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FINNISH METEOROLOGICAL INSTITUTE

Data recovery and rescue at FMI

8th Seminar for Homogenization and Quality Control of Climatological Databases

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Observation service

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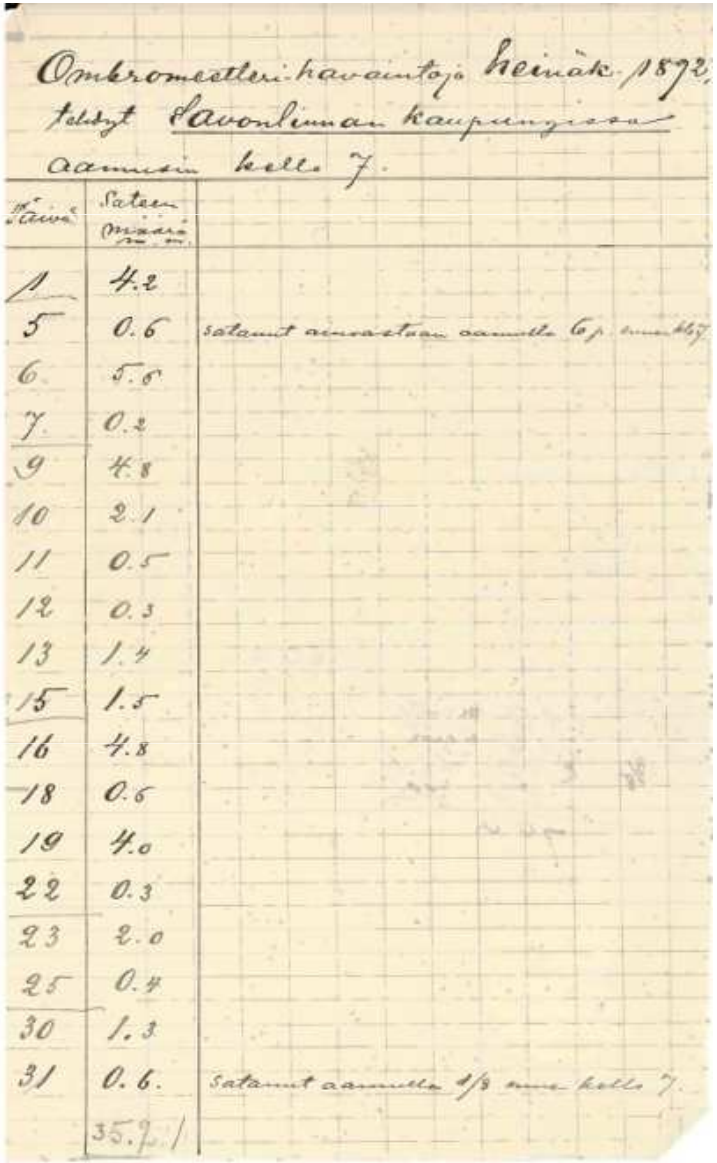
Why to rescue historical data, e.g. …?

- **Climatological importance**
  - Improved understanding of historical climate variability and changes
  - e.g. climate change study
  - National and international interest
- **FMI data gradually open for public use starting from June 2013**
  - Interest to open historical data
    - Temperature and precipitation open for 2 stations from the beginning of the observation series (Kaisaniemi from 1828, Sodankylä from 1908)
- **Sheets do not last forever!!!**


Ombrometerin-havaintoja heinäk. 1892,
tehdyt Savonlinnan kaupungissa
aamusin kello 7.

Päivä	Sateen määrä mm	
1	4.2	
5	0.6	Sataunt aamuseen aamulla 6 p. mm 4.7
6	5.6	
7	0.2	
9	4.8	
10	2.1	
11	0.5	
12	0.3	
13	1.4	
15	1.5	
16	4.8	
18	0.6	
19	4.0	
22	0.3	
23	2.0	
25	0.4	
30	1.3	
31	0.6.	Sataunt aamulla 1/8 mm kello 7.
	35.7.1	

Example of a rain sheet from July 1892

Importance of metadata

- **If metadata is unknown, observations are useless!!!**
- **Changes in**
  - station surrounding
  - station location (coordinates)
  - observation instruments
  - Observer
  - Timing system
    - When are the observations done and in which time (local, UTC)

