



Koninklijk Meteorologisch Instituut

Institut Royal Météorologique

Königliches Meteorologisches Institut

Royal Meteorological Institute

Citizen observations via the RMI smartphone app in Belgium: data collection and applications

Maarten Reyniers

EUMETNET IoT ET annual meeting 2024, Helsinki, Finland



Small country, difficult to forecast

Snow episode 17.01.2024



Sint-Agatha-Berchem (Brussels)
17/01/2024 17:17

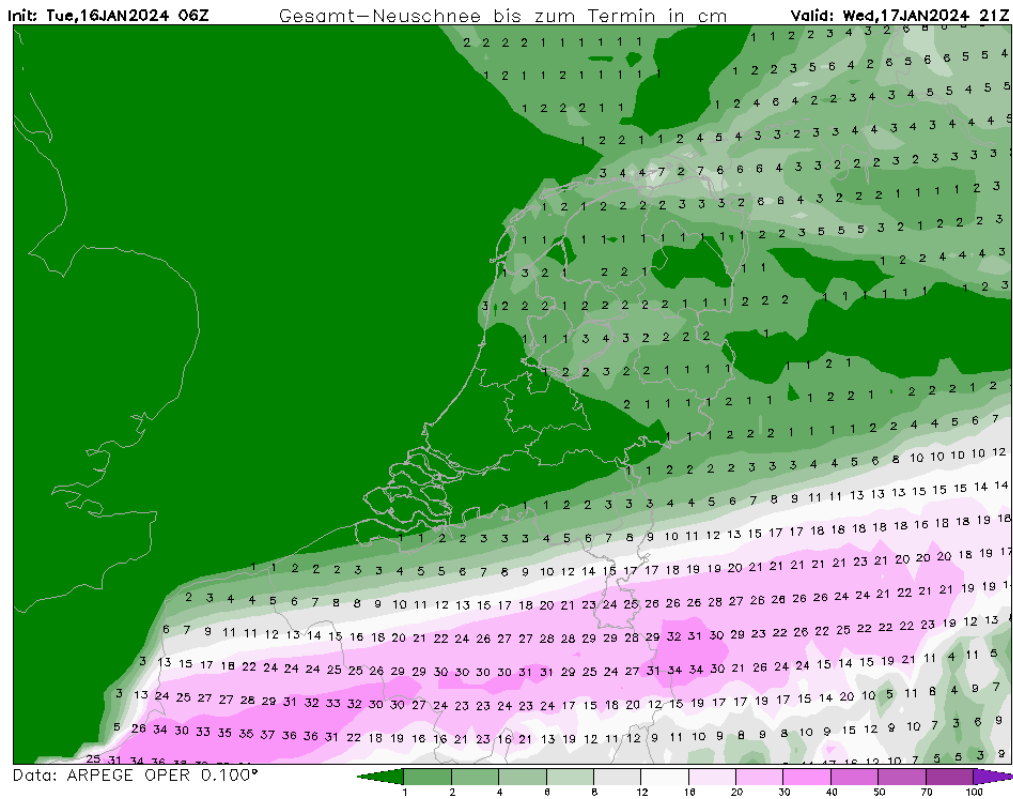


Antwerp
17/01/2024 16:59

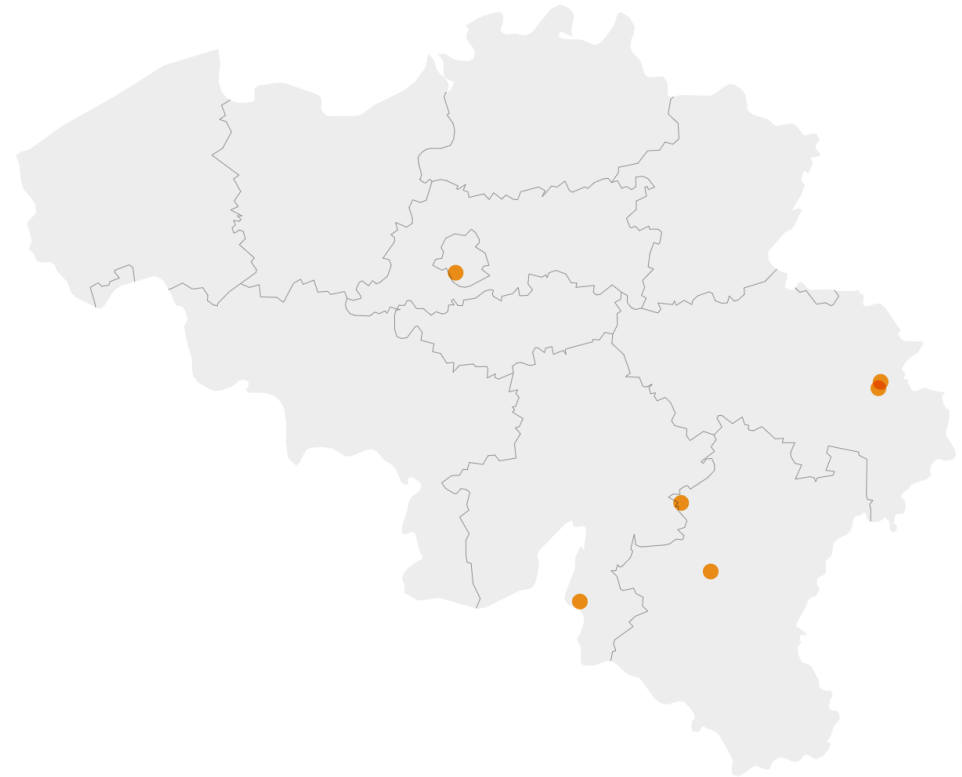


Small country, difficult to forecast

Snow episode 17.01.2024



