

5. Historická klimatologie

5.1 Definice a vývoj historické klimatologie

Historical climatology is defined as a research field situated at the interface of climatology and (environmental) history, dealing mainly with documentary evidence and using the methodology of both climatology and history. It is directed towards the following three objectives:

- It aims at reconstructing temporal and spatial patterns of weather and climate as well as climate related natural disasters for the period prior to the creation of national meteorological networks (mainly for the last millennium).
- It investigates the vulnerability of past societies and economies to climate variations, climate extremes and natural disasters.
- It explores past discourses and the social representations of the climate.

Brázdil et al. (2005)

5.2 Dokumentární údaje o počasí

Archives	Natural		Man-made	
Information				
direct observation of weather and climate or instrumental measurement of meteorological parameters			observed • anomalies • natural hazards • weather situations • daily weather	measured • barometric pressure • temperature • precipitation • water-gauge, etc.
indirect references: (Proxy data) indication of controlled or affected processes through meteorological parameters	organic • tree rings • fossil pollen • animal and plant remains • fossil wood (trees), etc.	non-organic • ice-cores • varves • terrestrial sediments • temperature of boreholes • moraines, etc.	organic • plant phenology • yield of vine • time of grain and vine harvest • sugar content of wine, etc.	non-organic • water levels • snow fall • freezing of water bodies • snow cover, etc.
			• cultural: rogations • pictorial	• epigraphical • archeological remains
			material:	

5.2.1 Zdroje vyprávěcí povahy

anály, kroniky, paměti atd.

5.2.2 Vizuální denní pozorování počasí

5.2.3 Obrazové dokumenty

5.2.4 Liturgické prameny

Rogation services (rogativas) of the Spanish church - documentary proxy climatic indicator

5.2.5 Prameny ekonomické povahy

Knihy počtů města Loun (SZ Čechy)

Informace o pravidelných sobotních výplatách mezd za zemědělské a různé obecní práce (ve vztahu k počasí - např. vysekávání ledu mezi mlýnskými koly a u mlýnů na řece Ohři, odklizení sněhu, žňové práce)

5.2.6 Lodní deníky

The sailing ship of the great of sail was the highest technological achievement of its time. They created, unintentionally, a near-global network of weather observation platforms.

Ships sailed the world's oceans, trading, fighting, exploring and maintaining the great European empires. Officers of all nations were obliged to keep logbooks, and in which a careful daily record of the weather was included.

It is estimated that well over 120,000 logbooks are held in British archives for the period 1650 to 1850, with additional collections in Spain, the Netherlands and France (and elsewhere?).

This represents over 6,000,000 days of reliable and detailed weather data.

Until c.1790, the observations are non-instrumental and include:

1. Wind force (non-Beaufort until c.1836)
2. Wind direction
3. Notes on the weather of the day (rain, hail, snow, fog, thunder, cloud etc.)

Barometer and thermometer readings were not commonplace until after 1800.

Studies by the CLIWOC project (Climatological Database for the World's Oceans: 1750 to 1850) have concentrated on data verification, calibration and on the preparation of a database (285,00 entries thus far) and ICOADS collaboration – visit: www.ucm.es/info/cliwoc
Global coverage is good for the N & S Atlantic and Indian Oceans, but poor for the Pacific.

5.2.7 Epigrafické prameny

5.2.8 Ostatní dokumentární prameny

- Příležitostné tisky - moralistický spis faráře Víta Jakeše Přerovského věnovaný vichřici z 28. prosince 1612
- Osobní korespondence
- Noviny
- Časné vědecké práce a sdělení

5.2.9 Dokumentární nepřímé (proxy) údaje

Proxy vine data

- beginning of vintage
- amount of wine
- quality of wine

5.3 Metody historicko-klimatologické analýzy a rekonstrukce

The index of record density Hz (*Pejml, 1966*)

$$Hz = k_1P_1/365 + k_2P_2/52 + k_3P_3/12 + k_4P_4/4 + k_5P_5$$

P_i - the number of observations (i - kind of records: 1 - daily, 2 - weekly, 3 - monthly, 4 – seasonal, 5 - annual),

k_i - the transfer coefficient (k₁=84.1, k₂=12.0, k₃=2.8, k₄=0.9, k₅=0.2)

