

Technological tool for historical climate data rescue in the Slovak Hydrometeorological Institute

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Motivation

1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation
2. Meteorological observations in Hurbanovo
3. Presentation of Hurbanovo temperature series
4. Data rescue of historical climatological observation from Hurbanovo

Content of presentation

1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation
2. Meteorological observations in Hurbanovo
3. Presentation of Hurbanovo temperature series
4. Data rescue of historical climatological observation from Hurbanovo

1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

- a. Invention of basic meteorological instruments in 17th century
- b. The first systematic meteorological observations and measurements in the Austro-Hungarian territory
- c. The Meteorological Society of Mannheim – beginning of international meteorological networks
- d. Establishment of state meteorological services
- e. International co-operation in meteorology

1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

a. Invention of basic meteorological instruments in 17th century

Florence, 1657:

Foundation of the **Accademia del Cimento** (Academy of Experiment) – scientific society (duration ca 10 years)

- Experimentation (about everything, in this early period of science)
- Avoidance of speculation
- Creation of laboratory instruments
- Standards of measurement
- Motto – *Provando e riprovando* (Try and try again)

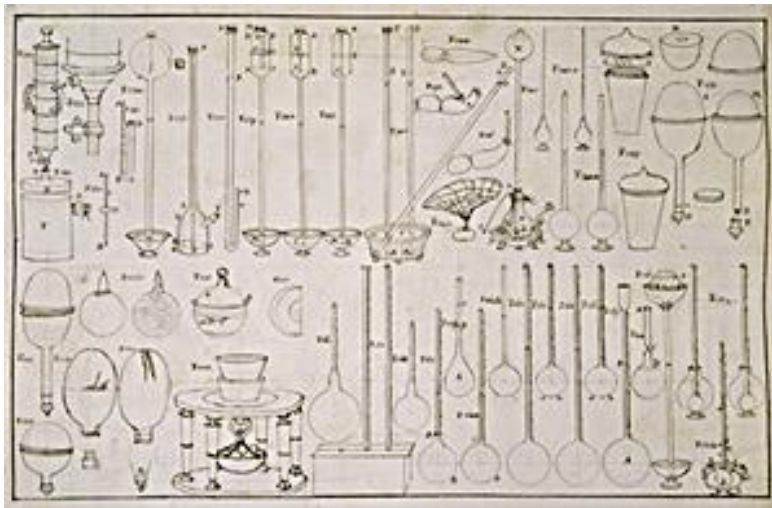


„International Scientific Conference“, Hurbanovo, 18.05.2016

1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

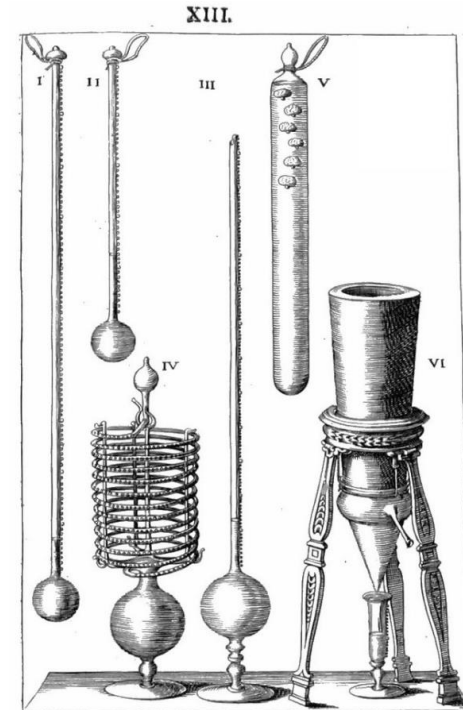
a. Invention of basic meteorological instruments in 17th century

Basic meteorological instruments from Academy of Experiment:
Barometer, Thermometer, Hygrometer



Main profit for meteorology:

- Standards in measurements
- Comparable results



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1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

b. The first systematic meteorological observations and measurements in the Austro-Hungarian territory

First known systematic „professional“ meteorological records using instruments are from Prešov: Adam Reiman (1690 – 1770)

- Meteorological records in the period 1717 – 1720
- Measurements – three times a day
- Barometer from Jena
- Thermometer from Florence (Accademia del Cimento?)

1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

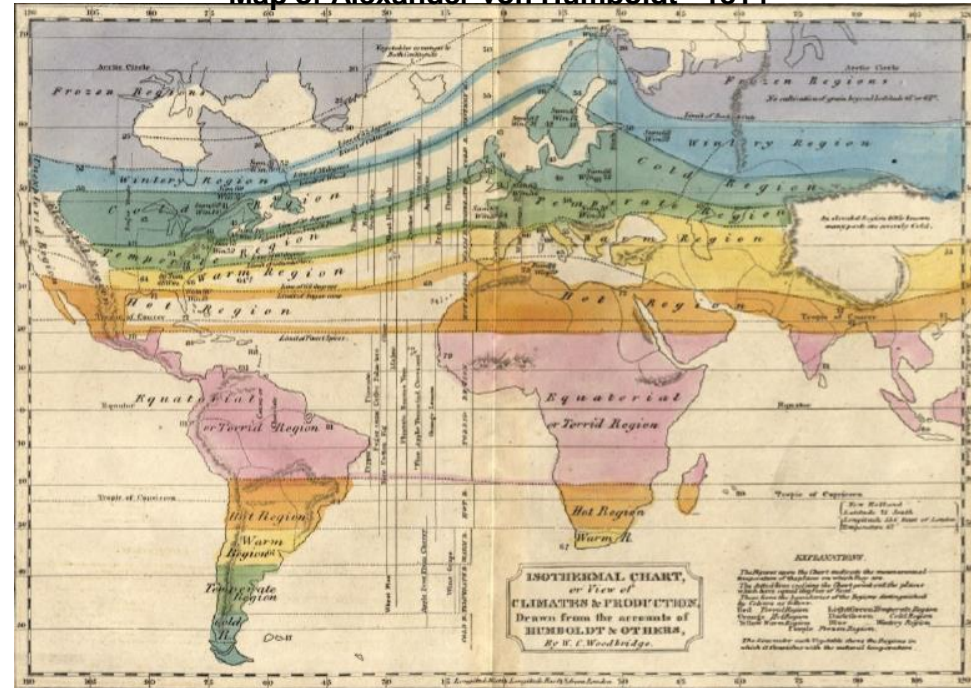
c. The Meteorological Society of Mannheim – beginning of international meteorological networks

Societas Meteorologica Palatina, founded 1780 in Manheim Germany),

Measurements: 1783 – 1795

- + The first society organising meteorological observation world-wide
- + 39 stations (Europe, Russia, Groenland, North America)
- + Unified instruments (Thermometer, Barometer, Hygrometer)
- + Measurements in fixed terms: at 7:00, 14:00, 21:00
- + Usage of unified forms, symbols etc.