… influence e.g. continuity, quality etc… of observations

- **Also e.g. maintenance at the station should be known**
- **Information given by the observer important and interesting**
- **Metadata from 1944: Station description**

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Weather station in eastern of Finland, in Pudasjärvi

In year 1968

…and in year 2004

…in year 2000

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State of data rescue/digitizing at FMI

- **Observation sheets since late 1800**
- **Station types: climate (3-4 obs./day), SYNOP (8 obs./day), precipitation (1 obs./day)**
- **In principle, since ~1960 observations digitized**
  - In practice, not fully
- **Data of weather observation stations (SYNOP, climate) mainly in digital form up to 1959**
- **Digitizing of precipitation station data in progress**
- **There are various data sets that are not digitized and for which there are no plans how and when the rescue should happen**
  - e.g. hourly observations from aviation stations, co-operated observations
  - The needs and priorities should be clarified

State of data rescue/digitizing at FMI

Digitizing of weather observation station data

- **Responsibility in Climate service center unit**
- **50 stations digitized**
  - Oldest digitized stations operated since 1881
- **Main parameters: temperature, dew point pressure, RH, cloudiness, snow depth, wind direction and speed**
  - Varied between stations
- **Quality control of digitized data**
  - No automatic control
  - manual control through the digitizing process
  - No flagging
- **In FMI's operative database**