- 1- narrative sources
- 2 - visual daily observations

Kinds of climatic evidence from historical documents from the High Middle Ages

- Prior to AD 1300: Reports of socio-economically significant anomalies and (natural) disasters.
- 1300 to 1500: More or less continuous reports on characteristics of summers and winters (to some extent also on those of spring and autumn) including reference to “normal” conditions.
- 1500 to 1800: Almost complete description of monthly weather, to some extent also of daily weather.
- 1680 to 1860: Instrumental measurements made by isolated individuals. First short-lived international network observations
- From 1860: Mostly instrumental network observations

Pfister (2001)

Kritická práce s daty – historické kompilace zpráv o počasí

Advantages of descriptive documentary data

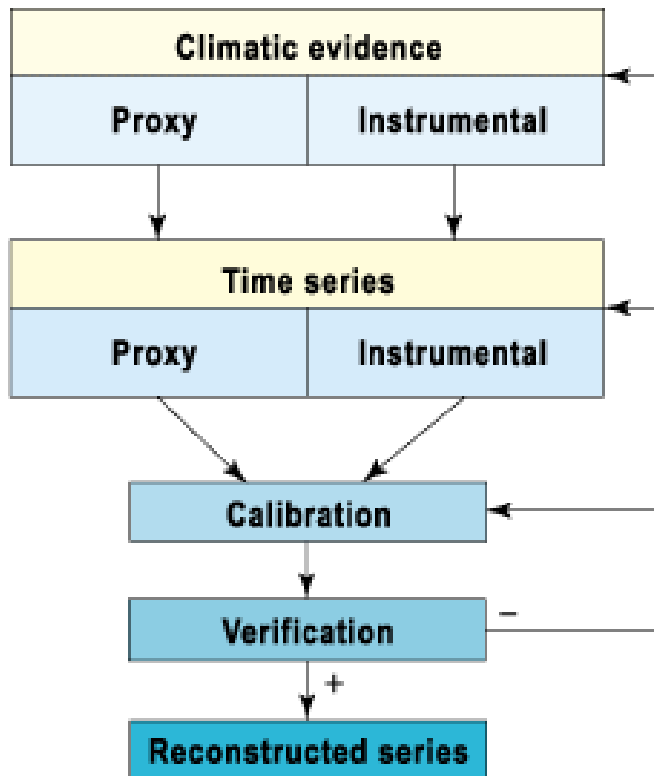
- Good dating control and high temporal resolution.
- Clear distinguishment of meteorological elements in the narrative reports (e.g. temperature, precipitation, snow cover, wind).
- Focus on anomalies and natural disasters.
- Taken together they cover all months and seasons