Map of Alexander von Humboldt - 1814



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1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

d. Establishment of state meteorological services

- Meteorology starting to take a universal character due to increasing needs for climate and weather data collection for practical purposes.
- National economies required the development of meteorological station networks and the perfecting of observational methods.
- 1851: Foundation of ***Zentralanstalt für Meteorologie und Erdmagnetismus*** in Vienna
 - The oldest state meteorological service in the world
 - Foundation of Meteorological network
 - Unified measurements, instruments
 - Scientific research in the service



Karl Kreil (1798 – 1862) the first director of Institute

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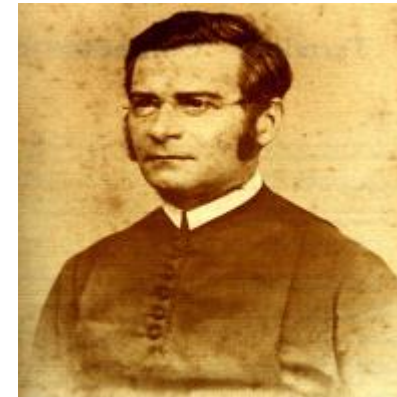
1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

d. Establishment of state meteorological services

1870 - Foundation of the ***Royal Hungarian Central Institute of Meteorology and Earth Magnetism*** in Budapest

The main tasks of the Institute:

- organize and assess meteorological measurements,
- investigate the climatic features of Hungary



Schenzl Guidó (1823 – 1890), the first director of Institute

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1. Development of meteorological observations and measurements in Europe since 17th century till the Hurbanovo Observatory foundation

e. International co-operation in meteorology

1853 – the First International Meteorological Conference in Brussels

- Standardise meteorological observation to be taken from ships

1872 – Leipzig Conference (52 directors of Met services)

- Preparation of the establishment of the International Meteorological Organisation (IMO)
- Standardisation of land-based meteorological observations

1873 - the First International Meteorological Congress, Vienna

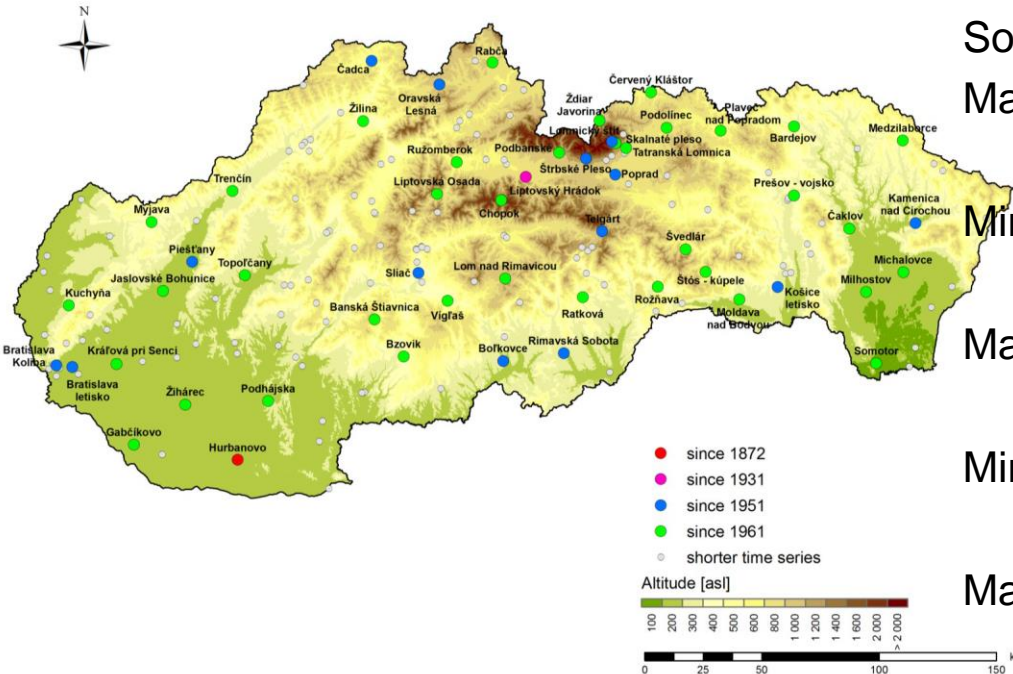
- Establishment of IMO and its Permanent committee
- Principle for co-operation
- Definition of met phenomena, symbols for hydrometeors, classification of met stations, necessity of global observation

1879 - the Second International Meteorological Congress, Rome

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2. Meteorological observations in Hurbanovo

The position of the Observatory in the southern part of Slovakia is the perfect combination with Vienna and Budapest stations to assess climate features of this region



Some records from Hurbanovo:

Maximum temperature:

40,3 deg (20.07.2007)

Minimum temperature:

-35,0 deg (11.02.1929)

Maximum annual precipitation:

978 mm (2010)

Minimum annual precipitation:

322 mm (2011)

Maximum snow depth:

49 cm (Feb.1929)

Meteorological data from Hurbanovo station are an excellent source for climate variations studies and climate change detection

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2. Meteorological observations in Hurbanovo



- First meteorological records from 1871
- No essential changes in the position (some replacements within area of 300 m in the Observatory area)
- Usage of the screen for temperature measurement
- Change of height of thermometers bulbs gradually from 1,3 to 1,65 m over ground
- Some changes in terms of observation till 1893
- Rare breaks in observation (mainly in 1888)

In the contrast with Vienna, Prague and Budapest, Hurbanovo remained the provincial city with practically no urban influence on measurement quality (urban island etc).