Snow height model forecast

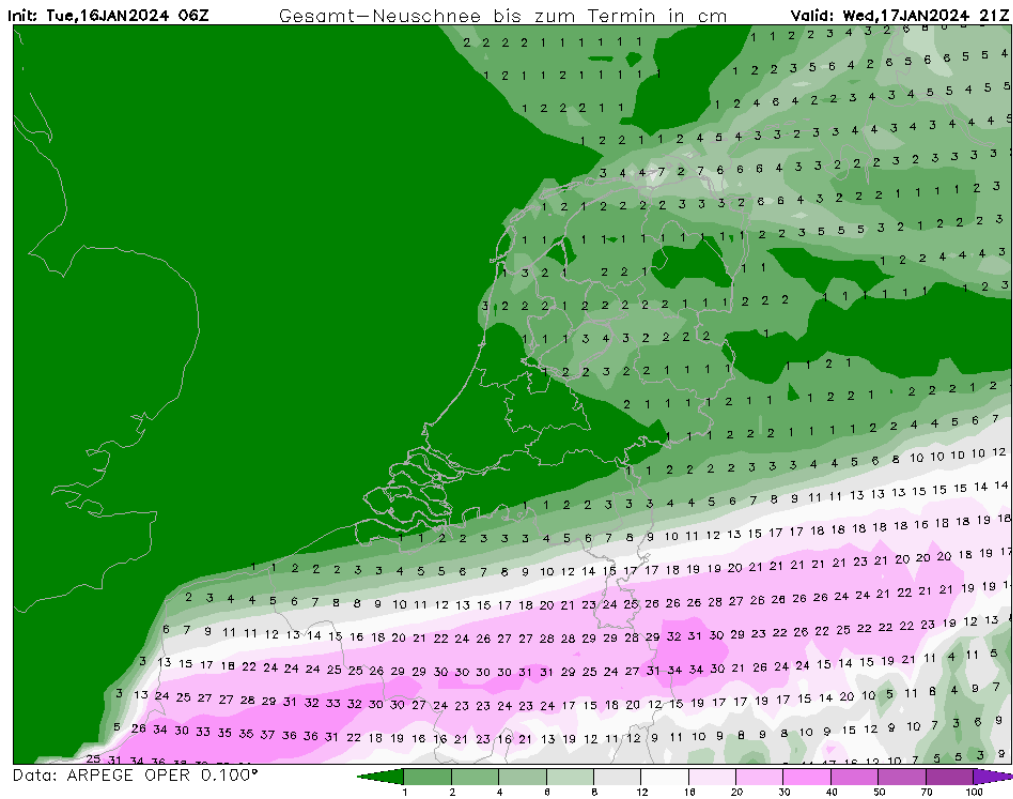


Automatic snow sensors

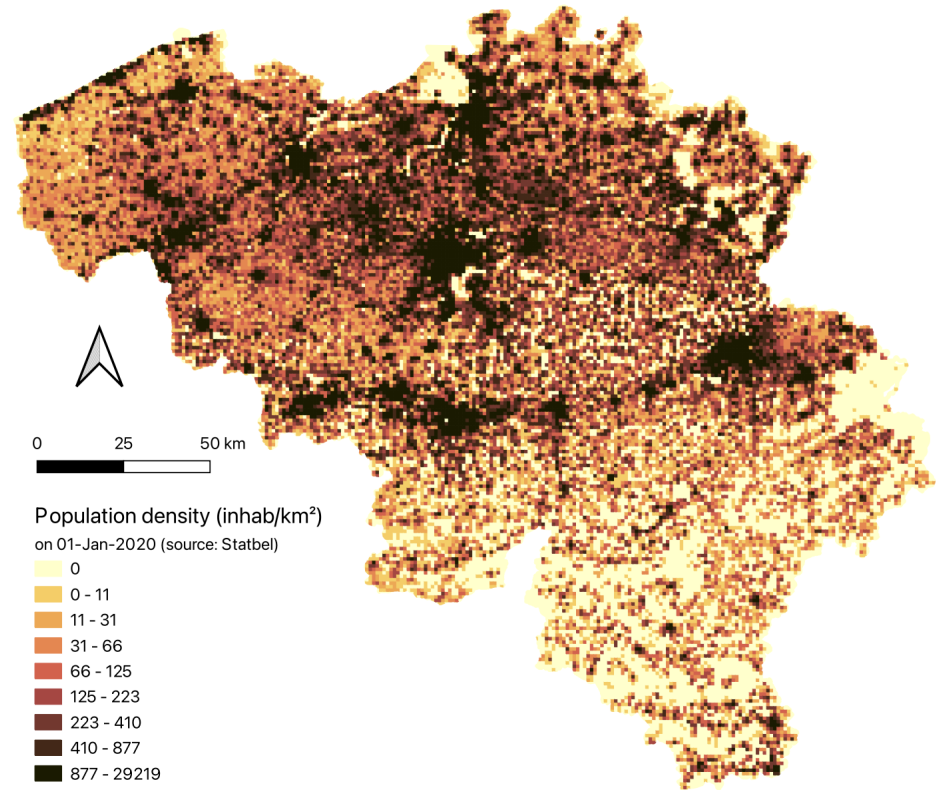


Small country, 11.7 million observers

Snow episode 17.01.2024