Asematietoja

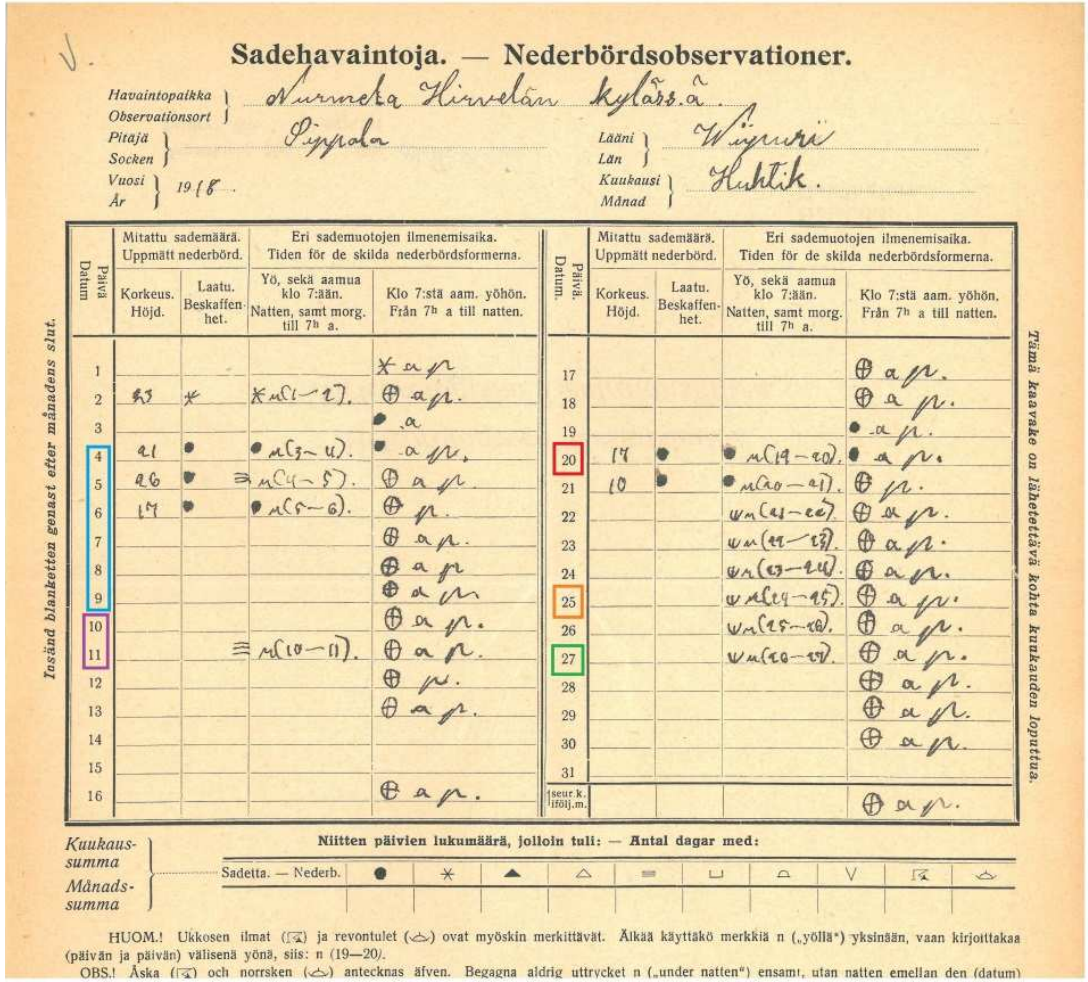
Lpnn	Nimi	Lon	Lat	Korkeus merenpinnasta	Alkaa	Päättyy	Muutospäivä
1	Maarianhamina	19.54	60.07	2	01.08.1884	31.12.1959	-
14	Märket	19.08	60.18	3	01.12.1885	31.12.1959	-
16	Bogskar	20.21	59.3	4	08.02.1884	31.07.1914	-
101	Hanko	22.57	59.46	5	01.01.1881	31.12.1959	-
205	Salo Kärkkä	23.06	60.22	3	01.07.1936	31.12.1958	-
304	Helsinki Kaisaniemi	24.56	60.1	4	01.10.1828	31.12.1959	-
380	Inkoo Älkila	24.06	60.05	20	01.06.1931	31.12.1950	-
404	Tikkurila	25.04	60.18	25	01.06.1937	31.12.1959	-
405	Tuusula Ruotsinkylä	25	60.22	60	01.01.1925	30.09.1959	-
1080	Säppi majakka	21.21	61.29	6	01.01.1881	30.09.1962	-
1101	Turku	22.16	60.27	16	01.01.1881	31.12.1939	-
1104	Kokemäki Peipohja	22.15	61.16	37	01.01.1931	31.12.1959	-
1112	Eura Kauttua	22.1	61.06	53	01.03.1925	31.12.1942	-
1180	Karkku	22.59	61.23	52	15.12.1909	31.08.1925	-
1303	Hattula Leteensuo	24.15	61.04	88	01.01.1925	31.12.1959	-
1304	Hattula Lepaa	24.2	61.07	89	01.09.1927	31.12.1959	-
1380	Hattula Parola	24.21	61.02	102	19.01.1949	31.08.1962	-
1506	Heinola	26.02	61.12	100	01.01.1908	31.12.1959	-
1701	Lappeenranta	28.11	61.04	98	23.07.1886	31.12.1960	-
2080	Yttergrund	21.18	61.59	3	01.01.1925	29.02.1960	-
2403	Jyväskylä	25.44	62.14	115	01.01.1883	31.12.1959	-
2580	Hankasalmi	26.25	62.23	110	01.01.1909	31.08.1923	-
2680	Mikkeli Karila lentokenttä	27.13	61.41	100	12.10.1951	31.12.1963	-
2801	Punkaharju Laukansaari	29.19	61.48	78	01.01.1904	31.12.1959	-