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2. Meteorological observations in Hurbanovo



Praha – Klementinum observatory (measurements from 1775)
one of the Mannheim Meteorological Society network

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2. Meteorological observations in Hurbanovo

Meteorologiai észleletek.
Meteorologische Beobachtungen.

Ér. 1878
Jahr 1878
Hónap Január
Monat

Eszlelési állomás Beobachtungs-Station
Eszlelő Nagy János asszisztens
Beobachter

Műszerek Instrumente
Eszlelési órák Beobachtungsstunden

Nagy János
1878. I. 9.

Nap (Tag)	Közvetlen leolvasás Umittelbare Ableseung				0° fokra visszavitt légnyomat reducirter Barometerstand				Száraz Thermometer (trocken) Celsius sz.				Nedvesített Thermometer (nass) Celsius sz.				Páranymot Dunstdruck Mittelwert				Nedvesség Feuchtigkeit százalékok in Procenten				Felhőzet Bewölkung detült/ =0 borult/ =10 trübe				Szel-iránya és erőssége Wind-Richtung und Stärke szél-erősség Windstärke				A felhők hozama és alakja Zug und Form der Wolken				C 24 Nin binen MI Magyar Óra
	Thermo- meter a baro- metern	Baro- meter	Thermo- meter a baro- metern	Baro- meter	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	
	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	7 ^a	8 ^a	9 ^a	Közép Mittel	
1	10	28.11	10	28.11	10	28.11	28.10	28.10	28.10	8.9	6.5	7.1	7.2	8.1	6.5	7.1	0.93	1.28	1.16	1.14	100	100	100	100	10	10	10	10	N ₁	N ₁	N ₁	N	N	N			
2	10	28.11	10	28.11	10	28.11	28.10	28.10	28.10	8.4	5.9	6.2	6.5	7.7	5.6	6.1	1.13	0.88	1.01	0.67	83	59	81	74	10	10	10	10	NE ₁	NE ₁	NE ₁	N	N	N			
3	10.0	28.10	0.5	28.90	0.5	28.90	28.09	28.09	28.09	8.1	2.1	3.0	2.9	3.8	2.1	3.7	1.10	1.04	1.12	1.05	94	100	100	98	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N			
4	0.5	28.80	0.0	28.80	0.0	28.80	28.79	28.79	28.79	6.2	2.1	3.0	3.2	6.5	2.1	3.7	1.08	1.30	1.52	1.26	91	95	100	92	10	0	10	7	SW ₄	SE ₁	SW ₁	N	N	N			
5	10	28.80	10	28.80	0.5	28.70	28.79	28.79	28.79	7.9	2.1	3.0	3.5	5.8	2.5	4.6	0.77	1.62	1.40	1.66	81	100	100	85	10	0	10	7	SE ₁	SE ₁	SE ₁	N	ES	N	18		
6	10	28.80	10	28.80	10	28.80	28.79	28.79	28.79	7.3	2.5	3.0	3.4	3.4	2.5	3.4	0.90	1.63	1.97	1.93	41	52	77	66	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N	24		
7	10	28.80	10	28.80	2.0	28.70	28.79	28.79	28.79	1.8	2.5	2.5	2.3	1.5	2.5	2.5	2.13	2.40	2.40	2.31	73	100	100	97	10	10	10	10	W ₁	N ₁	N ₁	N	N	N	180		
8	2.0	28.80	2.0	28.80	2.0	28.80	28.79	28.79	28.79	0.6	0.2	0.0	0.3	0.6	0.2	0.0	2.09	2.15	2.01	2.04	100	100	100	100	10	10	10	10	NE ₁	NE ₁	NE ₁	N	N	N			
9	2.0	28.80	2.0	28.80	2.0	28.80	28.79	28.79	28.79	0.0	1.2	1.8	0.2	0.6	0.8	4.0	1.35	2.09	1.01	1.62	87	95	58	80	10	0	0	3	NE ₁	NE ₁	NE ₁	N	N	ES			
10	2.0	28.80	2.0	28.80	2.0	28.80	28.79	28.79	28.79	0.0	1.2	1.8	0.2	0.6	1.2	3.2	1.71	2.10	1.52	1.87	100	100	100	100	10	10	0	7	SE ₁	SE ₁	SE ₁	N	S	E			
11	2.0	28.80	2.0	28.80	2.0	28.80	28.79	28.79	28.79	0.0	1.2	1.8	0.2	0.6	1.2	3.2	1.44	1.59	1.31	1.44	82	95	100	95	10	10	0	7	SE ₁	SE ₁	SE ₁	N	N	N			
