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PDF issue: 2026-11-29

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(Citation)
歴史地理学,55(5):99-106

(Issue Date)
2013-12

(Resource Type)
journal article

(Version)
Version of Record

(URL)
https://hdl.handle.net/20.500.14094/90005689

KOBE UNIVERSITY

歴史地理学　55－5（267）99-106　2013. 12

The meteorological Observations of the *"Vereenigde Oost-Indische Compagnie (VOC)"*- What can be learned from them?

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Ⅰ. The *Vereenigde Oost-Indische Compagnie (VOC) at Dejima, Nagasaki*
Ⅱ. The meteorological observations of Carl Peter Thunberg
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Ⅰ. The *Vereenigde Oost-Indische Compagnie (VOC) at Dejima, Nagasaki*

The Vereenigde Oost-Indische Compagnie (VOC) (Dutch East India Company) was established in 1602. The Company had its first trading post on the island of Hirado. By 1641, the VOC had to transfer its trading operations to small fan-shaped man-made island of Dejima in the harbor of Nagasaki (see Figure 1). Although the Dutch presence focussed on trade and commercial activities, one or two physicians were in residence at the factory. It is mainly through these contacts that European scientific ideas in the fields of medicine, botany, astronomy, physics, etc., were introduced. Therefore, western science was named Rangaku which means Dutch learning from Orandagaku. Among those physicians, three of them, Englebert Kaempfer, Carl Peter Thunberg and Philipp Franz von Siebold (curiously enough, in contradiction with the Japanese prescriptions, none of them being Dutch), were learned men. They greatly contributed to the introduction of western sciences in Japan, and in turn, their writings containing descriptions of its land, people and customs augmented the knowledge in the West on the remote Japan.

Ⅱ. The meteorological observations of Carl Peter Thunberg

Carl Peter Thunberg was born in Jönköping in Småland, South Sweden, in 1743 and studied medicine at Uppsala. He passed some years at the Dutch Cape of Good Hope factory in order to learn Dutch and to be able to pass himself off as a Dutchman. He did extensive botanical work in South Africa. Thunberg arrived in Dejima in August 1775 where he took charge as physician of the trading – post of the Dutch East Indies Company. In the spring of 1776 he took part in the Dutch Embassy to the Shogun at Yedo. He left Japan for Europe by the end of 1776 and returned to Uppsala in 1779. Thun-

Key words: VOC, meteorological observation, Dejima (Nagasaki), historical climatology

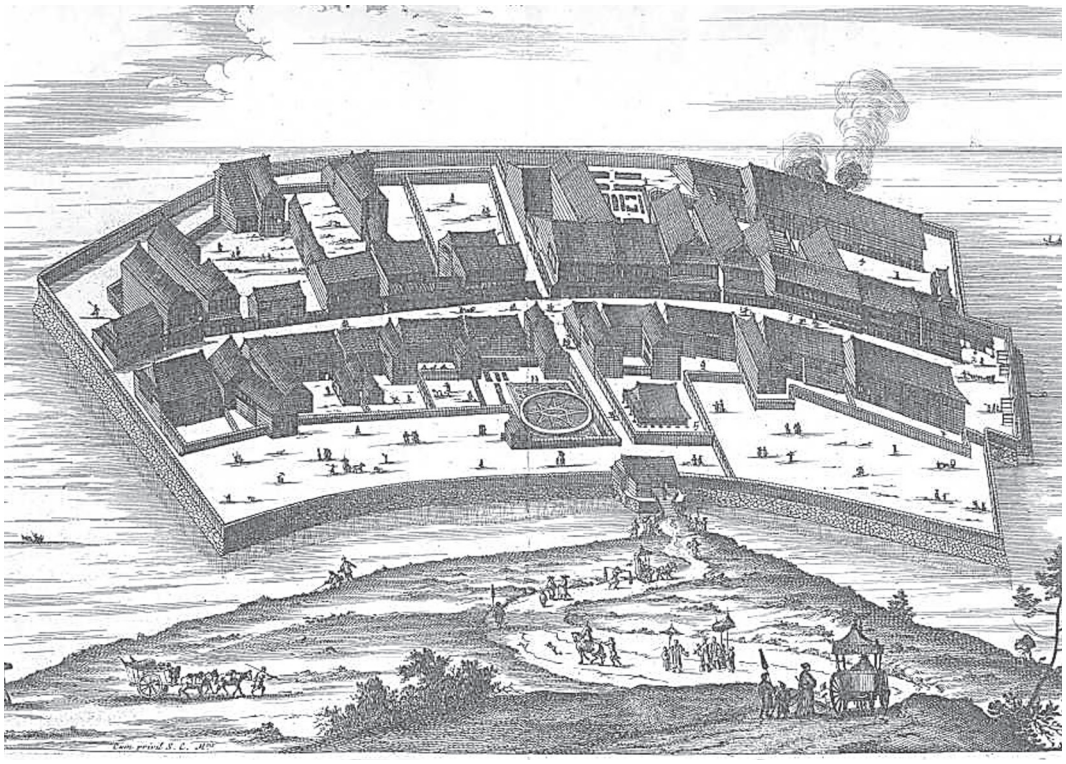


Fig. 1 Dejima, Nagasaki from the book by Arnoldus Montanus (1669)

