

WOW-BE: an open-source platform to deploy and operate personal weather station networks

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The gap

The planned **retirement** of the **UK Met Office WOW infrastructure** created the need for a sustainable national ingestion, storage and dissemination chain for personal weather station (PWS) data in Belgium.

What WOW-BE is

A **complete, self-hosted PWS data chain**: upload endpoints, validation, storage, aggregation, API and public website, in a single Docker container. **wow.meteo.be** looks unchanged to its users, but now runs on WOW-BE instead of the UK WOW infrastructure.

Built in

- Three upload protocols: **legacy WOW, Weather Underground, Ecowitt**
- Simplified **station registration**
- **Basic validation** and data harmonisation
- One **API** for front-end, open data and export

DATAFLOW From a station in a garden to an API response

1 Personal weather stations

Upload on their own schedule.

2 Reception & validation

Validated and converted to one format.

3 Observation archive

Full history stored. Not served directly.

4 Aggregation

5-minute aggregates and daily statistics updated on arrival.

5 Data access (API)

For front-end and data export.

Accounts, login and GDPR

- **OAuth2 sign-in** with Google or GitHub; other providers such as Apple can be added.
- No password needed when signing in with an existing account; e-mail registration remains available.
- **GDPR compliant**: an owner can delete their account and all their data.
- **Open source**, enabling community code review github.com/rmibelgium/wowbe

What step 4 produces

- 5-minute averages** UTC
- 5-minute averages** station local time
- Daily statistics** UTC
- Daily statistics** station local time

Updated on arrival, so the API never computes on request.

Reuse beyond Belgium

KNMI will adopt WOW-BE using RMI infrastructure.

Met Éireann in process of code review and will deploy later.

Listed in the **EU Open Source Solutions Catalogue**.

interoperable-europe.ec.europa.eu/eu-oss-catalogue

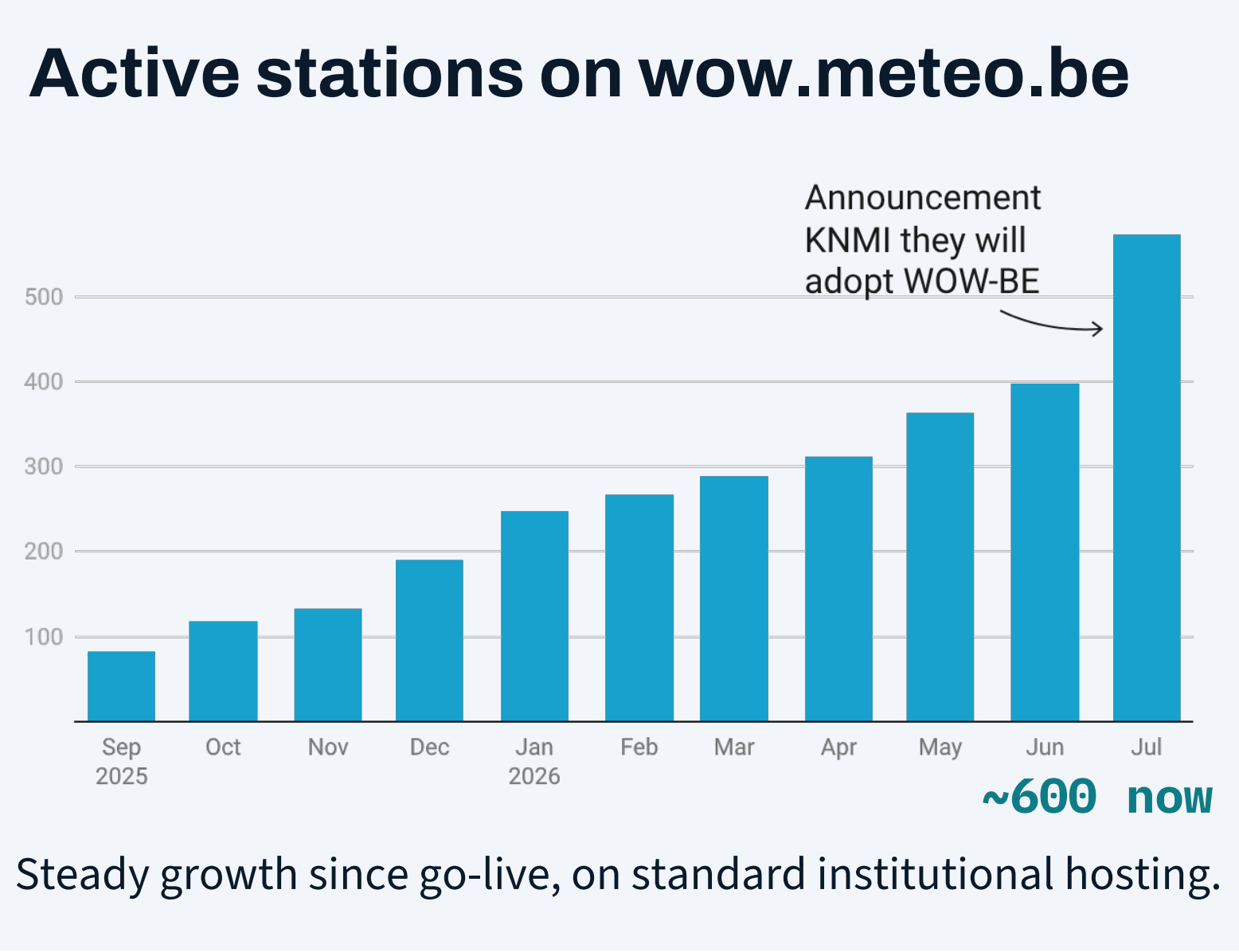
Leuven (B)

Cities, regions, local communities: easy setup of own citizen-science PWS network.