12	8.0	28.80	1.0	28.80	1.0	28.80	28.79	28.79	28.79	4.4	2.5	5.6	2.2	4.6	2.4	5.6	1.92	1.59	1.31	1.44	100	100	100	92	10	10	10	10	SW ₁	SW ₁	SW ₁	N	N	N			
13	4.0	28.80	1.0	28.80	0.0	28.80	28.79	28.79	28.79	4.4	2.5	5.5	2.1	4.6	2.5	5.8	1.44	1.68	1.08	1.90	100	100	100	92	10	10	10	10	SW ₁	SW ₁	SW ₁	N	N	N			
14	1.0	28.80	1.0	28.80	1.5	28.70	28.79	28.79	28.79	5.6	0.0	4.4	3.3	5.6	0.2	4.4	1.20	2.00	1.94	1.50	100	100	100	100	10	10	10	10	SW ₁	SW ₁	SW ₁	N	N	N			
15	0.5	28.70	0.5	28.70	0.5	28.70	28.69	28.69	28.69	4.6	1.3	3.4	3.1	4.6	5.0	3.4	1.40	0.58	0.54	1.16	88	85	100	76	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N			
16	0.5	28.80	1.0	28.80	0.5	28.80	28.80	28.80	28.80	4.4	1.2	4.4	3.3	4.4	0.2	4.4	1.44	1.50	1.44	1.57	100	100	100	100	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N			
17	1.0	28.70	1.0	28.70	1.5	28.60	28.69	28.69	28.69	2.7	0.0	1.8	1.5	2.7	0.0	4.3	1.14	2.00	1.74	1.21	100	100	100	100	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N			
18	1.0	28.40	1.5	28.30	1.5	28.30	28.29	28.29	28.29	0.0	3.1	1.8	1.8	0.6	2.5	1.5	2.09	2.33	2.13	2.12	90	89	89	92	10	0	10	6	SE ₁	SE ₁	SE ₁	N	N	N			
19	2.0	28.30	2.0	28.30	2.0	28.30	28.29	28.29	28.29	1.8	2.5	1.8	1.8	1.8	2.5	1.5	2.33	2.40	2.19	2.37	90	100	96	97	8	0	10	6	SE ₁	SE ₁	SE ₁	N	N	N			
20	2.0	28.30	2.0	28.30	2.0	28.30	28.29	28.29	28.29	1.8	3.4	1.2	1.2	1.8	3.1	0.8	2.33	2.40	2.09	2.37	86	94	95	95	10	0	0	3	SE ₁	SE ₁	SE ₁	N	N	N			
21	2.0	28.30	2.0	28.30	2.5	28.20	28.29	28.29	28.29	0.2	3.8	1.5	1.4	0.0	2.7	1.8	1.90	2.62	2.23	2.34	10	100	96	95	0	0	0	0	SE ₁	SE ₁	SE ₁	N	N	N			
22	2.0	28.30	2.5	28.20	2.5	28.10	28.29	28.29	28.29	0.6	0.5	1.8	1.6	0.6	1.8	1.8	1.90	2.62	2.23	2.34	10	92	95	95	0	7	8	5	SE ₁	SE ₁	SE ₁	N	N	N			
23	2.0	28.40	2.5	28.40	2.5	28.30	28.29	28.29	28.29	0.6	0.5	0.2	0.5	1.8	0.6	0.0	1.18	1.90	1.94	1.50	10	92	95	95	10	7	8	3	SE ₁	SE ₁	SE ₁	N	N	N			
24	2.5	28.30	2.5	28.30	2.5	28.30	28.29	28.29	28.29	2.5	3.8	2.4	2.2	0.6	1.8	1.2	2.09	2.13	2.63	2.15	10	96	95	87	10	7	8	8	SE ₁	SE ₁	SE ₁	N	ES	ES			
25	2.5	28.30	2.5	28.30	3.0	28.20	28.29	28.29	28.29	2.5	3.4	2.4	2.4	1.8	3.8	2.1	1.67	2.38	2.37	2.15	88	91	95	91	7	8	10	8	SE ₁	SE ₁	SE ₁	N	N	N	28		
26	2.5	28.30	3.0	28.40	3.0	28.30	28.29	28.29	28.29	2.1	3.1	2.4	2.5	1.8	3.1	2.5	2.14	2.44	2.41	2.34	88	91	95	91	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N	11		
27	3.0	28.40	3.0	28.40	3.0	28.30	28.29	28.29	28.29	2.5	3.8	2.4	2.2	2.1	3.4	2.1	2.30	2.46	2.24	2.36	88	91	95	91	10	10	10	10	SE ₁	SE ₁	SE ₁	N	N	N			
28	3.0	28.40	3.0	28.40	3.0	28.30	28.29	28.29	28.29	1.8	3.1	2.4	2.5	2.1	3.4	2.1	2.30	2.46	2.24	2.36	88	91	95	91	7	8	0	4	SE ₁	SE ₁	SE ₁	N	N	N			
29	3.0	28.80	3.0	28.80	3.0	28.80	28.79	28.79	28.79	1.8	0.2	1.8	1.3	1.5	1.2	1.8	2.09	2.13	2.29	2.32	85	100	100	98	0	0	0	0	SE ₁	SE ₁	SE ₁	N	N	N			
30	3.0	28.80	3.0	28.80	3.0	28.80	28.79	28.79	28.79	0.8	0.6	1.8	1.4	1.5	1.2	1.8	2.09	2.13	2.29	2.32	85	100	100	98	0	0	0	0	SE ₁	SE ₁	SE ₁	N	N	N			
31	3.0	28.40	3.0	28.40	3.0	28.40	28.39	28.39	28.39	0.2	5.0	0.2	0.3	0.0	5.0	0.8	1.95	2.38	1.58	2.32	97	89	100	91	8	0	0	8	SE ₁	SE ₁	SE ₁	N	N	N			