berg became professor of medicine and natural philosophy at the University of Uppsala in 1781 and was appointed in 1784 the botanical professor's duty 'the Chair of botany' after Carl Linnaeus the Younger (1741-1783) (Wallin, 1993).

His travels in Europe, Africa and Asia during the years 1770 through 1779 were published in Swedish language at Uppsala (Thunberg, 1791), and translated in German, French and English. The French edition (Thunberg, 1796) has been translated and complemented by Louis Mathieu Langlès (1763-1824) and for the part of natural sciences by Jean-Baptiste Lamarck (1744-1829).

The first known set of instrumental meteorological observations (1st September 1775-31st October 1776) were carried out by Thunberg (Demarée & Mikami, 2000). His observations were presented and read at the *Hollandsche Maatschappye der Weetenschappen* at Haarlem on March 2, 1779. They were consequently published in the *Verhandelingen* in 1780 (Thunberg, 1780). Thunberg was put on the list of the candidates of the Society on August 3, 1780 and was subsequently elected member of that learned Society on 21 May 1781. It may be questioned that Thunberg's observations are the first systematic instrumental meteorological observations in Japan. Although no definite answer has been given today, some other possibilities have been suggested by Tsukahara (see Tsukahara, 2010, p.233).

The first edition in Swedish of Thunberg's *Travels* also hold the data set. The temperature

(in integer degrees Fahrenheit) was noted four times-a-day (in the morning just before sunrise, at 12 o'clock at noon, at 3 o'clock in the afternoon, and at the evening when dark). Thunberg describes the instrument as *with a double glass, and filled with quicksilver, and was affected by the slightest change of weather. I always kept it hanging on the outside of my chamber window, by the side of the wall, against a wooden post in a northern aspect, and in the open air*.

At the very beginning of his meteorological notes, Thunberg writes on September 1st, 1775, "*On the Island Decima*", followed on the 14th October 1775 "*At the ship near Papenberg*", and again on 26th October 1775 "*On the Island Dezima*". Does this back-and-forth travel explain the somewhat rather scarce meteorological information at the starting period? His observations were chiefly made at Dejima, a part was made during his journey to the court in Jedo [Tokyo]. According to these notes, the journey to the court started from Dejima on 4 March 1776, the party arrived in Osacca [Osaka] on April 8th, in Miaco [Kyoto] on April 11th, in Jedo on May 1st, and started traveling back to Nagasaki on 26th May, arriving in Miaco on June 7th, in Osaka on June 11th, in Kokora [Kokura] on June 23rd, and finally back at Dejima on June 29th. Thunberg's meteorological observations end on 31 October, 1776 (see Figure 2). Thunberg left Dejima on 23 November 1776 to board the ship *Stavenisse* near *Papenberg* and left Japan on December 3rd, 1776. It may be noted that the time span of Thunberg's meteorological observations do not exactly correspond with the day of his arrival to and departure from Japan.

Besides the instrumental thermometric observations, Thunberg's records contain also notes on the *state of the weather*. Herein the character of the rainy days (rain, mizzling rain, thunder showers, small rain, hard rain, rain and thunder, ..., snow, hoar frost) is described. The notes further contain limited information on the wind directions. It should be noted that the oldest paper (Thunberg, 1780) contains some information which has not been reproduced in the books afterwards. The most important words are without doubt the mention of the medical information *Rheumatismi en de Tuccis algemeen* (Rheumatisms and caughts general) on the 27th January 1776 which puts Thunberg in the neo-Hippocratic spirit of his time. Noteworthy for its lyric expression is the mention on 20th January 1776: "In the night ice frozen as thick as three ducats".

Ⅲ. Further VOC meteorological observations

A second, much less known, set of meteorological observations at Dejima is covering the time span January through November 1778/1779. This set has been first published in the Proceedings of the Batavian learned Society (Anonymous, 1784) and has been quoted by Louis Mathieu Langlès in his French edition of Thunberg's *Voyages (1796), Tome III*. Langlès named these data *Observations météorologiques faites à Nagasaki en 1779*; however, a doubt may remain on the exact year, 1778 or 1779, since in the original publication the headings of the pages 84 & 85 read *Japon 1778* while the pages 86 & 87 mention *Japon 1779*. However, from the original title in the Proceedings, it is thought that the observations are referring to the year 1779 (see Figure 3).