Drawbacks of descriptive documentary data

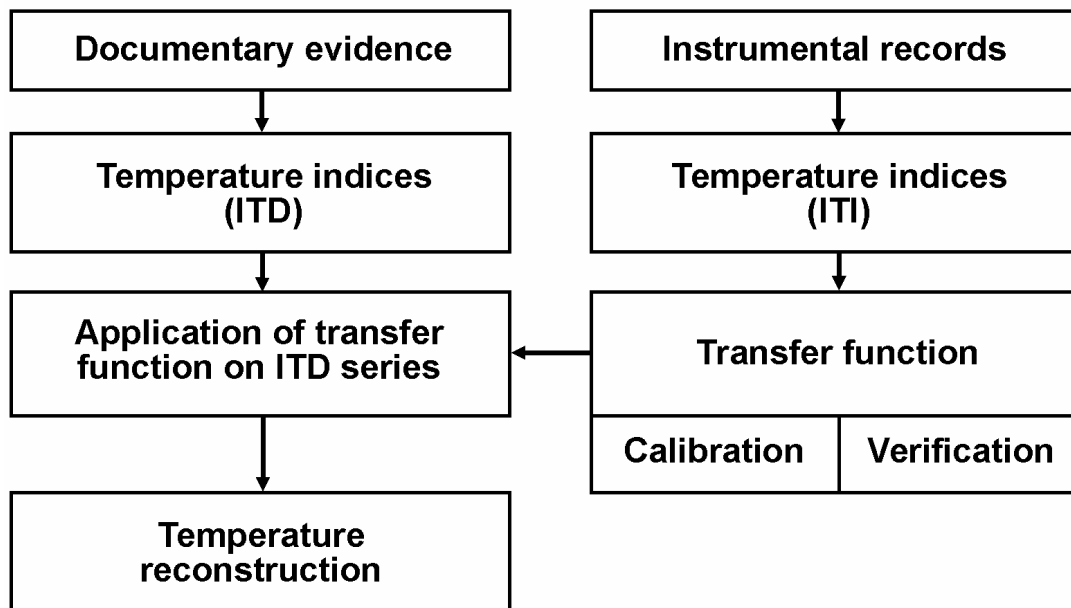
- Discontinuous structure of the records (due to the death of observers).
- Bias by the selective perceptions of observers.
- Mathematical analysis is simple but robust, however this may be a drawback for the acceptance of results in the scientific community.

(Pfister et al., 1999)

Rekonstrukce teploty vzduchu a srážek



- index series (documentary evidence) - monthly: simple -1 to 1, weighted -3 to 3
- transfer function (index - measured value)
- verification - different statistics
- reconstruction



The diagram of the quantitative climatic reconstruction

5.4 Časové škály v historické klimatologii

Short term: events with a duration of days to seasons

Medium term: variations with a duration of more than a year

Long term: variations with a duration of centuries -

Medieval Warm Period (MWP)

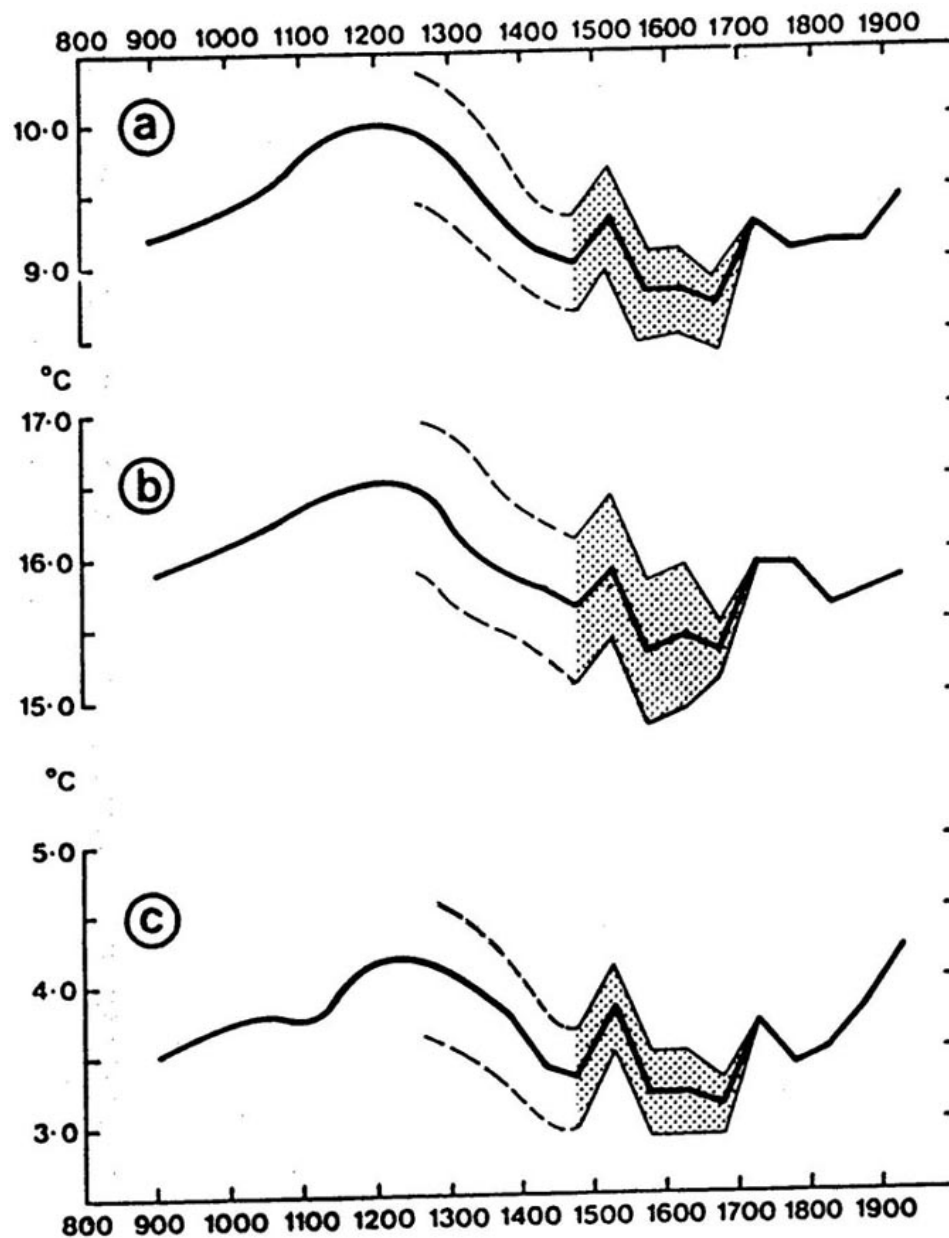
Little Ice Age (LIA)