Összevétel
Summen von

1-5
6-10
11-15
16-20
21-25
26-31
1-81

Max. 71.0
Minim. 71.5

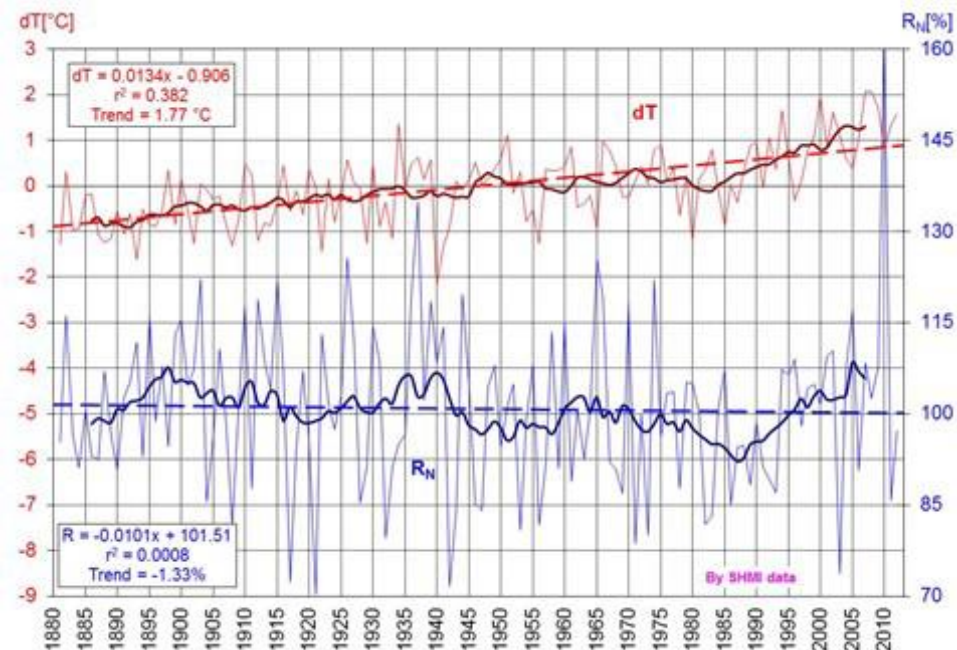
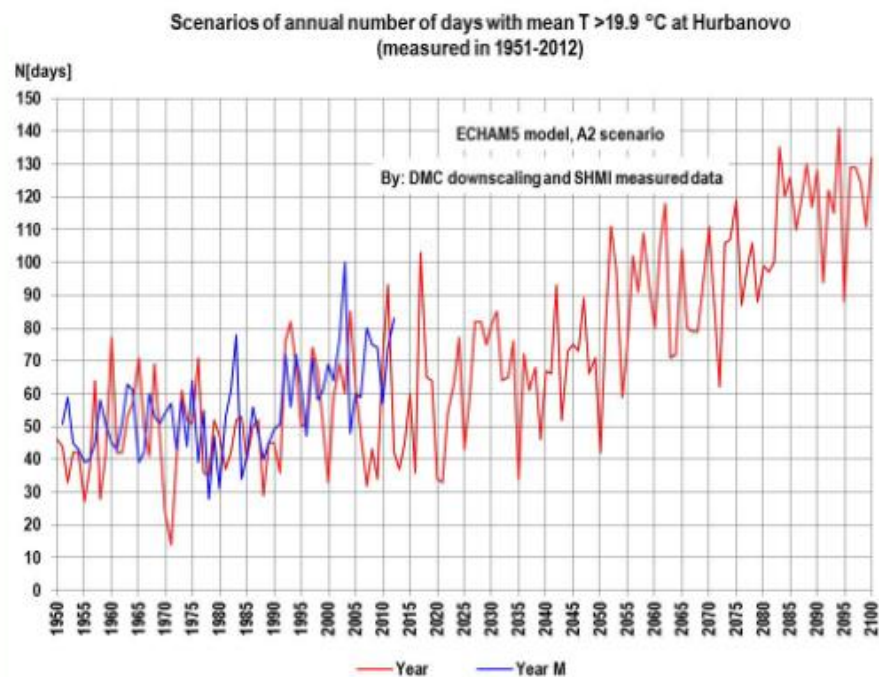
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3. Presentation of Hurbanovo temperature series

THE SIXTH NATIONAL COMMUNICATION OF THE SLOVAK REPUBLIC ON CLIMATE CHANGE

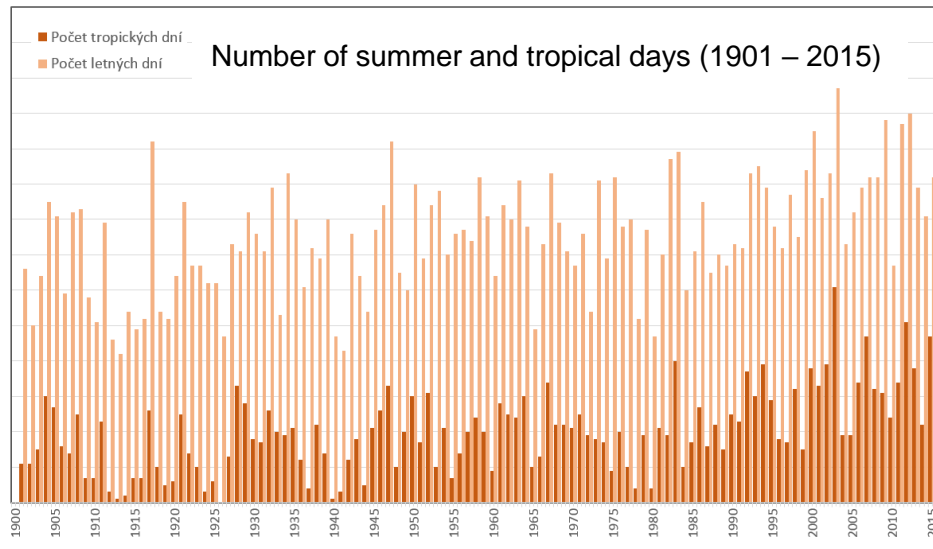
Figure 6.2: Scenarios of annual number of warm days (with average temperature $\geq 20^\circ\text{C}$) at Hurbanovo in 1950-2100, by modified ECHAM5 model outputs, SRES A2 emission scenario and by measured warm days data in 1951-2012 (SHMI data applied)



3. Presentation of Hurbanovo temperature series

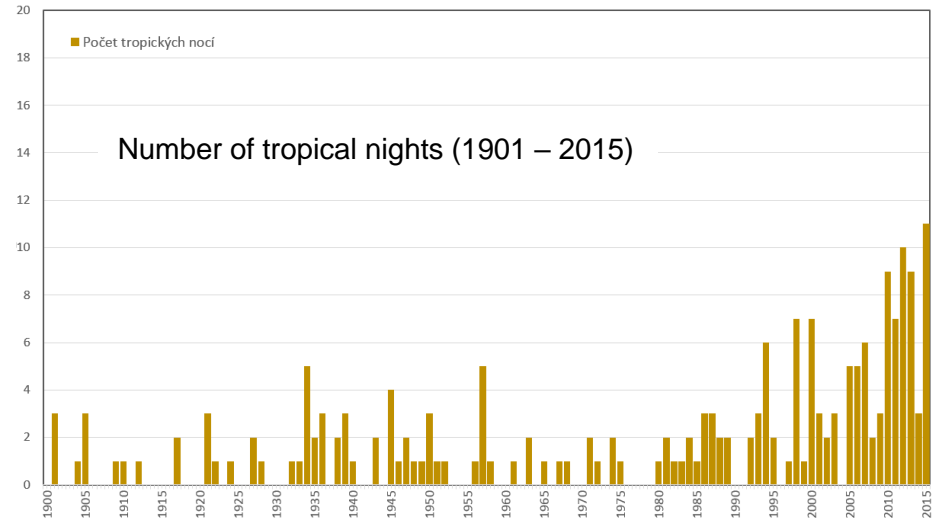
Počet letných ($T_{\max} \geq 25^\circ\text{C}$) a tropických dní ($T_{\max} \geq 30^\circ\text{C}$)