Snow height model forecast

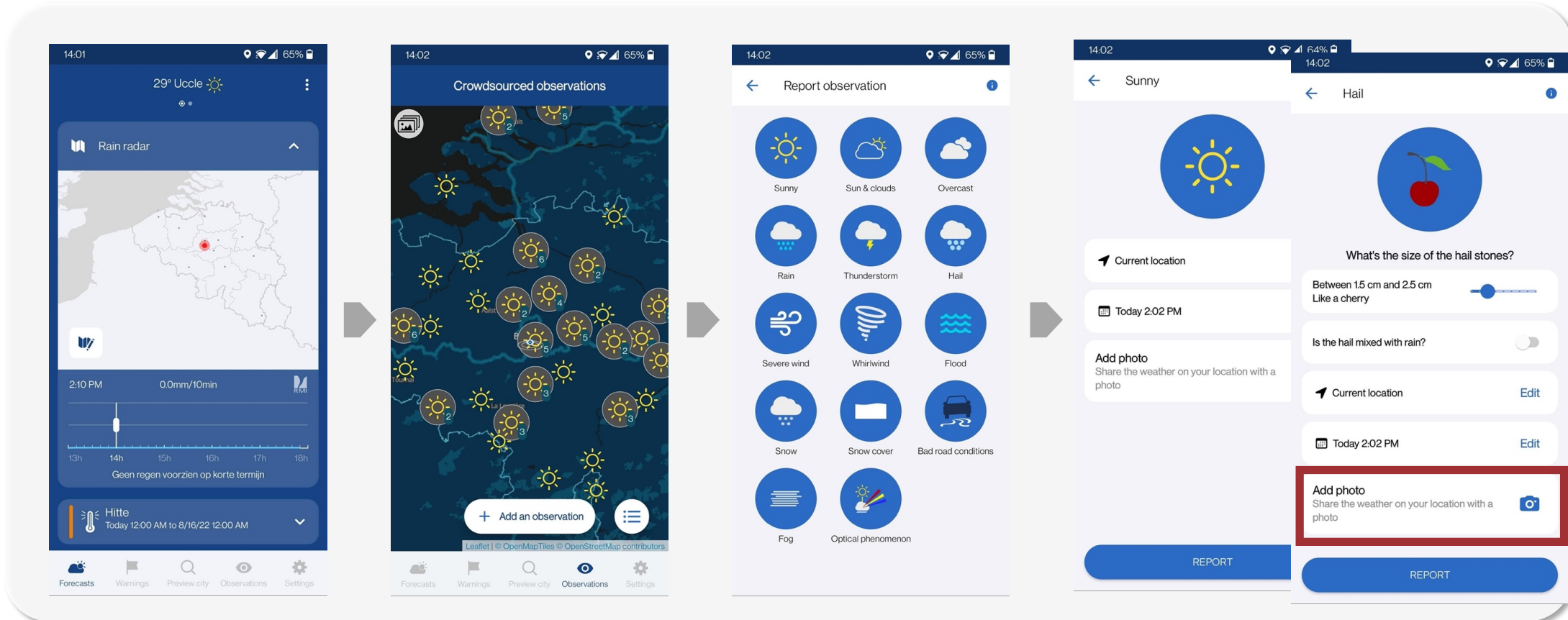


Population density



Smartphone app RMI

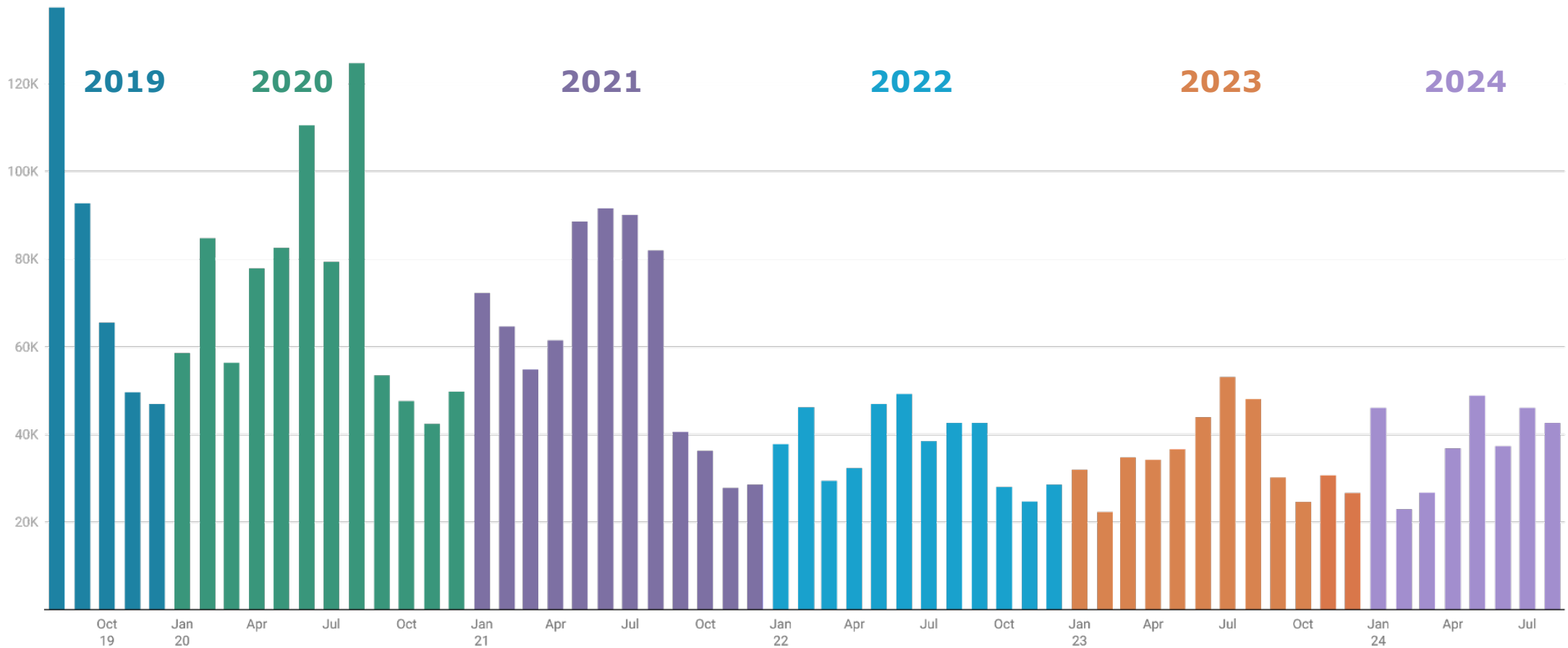
Reporting feature added to the RMI app in August 2019