2902	Tohmajärvi Kemie	30.21	62.14	90	01.01.1925	31.12.1959	-
3001	Vaasa	21.46	63.02	4	01.08.1882	31.12.1959	-
3003	Mustasaari Valassaaret	21.04	63.25	5	25.08.1895	31.12.1960	-
3201	Kauhava	23.01	63.06	48	11.11.1931	31.12.1960	-
3301	Ähtäri	24.13	62.32	157	01.01.1910	31.12.1960	-
3502	Vesanto	26.24	62.57	127	01.01.1914	31.12.1959	-
3603	Maaninka koeasema	27.19	63.09	88	01.01.1930	31.12.1954	-
3603	Maaninka koeasema	27.19	63.09	85	01.01.1930	31.12.1959	01.01.1954
3801	Joensuu	29.36	62.39	118	01.01.1946	31.12.1959	-
3880	Joensuu	29.46	62.36	81	01.06.1933	30.09.1958	-
4202	Ulkokalla/Kalajoki	23.27	64.2	4	01.06.1876	31.12.1959	-
4601	Kajaani	27.4	64.16	134	01.10.1887	31.12.1959	-
4602	Vierema Kaarakkala	27.13	63.5	200	16.09.1937	31.12.1959	-
5380	Hailuoto Marjaniemi	24.34	65.03	6	01.01.1881	31.12.1919	-
5402	Ruukki Revonlahti	25.02	64.41	48	01.01.1952	31.12.1959	-
5501	Vaala Pelso	26.27	64.31	113	01.06.1943	31.12.1959	-
6201	Ylitornio Portimojärvi	23.56	66.23	70	01.07.1935	30.11.1959	-
6380	Alatornio	24.1	65.5	5	01.01.1881	31.05.1906	-
6701	Taivalkoski	28.15	65.35	209	01.02.1948	31.12.1959	-
6801	Kuusamo	29.13	65.59	264	01.01.1908	31.12.1958	-
7301	Ylitornio Meltosjärvi	24.38	66.32	89	01.01.1937	31.12.1959	-
7401	Rovaniemi lentokenttä	25.5	66.34	198	21.05.1946	31.12.1958	-
7501	Sodankylä	26.38	67.22	115	01.01.1908	31.12.1959	-
8302	Kittilä Pallasjärvi	24.09	68.01	278	01.12.1935	31.12.1959	-
9601	Ivalo	27.25	68.37	145	24.05.1946	31.12.1959	-
9604	Utsjoki	27.52	70.05	72	01.01.1940	31.12.1960	-