Number of summer and tropical days (1901 – 2015)



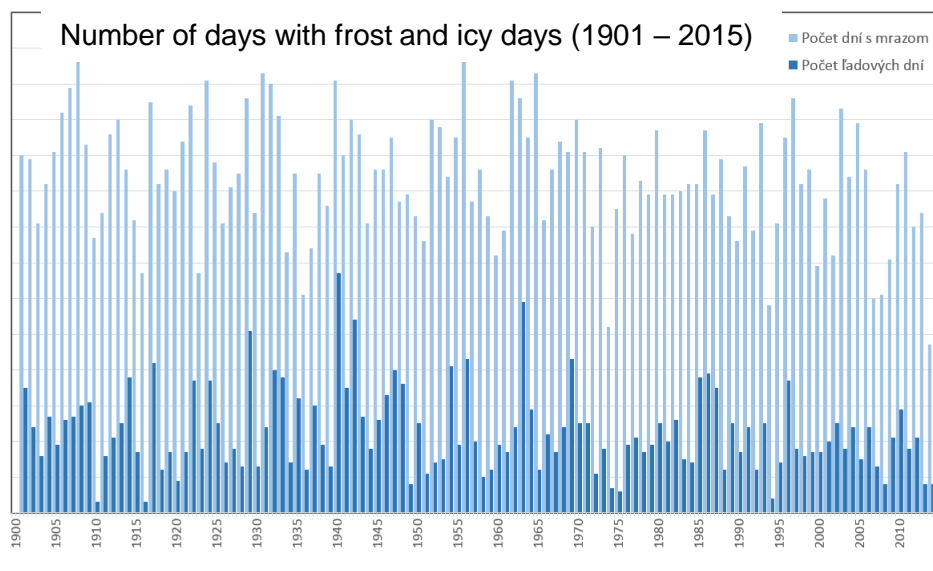
Počet tropických nocí
 $T_{\min} > 20^\circ\text{C}$

Number of tropical nights (1901 – 2015)



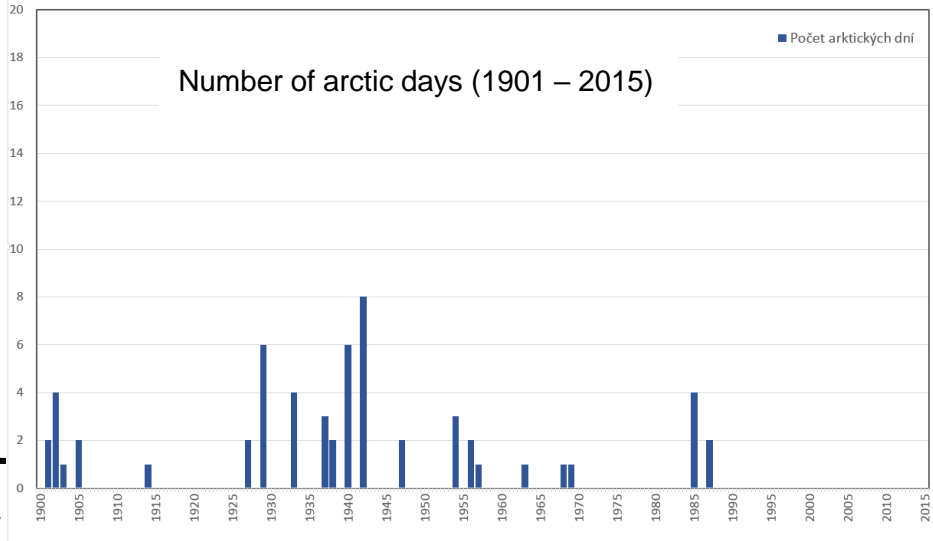
Počet dní s mrazom ($T_{\min} < 0^\circ\text{C}$) a počet ľadových dní ($T_{\max} < 0^\circ\text{C}$)

Number of days with frost and icy days (1901 – 2015)



Počet arktických dní
 $T_{\max} < -10^\circ\text{C}$

Number of arctic days (1901 – 2015)