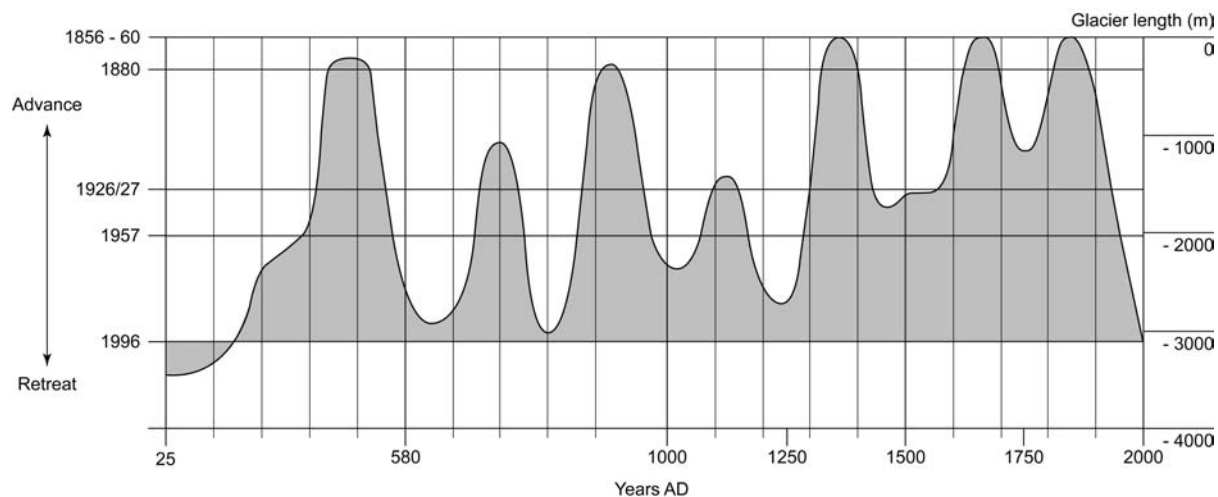
Recent Global Warming (RGW)