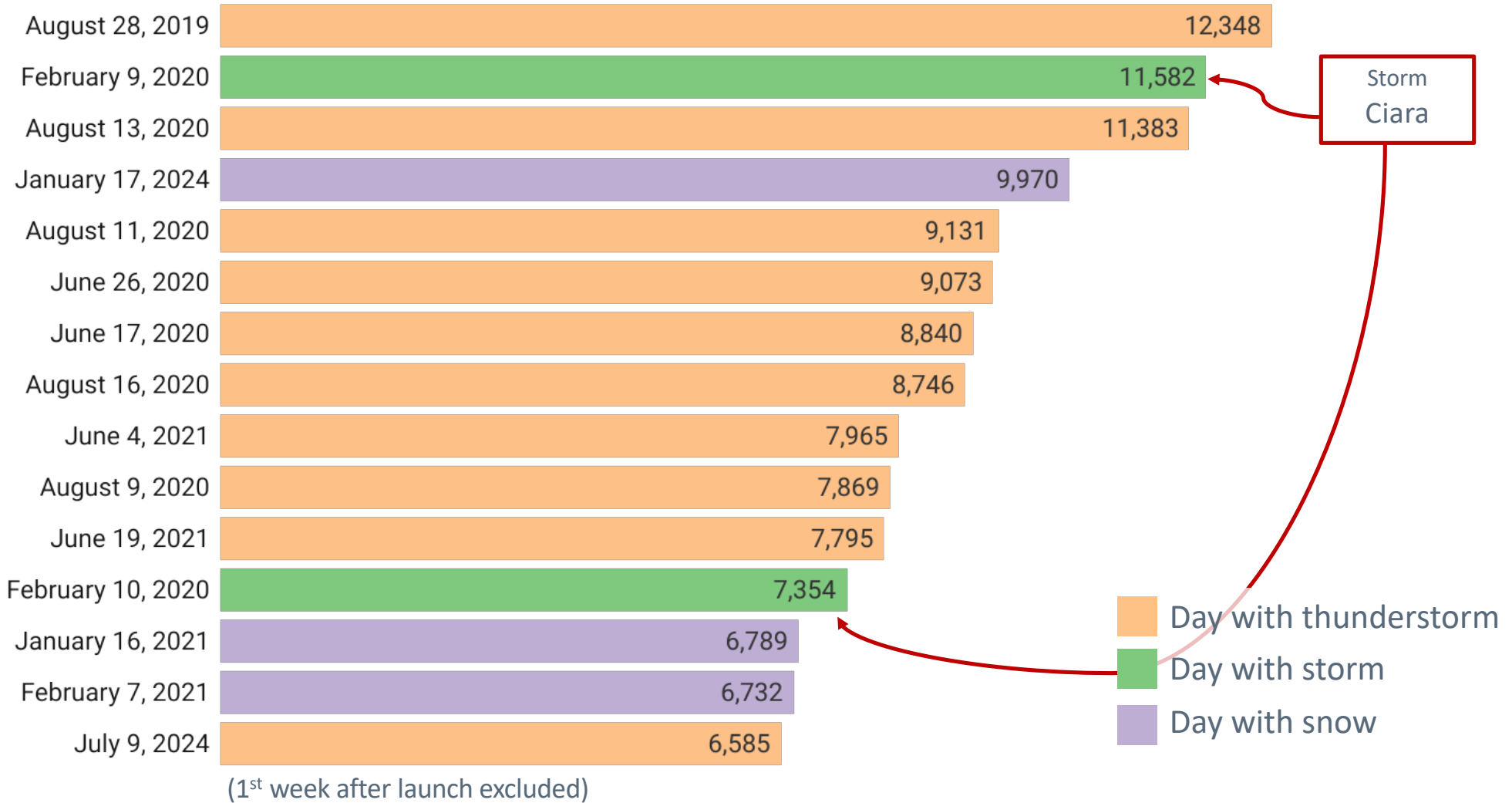
Total number of observations per month

More than **3,2 million observations!** (and 52,000 photos)