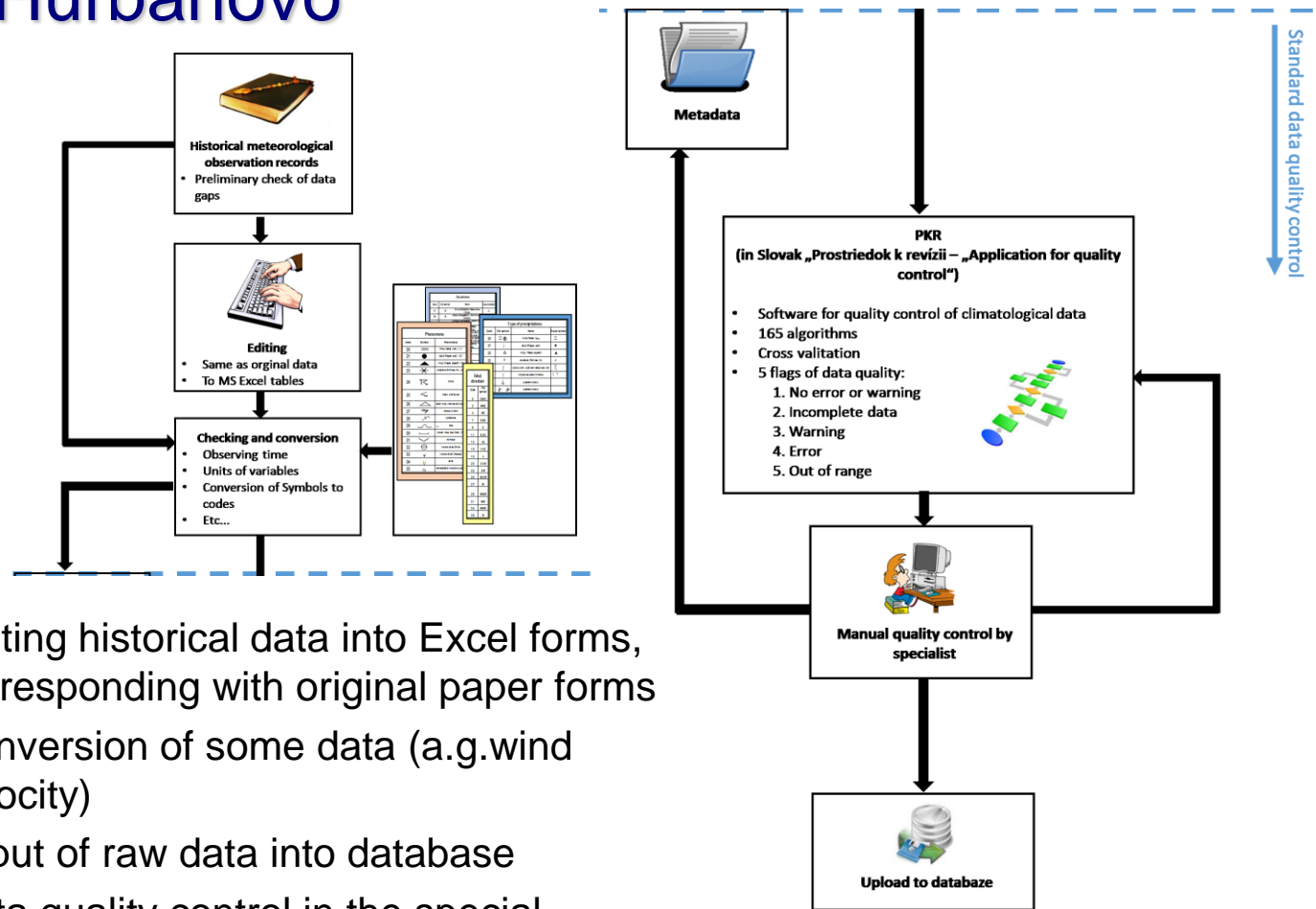


4. Data rescue of historical climatological observations from Hurbanovo

- The electronic database of SHMI contains digitized climatological data consistently since 1961
- Later on, the portion of data from 14 stations since 1951 was added into the database
- Hurbanovo data were completed into database since 1901
- The time series of daily data (measured at 7:00, 14:00 and 24:00) from Hurbanovo station were inserted into special EXCEL forms since 1872
- Currently quality control process on data is underway
- Next plans: after finishing QC of data from Hurbanovo, to start with Liptovský Hrádok station (since 1881)
- Activities of SHMU are in accordance with DARE – WMO project

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4. Data rescue of historical climatological observations from Hurbanovo



- Editing historical data into Excel forms, corresponding with original paper forms
- Conversion of some data (a.g. wind velocity)
- Input of raw data into database
- Data quality control in the special programme, the same as for current data
- Checked and validated data stored in electronical archive

The technological tool for editing, quality control and archiving historical data

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4. Data rescue of historical climatological observations from Hurbanovo

