Data Quality Control Within the RMI Climatological Network

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Meteorological Observations in Belgium

Early Meteorological Observations in Belgium

- Jean-Baptiste Chevalier (1722-1801): first instrumental meteorological observations in “Belgium” from 1763 onwards
  → several natural scientists did precede him but their observations are considered as lost
  Ex.: Jean Motte (1719-1791): instrumental meteorological observations from 1736 to 1783 (only a few extreme values for the temperature and atmospheric pressure are known)

- Guillaume-Lambert Godart (1721-1794): earliest long-term (January 1767 till February 1794) daily instrumental records (temperature, atmospheric pressure, wind direction and state of the sky)

Location of the long-term high quality meteorological stations in “Belgium” before the operational phase of the Royal Observatory of Brussels in 1833.
Meteorological Observations in Belgium

Modern Meteorological Observations

- **June 1826**: King Guillaume 1 of the United Kingdom of the Netherlands founded the Royal Observatory of Brussels

- **1828**: Adophe Quetelet (1796-1874) was appointed astronomer

- **January 1st, 1833**: beginning of climatological observations

- **1876-1879**: Albert Lancaster (1849-1909) built a dense climatological network → more than 200 rain gauges in 1887 (the densest network in Europe [Lancaster, 1889])
Modern Meteorological Observations in Belgium

- November 1890 → Observatory moved from the site at the Porte de Scharbeek on the Uccle plateau (6 km SSE as crow flies from the old site)

Situation at the end of the 19th century (lancaster, 1903). Hatched area: urbanized part of the town

Open area swept by the winds → part of a residential area

Uccle (Brussels) 1910 1926 2005
1913 → the “Service météorologique” at the Observatory became an autonomous institution with the name “Institut Royal Météorologique de Belgique”
Belgian Climatological Network

~ 280 stations: 250 manual stations: voluntary observers (RMI)
28 (semi-)automatic stations: professionnall observers
(RMI, Belgocontrol, Wing Météo)

Belgocontrol: public company in charge of the savety of air traffic in the civil airspace

Wing météo: Meteorological Wing of the Air Component of Defense

Area: 30528 km²
Alt. max: 694 m
RMI climatological Network: Voluntary Observers

- RMI: **pluviometer** (250 manual rain gauges: P50)
  - RR
- ~3/5 stations (145) **meteorological shelter**
  - T8, TX & TN

+ **OPTIONAL**
  - TNG, precipitation distribution, fog duration & visibility, hail, storm, state of the ground, etc.
Belgian Climatological network data flow and processing

- **RMI climatology unit**
  - Manual RR/TT stations
  - Manual encoding
  - Daily TELECLIM data transfer
  - Monthly bulletin (all stations, 36 only)
  - Daily excel Sheets of additional data

- **RING-RING SERVER**
  - Daily connection (9h, 13h, 24h)

- **ORACLE DB**
  - Monthly transfer of additional data

- **RMI AWS**

- **WING METEO SYNOP STATIONS**
  - Monthly transfer of additional data

- **HQC RR/TT**
  - Daily connection (9h, 13h, 24h)

- **METEOSCAN QC (TELECLIM TRANSFERED DATA)**

- **BELGOCONTROL SYNOP STATIONS**

- **TELECLIM: TELEphone pour le transfert des données du réseau CLIMatologique**
Data archive and digitalization

• Prior to 1999: no rule!
  → long-time series (from 1833) RR/TT for the reference station in Uccle
  + long-term daily central Belgium temperature series (1767-1998)

Overview of the availability of the long-term and high quality
Early instrumental daily temperature observations in Belgium

⇒ Mainly based on the Brussels-Uccle time series (simultaneous observations of TX & TN carried out at both sites from June 1886 to 1890) + linear regressions over overlapping periods (see Demarée et al., 2002)
Data archive and digitalization

→ historical RR series for 8 additional stations (starting from 1880)

• **1999:** Implementation of a central (Oracle) DB
  → data transfer from magnetic media to ODB (all available since 1951)

1951-1999:
165 RR stations presenting less than 6 missing yearly values
→ 1 station/200 km²
Data archive and digitalization

(2) → archive digitalization: 1880-1950
~ 185000 monthly bulletins [daily rainfall (all) and TX & TN (1/4)]
~ 8.5 millions of values

2005 – 2008 : 4.25 millions of values encoded (1880-1915)

!!!! COMPLETED !!!!
RMI Climatological Data QC

- **Data archive: 1880 – 1950**
  - Excepted for the reference station in Uccle and the 8 historical RR stations
  - No QC procedures applied on the digitalized data

- **Data archive: 1951 – 1999**
  - Monthly bulletins (daily report) parameters values checked and encoded manually twice in the local DB to minimize the risk of introducing typo errors
  - Manual QC
From 2000 onwards

→ monthly bulletins (daily report) parameters values checked and encoded manually in the central DB

→ basic automated QC on the data transferred directly in the central DB via teleclim (phone communication line)

→ Manual inspection on a monthly basis by well-trained operators
  
  • Where errors are found corrections are supplied
  • Where values are missing estimates are made
Since April 2003 use of meteorological radar information in the rainfall QC

Parapluies - Output

Fig. 1: Radars météorologiques de Wideumont, Zaventem et l’Avesnois. Les cercles indiquent les rayons à 100 km.
Conclusions

- All data from the Belgian Climatological Network transferred and stored in the central ODB
  → digitalization fully completed!
  → observation from all manual stations should be transferred automatically to the ODB by the end of the year

⇒ Allow the computation of new historical time series
  ♦ automatic QC on digitalized dated
  ♦ homogenization procedures
⇒ perfect timing to take advantage of the COST-ES0601 results!