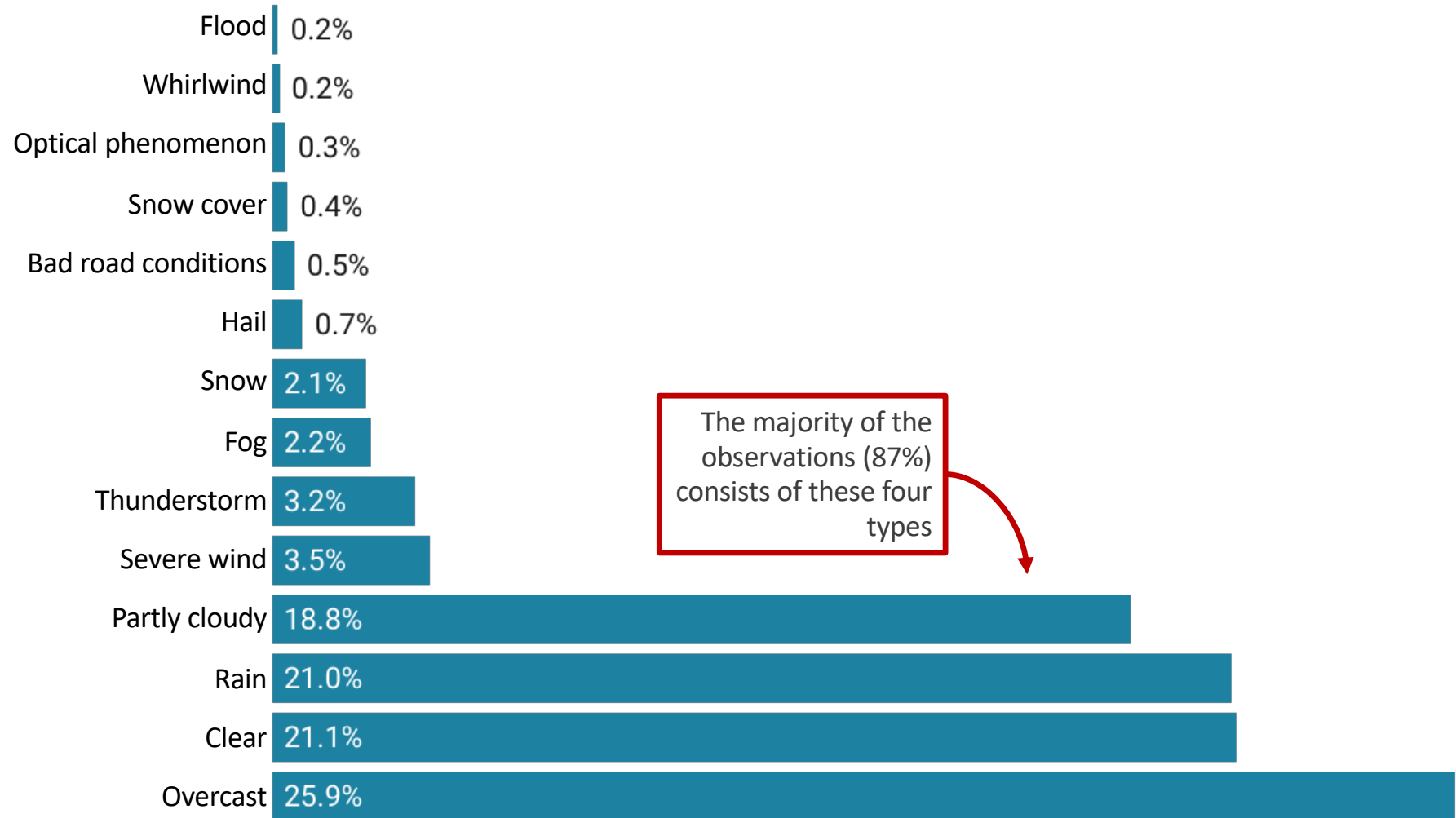
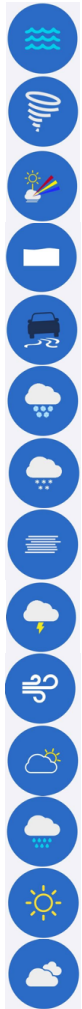