Digitizing of precipitation station data

- **Responsibility in Observation services unit**
- **Operated part-time by e.g. quality controllers, aviation weather observers , persons undergoing civil service , summer employees**
- **at the moment, ~data of 100 precipitation stations in operative database**
  - Max. amount of stations has been >700 (found from station record)

  → Historical precipitation data in temporary database
- **Web-based program, intranet of FMI**

Precipitation observation sheet from Vyborg during civil war of Finland 1918



Sadehavaintoja. — Nederbördsobservationer.

Havaintopaikka / Observationsort: Nurmela Hirvelän kylässä.
Pitäjä / Socken: Pyhäjoki
Vuosi / År: 1918
Lääni / Län: Wiipuri
Kuukausi / Månad: Huhtik.

Mitattu sademäärä. Uppmätt nederbörd. — Korkeus. Höjd. — Laatu. Beskaffenhet.
Eri sademuotojen ilmenemisaika. Tiden för de skilda nederbördsformerna. — Yö, sekä aamua klo 7:ään. Natten, samt morg. till 7h a. — Klo 7:stä aam. yöhön. Från 7h a till natten.

Tosiind blanketten genast efter månadens slut.

Tämä kaavake on lähetettävä kohta kuukauden loputtua.

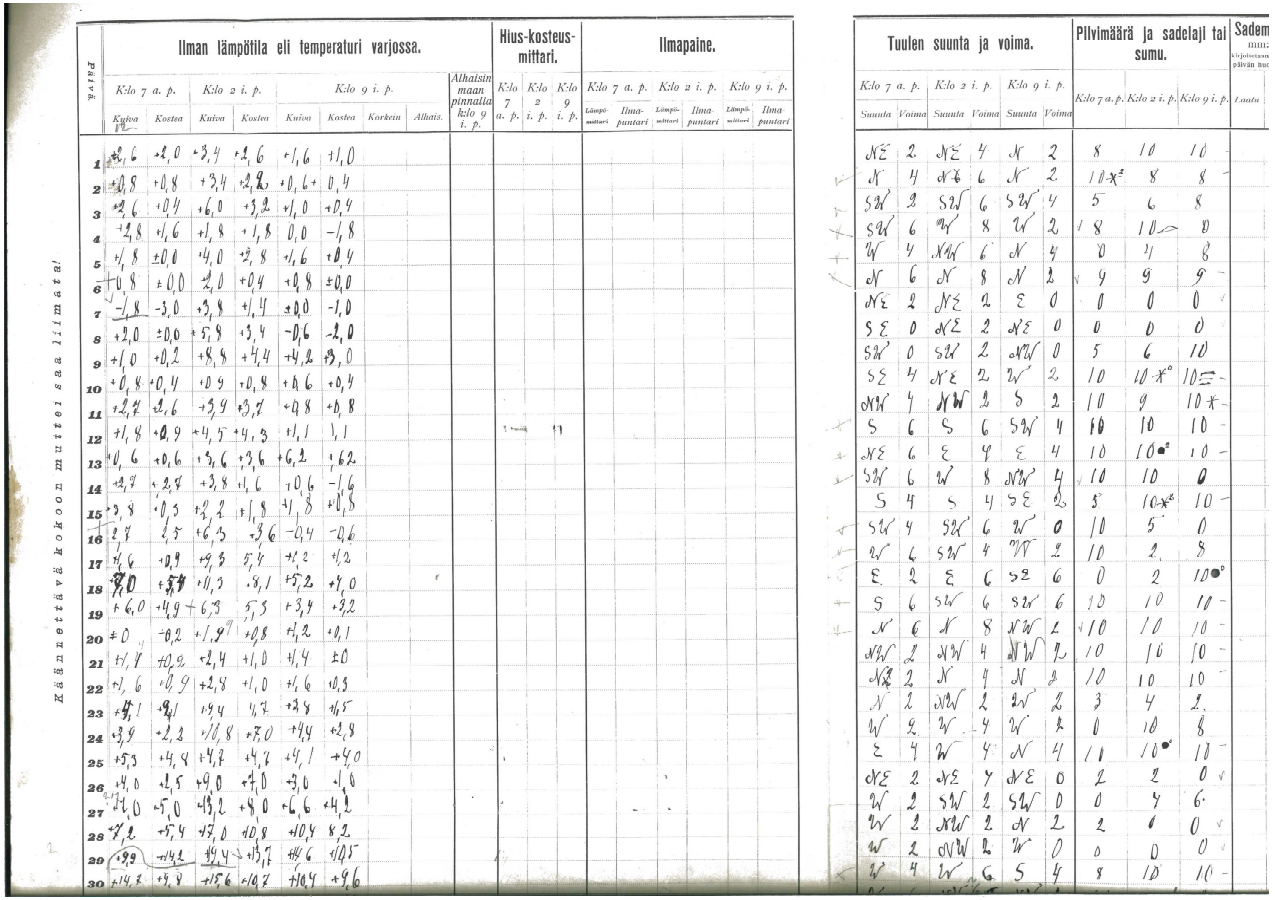
Kuukaussumma / Månadssumma — Niitten päivien lukumäärä, jolloin tuli: — Antal dagar med:
Sadetta. — Nederb. | ● | * | ▲ | △ | = | ⊔ | ⌓ | V | ⊠ | ⌓

HUOM.! Ukkosen ilmat (⊠) ja revontulet (⌓) ovat myöskin merkittävät. Älkää käyttäkö merkkiä n („yöllä") yksinään, vaan kirjoittakaa (päivän ja päivän) välisenä yönä, siis: n (19—20).
OBS.! Åska (⊠) och norrsken (⌓) anteckn[as] äfven. Begagna aldrig uttrycket n („under natten") ensamt, utan natten emellan den (datum)

State of data rescue/digitizing at FMI

Digitizing of precipitation station data

- **6 different data sheets from following time periods**
  - 1892-1909
  - 1909-1936
  - 1937-1947
  - 1944-1958
  - 1959-1986
  - 1986→
- **Before year 1959: amount of precipitation and present weather observed**
- **After year 1959: in addition to previous, also state of the ground and snow depth**
- **All the information from the sheets digitized**