The data consist of monthly highest and lowest temperature values, monthly means in the morning, noon and evening of the temperature (see Figure 2), the monthly number of

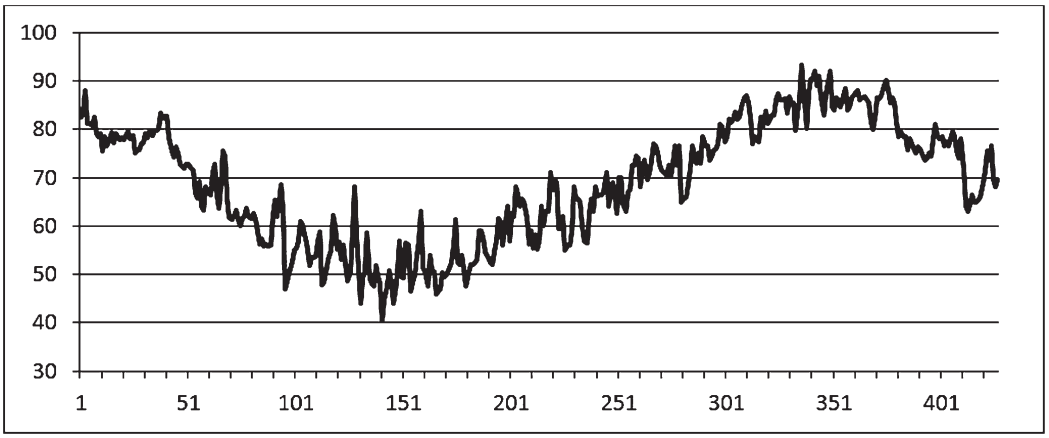


Fig. 2 Arithmetic mean temperature of the 4-times-a-day meteorological observation carried out during Sep. 1775–Oct. 1776 by Thunberg at Dejima, Nagasaki, and during the travel to the Shogun at Jedo. (unit: °F)

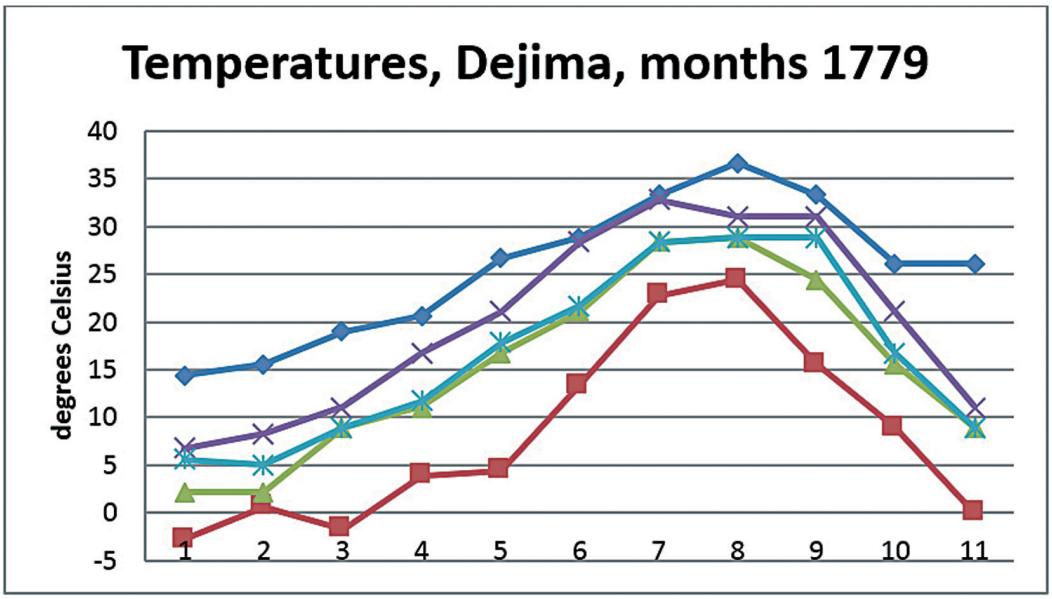


Fig. 3 Monthly highest (top) and lowest (bottom) temperature values, monthly means in the morning (green), noon (purple) and evening (light blue) of the temperature (in degrees Celsius) at Dejima, Nagasaki, in the months January to November 1779 (Anonymous, 1784).

days with wind directions, rain, storm, frost, thunder, etc. Again a Fahrenheit temperature scale is used and it is legitimate to ask if not the same thermometer as Thunberg's one is being used here. It is strongly suggested (Tsukahara, 2006) that these anonymous meteorological observations have been observed and reported by Arend Willem Feith (1745–1782), who has been appointed five times as the *Opperhoofd* (=Head) of Dejima, from the following arguments: (1) A.W. Feith was *Opperhoofd* for the period 12.11.1777 to 28.11.1779, a time span

fully including the period of the observations whenever the year of the observations would be 1778 or 1779; (2) A.W. Feith was one of the three members of the Batavian Society of Arts and Sciences who have staid in Japan; (3) Feith was also *Opperhoofd* of Dejima (28.10. 1775 to 22.11.1776) when Thunberg was carrying out his observations; (4) the climatological time-series stops at November 1779 when Feith left Dejima. According to these arguments Feith looks more or less as continuing Thunberg's observations. Unfortunately, the daily observations could not be tracked today.

