friesland. On the fair at *Boston* (Linc.), Frisian merchants were (later) selling silver and golden jewelry found on drowned bodies. Obviously, Matthew Paris's record was based on garbled reports. Not surprisingly, knowing that, sent by the Pope, he spent these particular years in an abbey on the Norwegian island of *Nidarholm* (Antonia Gransden, *Historical writing in England, c. 550-1307 I*, London 1974, 356) and completely missed the infamous floods. After his return, he patched up his historical record with hearsay. His absence also shows in the limited number of details he supplies about the weather. Remarkably enough, the storm surge of 1248 he dates accurately, although without any significant details and without giving any precise locations. He never realized that, firstly, a number of details mentioned later on by him belonged to one and the same storm surge and that, secondly, the second storm surge still occurred in the same winter. Nothing at all is known about a possible storm surge in *Holland* and *Flanders* in 1250 or 1251. Conclusion: the information given by Matthew Paris for the years 1250 and 1251 (?) must refer to the storm surges of 1248-1249.
15. Matthew Paris, 813. Thomas Wykes (latter part 13th c.) talks about cold weather end of March - begin of April, continuing till mid May 1250 (=1249?).