11858 - Hurbanovo

Data Zobrazit Bunka Stĺpec Riadok

Vkladám mesačný výkaz

DATUM	Tx	Tn	Tg	TxD	TxN	TnD	TnN	T07	T14	T21	e07	e14	e21	VL7	VL14	VL21	U07	U14	U21	P07	P14	P21	d07	f07	d14	f14	d21	f21	N07	N14	N21	SSS	VVP	VTP	HML	SP7	SP14	SP21	ss	sss
31.03.97	17.7	5.8						7.2	16.1	11.7	6.4	6.3	7.3	84	47	72				744.3	743.2	740.6	09	1	18	2	18	4	8	6	8	4.2	1.5		-1.0	-1	-1	-1	-1	-1
01.04.97	18.9	8.9						8.9	18.2	12.4	7.7	7.5	6.4	91	48	60				738.1	736.3	735.2	22	2	18	4	09	3	8	4	3	7.4	1.9		-1.0	-1	-1	-1	-1	-1
02.04.97	10.8	5.5						10.6	10.7	7.3	8.1	8.6	6.2	85	91	82				732.9	733.9	735.5	13	2	31	2	31	4	10	10	10	0.8			-1.0	-1	-1	-1	-1	-1
03.04.97	9.1	0.0						3.8	8.3	2.0	4.6	3.9	3.9	77	48	73				740.3	741.3	742.3	36	5	36	6	00	0	10	7	0	4.3	1.3		-1.0	-1	-1	-1	-1	-1
04.04.97	10.9	-1.1						2.4	9.6	7.2	4.1	4.6	6.1	75	52	80				740.6	738.2	738.2	09	2	18	4	13	2	10	10	10	1.1			-1.0	-1	-1	-1	-1	-1
05.04.97	9.1	3.6						6.3	8.0	3.7	7.1	7.5	4.8	99	93	80				740.2	744.0	746.7	09	1	36	2	36	4	10	10	0	0.5	0.3		-1.0	-1	-1	-1	-1	-1
06.04.97	12.3	0.9						2.0	11.1	3.9	4.4	3.7	4.6	84	38	75				747.5	746.6	747.0	31	3	27	3	00	0	1	1	0	10.2	1.4		-1.0	-1	-1	-1	-1	-1
07.04.97	13.8	1.9						3.8	13.3	5.4	5.2	5.2	5.8	87	45	86				747.8	748.3	749.2	00	0	27	3	00	0	2	2	0	7.0	0.9		-1.0	-1	-1	-1	-1	-1
08.04.97	16.0	0.4						2.3	14.5	8.3	5.3	5.7	6.7	98	47	82				750.2	749.3	750.1	00	0	36	2	00	0	2	3	3	10.3	1.1		-1.0	-1	-1	-1	-1	-1
09.04.97	16.2	3.4						3.5	15.6	7.0	5.6	6.1	5.5	95	47	74				751.1	750.8	751.3	18	1	27	1	31	1	3	5	2	7.4	1.0		-1.0	-1	-1	-1	-1	-1
10.04.97	16.2	2.5						4.4	14.3	8.5	5.5	6.0	6.3	89	49	76				750.9	749.2	748.8	36	1	36	4	31	3	2	7	7	7.6	1.4		-1.0	-1	-1	-1	-1	-1
11.04.97	17.2	4.8						6.6	15.4	8.6	6.1	6.3	6.0	84	48	71				747.8	745.8	746.3	36	3	36	4	31	1	2	5	7	8.5	1.5		-1.0	-1	-1	-1	-1	-1
12.04.97	10.8	4.6						7.3	8.7	6.3	5.9	6.8	6.7	78	81	94				745.8	745.7	747.0	36	4	31	4	27	3	7	10	10	0.7			-1.0	-1	-1	-1	-1	-1
13.04.97	13.8	5.5						6.3	12.8	9.5	6.8	7.2	7.3	96	66	83				750.2	751.7	752.4	18	1	13	3	13	2	10	9	7	2.1	0.6		-1.0	-1	-1	-1	-1	-1
14.04.97	19.1	6.9						7.6	18.4	12.0	7.1	8.0	8.6	91	51	83				753.4	753.0	753.4	09	1	22	2	31	1	4	7	6	6.6	1.3		-1.0	-1	-1	-1	-1	-1
15.04.97	21.4	6.2						7.6	19.6	13.4	7.7	8.7	9.4	99	51	82				754.4	753.7	754.4	00	0	27	2	00	0	2	2	9	9.6	1.1		-1.0	-1	-1	-1	-1	-1
16.04.97	11.4	6.6						9.0	8.5	7.3	8.1	7.8	7.1	95	94	93				756.4	757.3	757.7	27	2	27	2	27	2	10	10	9	0.4			-1.0	-1	-1	-1	-1	-1
17.04.97	14.9	4.8						6.6	13.6	8.0	6.4	6.3	6.0	88	54	75				758.4	758.1	756.8	31	1	31	3	00	0	6	2	0	6.7	1.1		-1.0	-1	-1	-1	-1	-1
18.04.97	19.5	3.7						7.1	19.0	12.1	6.6	6.0	7.8	87	36	74				753.8	749.5	747.1	18	2	18	3	22	1	2	7	9	8.2	1.8		-1.0	-1	-1	-1	-1	-1
19.04.97	13.5	3.6						6.9	11.6	4.7	5.4	4.7	5.2	73	46	81				749.0	748.5	748.0	31	4	31	5	00	0	10	4	2	9.3	1.8		-1.0	-1	-1	-1	-1	-1
20.04.97	18.7	2.9						7.7	18.3	11.3	5.2	5.3	6.6	67	34	66				745.9	742.9	741.8	13	2	18	3	13	2	9	5	10	6.5	2.3		-1.0	-1	-1	-1	-1	-1
21.04.97	14.2	5.5						7.9	14.2	7.8	7.1	6.9	6.2	89	57	79				744.4	746.4	749.7	31	2	31	4	31	5	10	6	3	5.1	1.2		-1.0	-1	-1	-1	-1	-1
22.04.97	19.4	2.0						4.1	17.0	12.0	5.6	5.5	7.2	92	38	69				752.0	750.0	747.7	13	2	27	1	13	2	0	2	10	9.7	1.2		-1.0	-1	-1	-1	-1	-1
23.04.97	10.6	5.2						8.7	8.7	7.2	7.6	6.1	5.5	91	73	73				746.0	748.5	749.7	31	2	31	3	31	2	9	10	10	0.6			-1.0	-1	-1	-1	-1	-1
24.04.97	10.1	4.5						4.8	9.5	7.8	4.7	6.5	7.1	73	74	90				748.8	747.0	743.6	00	0	09	3	00	0	10	10	10	0.6			-1.0	-1	-1	-1	-1	-1
25.04.97	14.6	7.0						8.9	13.4	9.6	7.2	8.6	8.1	86	75	91				744.1	746.6	748.7	00	0	31	1	27	2	10	10	3	1.0	0.4		-1.0	-1	-1	-1	-1	-1
26.04.97	18.7	6.0						8.4	17.1	12.9	7.8	8.8	9.3	94	61	85				751.7	753.4	754.9	18	1	27	2	00	0	10	4	10	4.6	0.8		-1.0	-1	-1	-1	-1	-1
27.04.97	21.0	9.6						12.2	18.2	11.3	9.4	8.3	7.8	90	54	78				757.1	758.0	758.5	09	2	09	4	13	1	7	8	0	6.8	1.3		-1.0	-1	-1	-1	-1	-1
28.04.97	22.9	6.8						9.7	22.2	13.7	6.3	5.8	6.3	70	29	54				758.8	757.8	756.6	09	3	18	4	13	2	0	0	0	12.4	2.3		-1.0	-1	-1	-1	-1	-1
29.04.97	25.9	12.2						14.0	23.4	15.6	7.0	11.3	11.5	59	53	87				756.7	755.8	754.8	13	2	18	2	00	0	0	5	1	8.6	2.6		-1.0	-1	-1	-1	-1	-1
30.04.97	24.6	11.2						13.0	22.6	15.5	9.8	10.3	10.3	89	50	79				754.3	752.2	750.0	00	0	27	2	00	0	0	4	2	9.5	1.4		-1.0	-1	-1	-1	-1	-1
01.05.97	24.2	11.9						15.2	22.8	16.2	10.8	10.9	12.2	84	53	89				747.5	745.3	744.6	09	1	13	3	00	0	0	7	1	10.1	1.9		-1.0	-1	-1	-1	-1	-1

Data quality control in the special programme
(T21 day before are higher then Tmax in actual day)



Thank you for your attention