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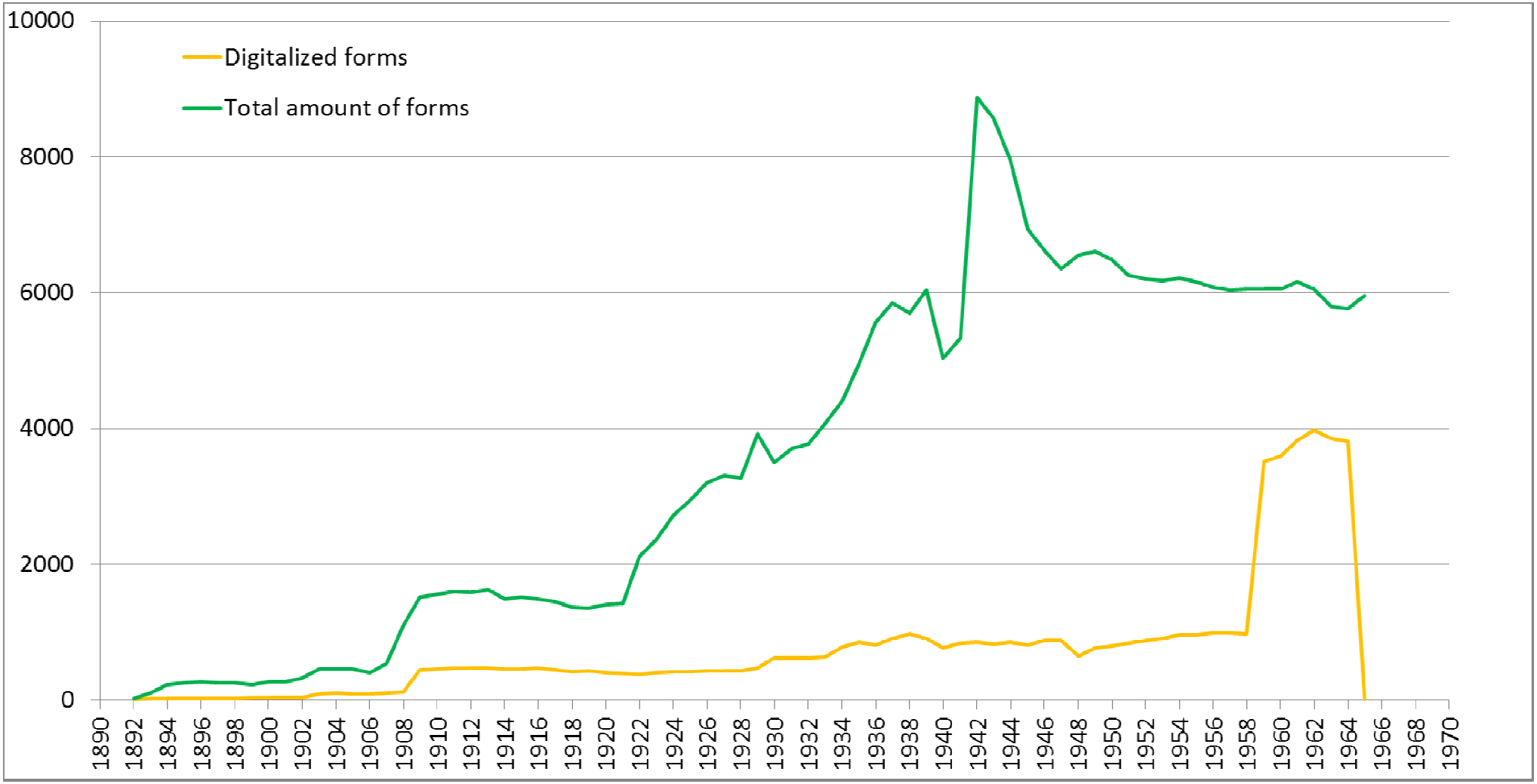
State of data rescue/digitizing at FMI

Precipitation stations

- **Up to 1965, ~263 000 observation data sheets in the archive**
- **Up to 1965, ~57 000 observation data sheets digitized (~22 %)**
- **With the present digitizing velocity, work is done within 2036**