Lamb's climatic paradigm of the past millennium

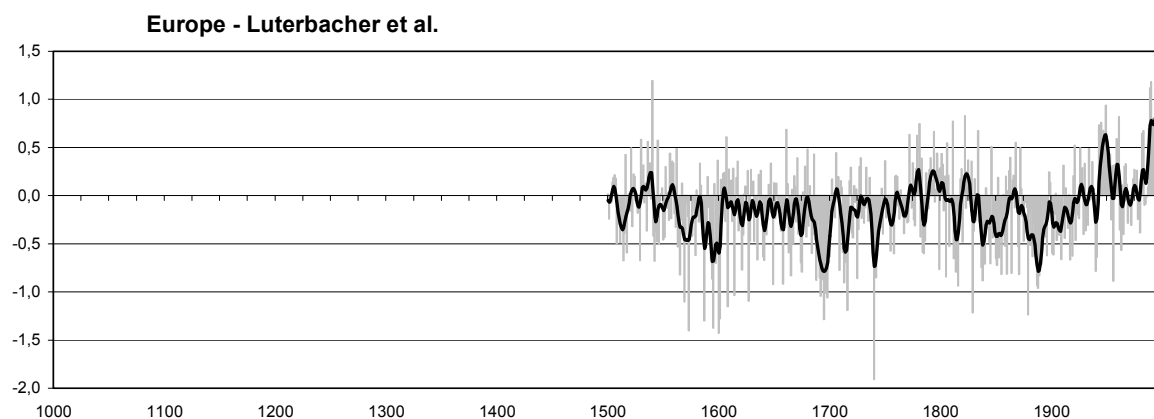
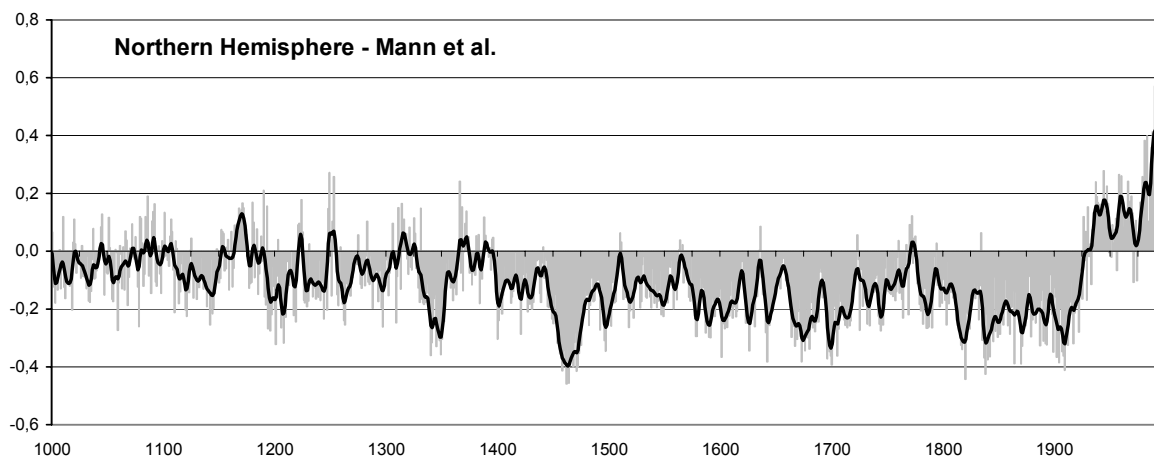
Lamb (1984):

- Medieval Warm Epoch (AD 950-1200) (1150-1300)
- Period of climate deterioration (AD 1200/1300-1550)
- Little Ice Age (AD 1550-1850)
- Recent global warming (after 1850)





Fluctuations in the length of the Grosser Aletsch glacier (the Alps, Switzerland) in the past millennium (corrected according to Holzhauser and Zumbühl, 1999)



5.5 Studium anomálií a extrémů

5.6 Rekonstrukce přízemního tlakového pole

5.7 Modelování klimatu

Doporučená literatura:

- Brázdil, R., Kotyza, O. (2002): Současná historická klimatologie a možnosti jejího využití v historickém výzkumu. Časopis Matice moravské 120/2001/Supplementum, s. 17-59.
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