Gouda (NL)



A typical contributing station.



PWS DATA FOR RADAR QPE

radar QPE field + PWS gauges

WOW-BE provides **hundreds of real-time PWS rain gauges** through an open API. These observations can complement operational networks for radar QPE evaluation, especially during spatially variable convective rainfall.

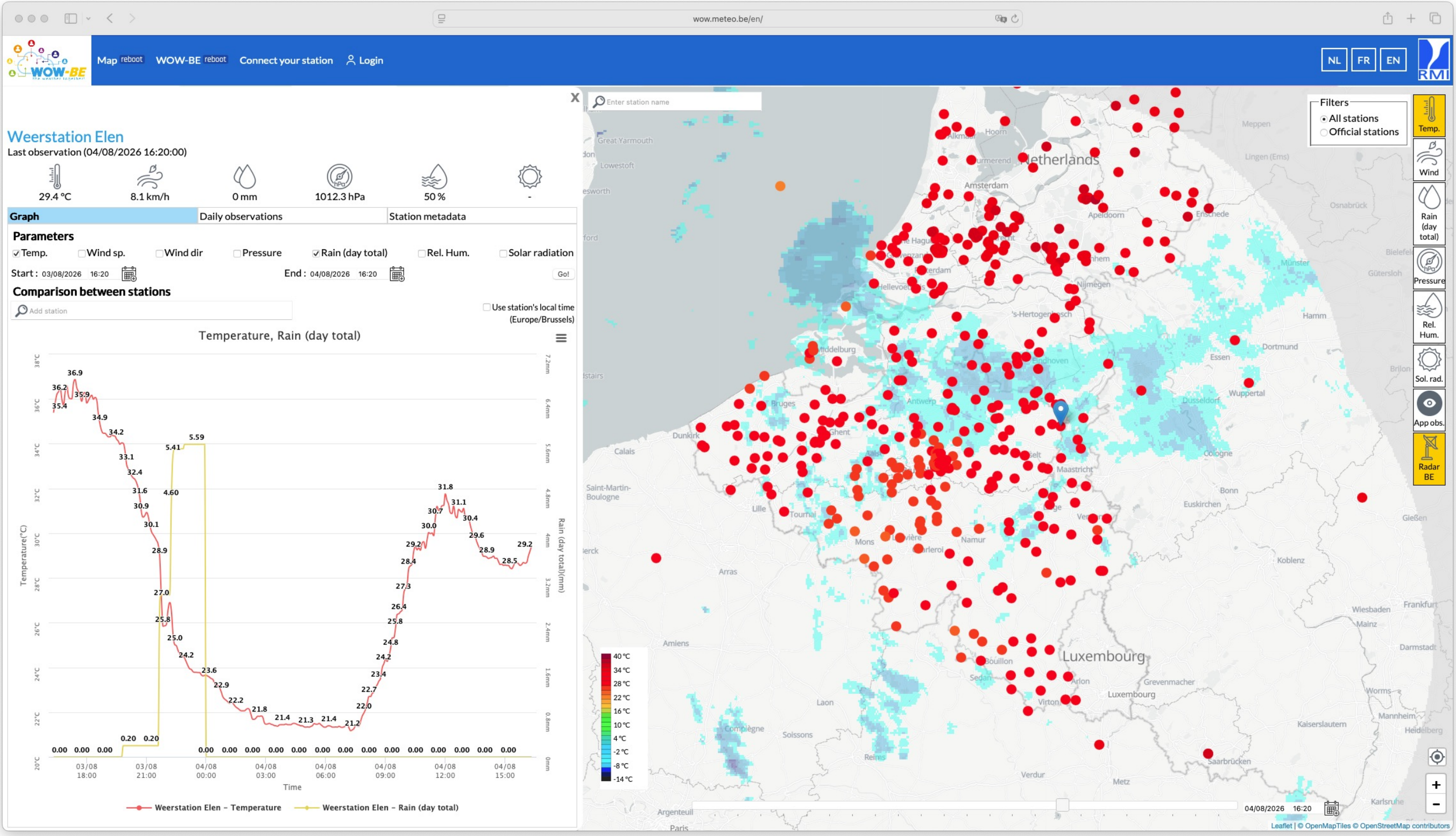
Key challenge

Heterogeneous sensors, siting and maintenance require **dedicated quality control** before quantitative use.

Example: quality control of the precipitation data from the Leuven.cool urban PWS network (WOW-BE subset).

Daily accumulated rainfall (mm) on 9 August 2020. The PWS network reveals highly localised rainfall variability.

Quality filters developed by de Vos et al. (2017) applied to the precipitation data of the Leuven.cool PWS network.



wow.meteo.be front-end: public map, station graphs and overlays.