Web-based software of digitizing of precipitation station data

Vanhojen sadelomakkeiden digitointi

Edellinen lomake | Seuraava lomake | Jatka sarjaa

Käyttöohjeet

Näytä virhetilanteet ponnahdusikkunoina

Sarjan #5947 lomake #54290 ***Basic information about observation sheet***

Vuosi:	1933	***Year***
Kuukausi:	Helmikuu	***Month***
Sadelomakemalli:	2: Sadehavaintoja, 1909-1936	***Pattern of observation sheet***
Koko:	Koko kuukausi	***Size of observation sheet: hole month / half of the month***
Sademäärän mittausperiodi:	Kerran vuorokaudessa joka päivä	***Period to measure precipitation***
Sateiden merkintä:	Sademäärä ja säämerkit mittausaamulla	***Marking of weather signs***
Säämerkkien lukumäärä:	Yksi merkittävin säämerkki vuorokautta kohden	***Amount of weather signs***

Asematiedot ***Information about station***

Aseman LPNN:	0000
Havaintopaikka:	Kirkonkylä, kirkkoherran virkatalo
Lääni:	Kuopio
Pitäjä:	Rääkkylä
Havainnontekijä:	T. Kapiainen

Laatuindikaattorit ***Quality indicators***

Lomake:	2: Tietokirjoitetaan, hyvä laatu
Sademäärät:	2: Hyvä laatu
Lumensyvyydet:	-1: Havainnot puuttuvat
Maanpinnanlaadut:	-1: Havainnot puuttuvat
Säämerkit:	2: Hyvä laatu

Liputus ***Quality flags***

tyhjä / 0:	Havainto OK	***OK***
2:	Havainto ei ole sama kuin lomakkeella	***estimated***
3:	Epäilyttävä arvo	***suspicious***
6:	Jakamaton sade	***undivided prec.***
8:	Puuttuva havainto	***missing***