Isaac Titsingh (1822) was *Opperhoofd* of Dejima for the period 24.11.1781 to 26.10.1783. He gives contemporaneous accounts of the eruption of the volcano Asama which took place in August 1783. Isaac Titsingh wrote frequently about climatic conditions in his diary (Tsukahara, 2010). *The Catalogue raisonné du Cabinet Titsingh* contains in III.3 Meteorology the (missing) item *Un Petit cahier in folio écrit en hollandais de la main du Défunt, contenant des observations Météorologiques* (Lequin, 2003). It is not known where these meteorological observations were carried out as Isaac Titsingh has been stationed in various VOC-posts.

It is interesting to compare the number of rainy days mentioned in the different data sets. They are compared to the present-day rainfall climate of Nagasaki. It is expected that the historical non-instrumental data show less rainy days than the instrumental CLIM61-90 data as the observer might have been unaware of light rainfall or of rainfall occurring in the night. The number of Thunberg's winter 1775-1776 rainy days is relatively large compared to the CLIM 61-90 data (see Table 1 – the years 1776-1779 are a protracted La Niña sequence – reference: Allan & D'Arrigo, 1999). As Thunberg's and Feith's records of temperature and rainy are rather short one may conclude that it is difficult to draw general climatic conclusions.

Table 1 Number of monthly rainy days according to the historical non-instrumental data of an official diary at Nagasaki (1700-1872) in 1775 and in 1776 (Mikami, 1993), to Thunberg's data (Sept. 1775 – Oct. 1776), to Feith's data (Jan. – Nov. 1779) and to the CLIM 61-90 data. The sign (-) represent no data.

	Mikami	Mikami	Thunberg	Thunberg	Feith	CLIM
	1775	1776	1775	1776	1779	61-90
Jan.	-	-	-	15	3	10
Feb.	-	-	-	7	4	9
March	6	9	-	11	8	10
April	4	7	-	8	0	11
May	10	14	-	9	0	11
June	7	8	-	9	14	13
July	6	16	-	9	4	11
Aug.	3	8	-	9	0	8
Sept.	-	5	2	8	11	9
Oct.	-	6	4	7	6	6
Nov.	-	3	4	-	9	8
Dec.	-	4	12	-	-	9

Ⅳ. Epilogue

Although the 19th century falls partly outside the scope of this presentation, it may be noted that other Dutch physicians, in line with their 17th and 18th century predecessors, carried out meteorological observations. From 1819 onwards instrumental meteorological observations were carried out at Dejima (Können *et al*., 2003).

Japan is extremely rich in the field of climatological records confined in historical documents. A large number of old Japanese diaries preserved in local libraries, museums or archives contain precious quasi-daily continuous weather descriptions. Some of these diaries start already in the second half of the 17th century and span a period of two centuries. This richness in weather descriptions complements the instrumental meteorological observations (to name only a few: Yoshimura, 1995; Mikami, 1988; Mikami, 1996; Mikami, 1999; Fukaishi and Tagami, 1993).

In the first half of 19th century, instrumental meteorological observations were carried out by Japanese researchers as well as the Dutch at Dejima. The situation changed completely after the opening of Japan in 1854 when a larger number of meteorological series become available. Zaiki has made a complete inventory and has produced long-term time series (Zaiki, 2004; Zaiki *et al*., 2006). Finally, a regular weather observation system as a government service was started in Tokyo on June 1, 1875.

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オランダ東インド会社（VOC）の気象観測
― そこから何を学び取るか？ ―

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気候学研究でなすべき挑戦の一つとして、気候の自然変動に関する知識を深めることが挙げられる。それ故、気候の歴史パズルの断片を集めて、過去1000年間の気候復元に向けた努力が図られるのである。本稿は、日本を訪れた西洋人によって初期に行われた気象観測記録、とりわけ長崎港の小さな人工島である出島においてオランダ東インド会社の医師達が行った気象観測に焦点をあてる。特に強調したいのは、18世紀に行われた二つの測器による気象観測データの価値が再評価されたという点である。これらの気象観測データは、日本の歴史気候データを補完する上で重要である。

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キーワード：オランダ東インド会社 (VOC)，気象観測，長崎出島，歴史気候学