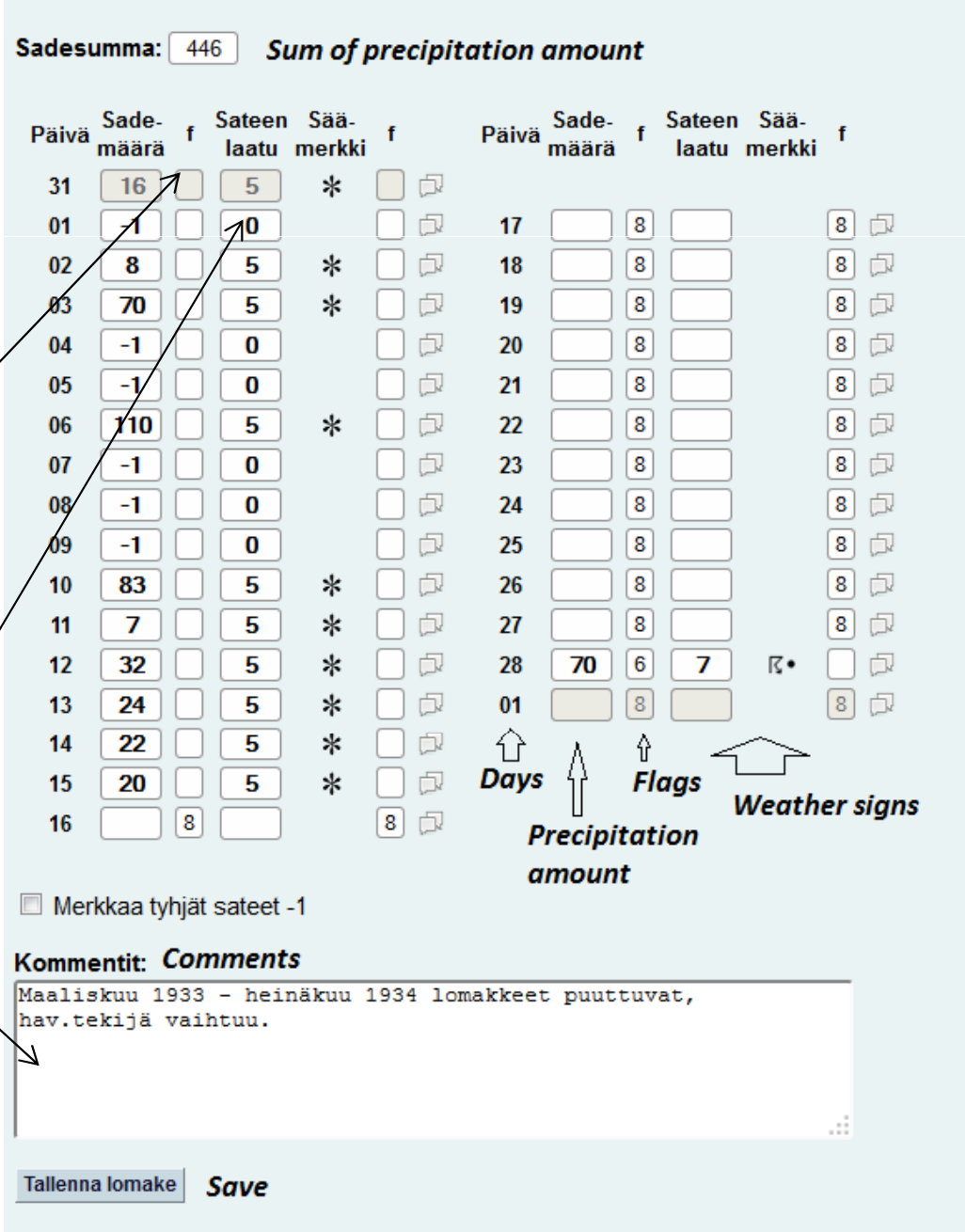
Metadata of station

Quality indicators for whole observation sheet and for observation parameters (good, acceptable, useless, missing, undefined)

State of data rescue/digitizing at FMI

Web-based software of digitizing of precipitation station data

- **Observations in this pattern: precipitation amount and weather signs**
- **QC tests: inconsistency, limit values, continuity, missing values, sum of precipitation values**
- **Number codes of weather signs**
- **Comments relative to station, observer, digitizer…**



Web-based software of digitizing of precipitation station data

- **Observations in this pattern: precipitation amount, snow depth, state of the ground , weather sign 3 times/day**

Sadesumma: 751

Päivä	Prec. amount: Sade-määrä	f	Snow depth: Lumi-peite	f	State of the ground: Maan-pinnan laatu	f	AIY	Weather signs: 08-14	f	14-20	f	20-08	f
30	6		12		9		505	✻				✻	
01	1		11		9		541	✻		⁂		—	
02	43		3		5		102	—				•	
03	6		-1		2		222	•		•		•	
04	99		-1		2		222	•		•		•	
05	51		-1		2		224	•		•		⁂	
06	56		2		5		0						
07	-1		1		5		0						
08	-1		1		5		555	✻		✻		✻	
09	131		16		9		500	✻					
10	1		14		9		505	✻				✻	
11	37		15		9		244	•		⁂		⁂	
12	81		17		7		221	•		•		—	
13	17		12		7		122	—		•		•	
14	16		10		7		115	—		—		✻	
15	2		9		7		555	✻		✻		✻	
16	12		9		7		552	✻		✻		•	
17	25		9		7		222	•		•		•	
18	18		4		6		0						
19	-1		4		5		124	—		•		⁂	
20	18		3		5		224	•		•		⁂	
21	14		3		5		410	⁂		—			
22	5		2		5		55			✻		✻	
23	40		6		7		442	⁂		⁂		•	
24	42		5		5		142	—		⁂		•	
25	20		2		5		211	•		—		—	
26	2		0	2	5		0						
27	-1		0	2	5		5					✻	
28	4		0	2	5		512	✻		—		•	
29	3		0	2	5		105	—				✻	
30	0		0	2	5		555	✻		✻		✻	
31	1		0	2	5		50			✻	2		
01	7		0	2	5								

Merkkaa tyhjät sateet -1
Merkkaa tyhjät lumet -1

Kommentit:

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Conclusions

- **Reliable historical data climatologically important**
- **Metadata information need to be carefully saved and easily available!**
- **in principle, FMI's surface weather data since 1960 digitized**
- **At FMI, data of ~50 climate and SYNOP stations digitized and in FMI's operative database starting from 1881**
- **Data rescue of precipitation station network since late 1800 in progress**
  - Part-time job
  - Web-based program in the intranet
  - Basic quality control included into the program

THANK YOU!

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