Top 15 of most successful days





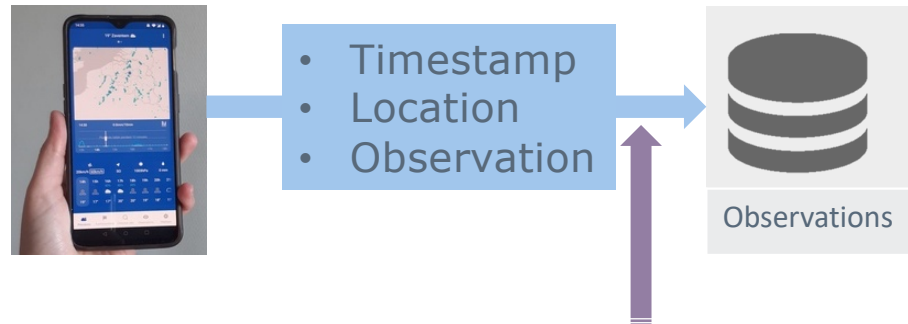
Distribution over observation type



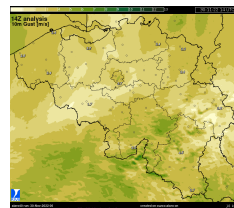
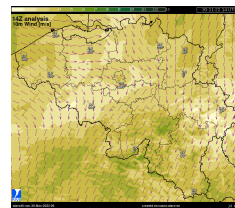
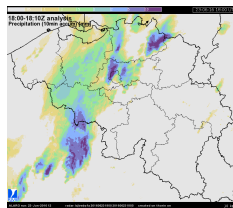
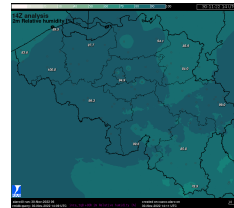
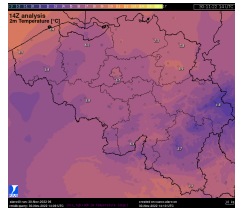
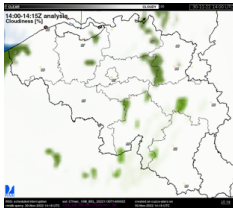
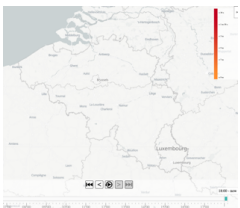


What about the quality?

Every observation is assigned a **quality label**.



**Nowcasting
(INCA-BE)
and lightning**



*"plausibility
check"*

Three possible values:

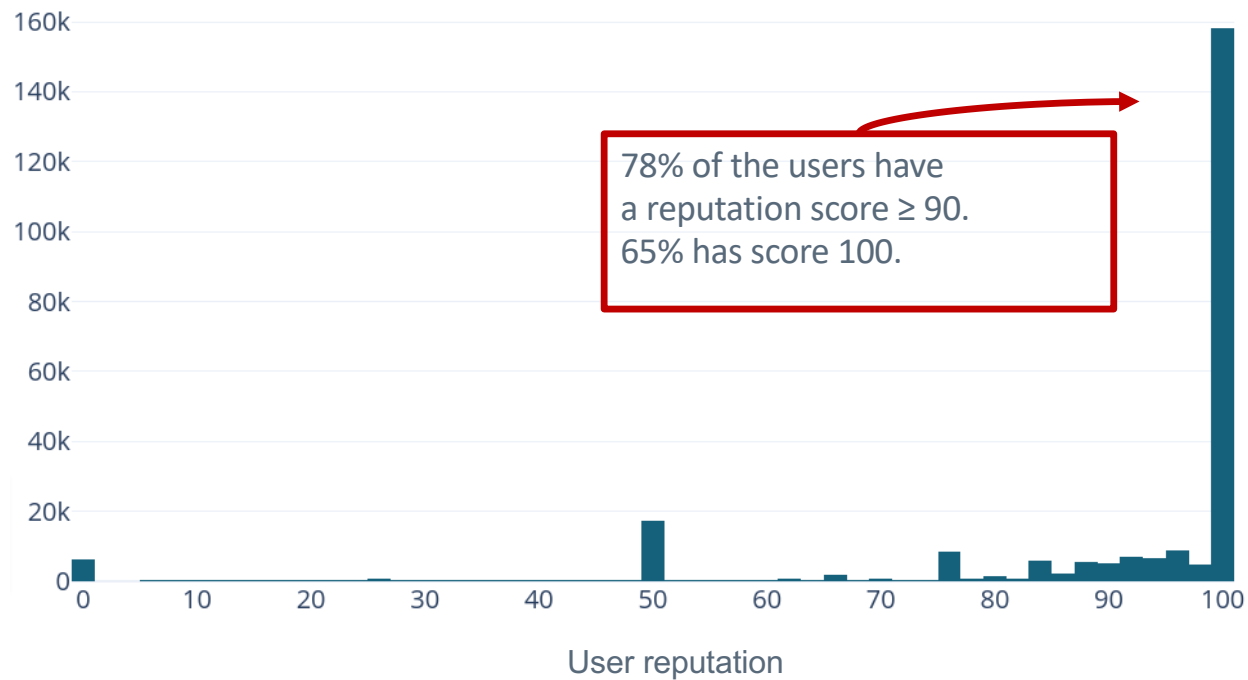
- **False** (score=0)
- **Doubtful but possible** (score=50)
- **Plausible** (score=100)



What about the quality?

For every user we keep an (anonymous) user reputation $\in [0,100]$

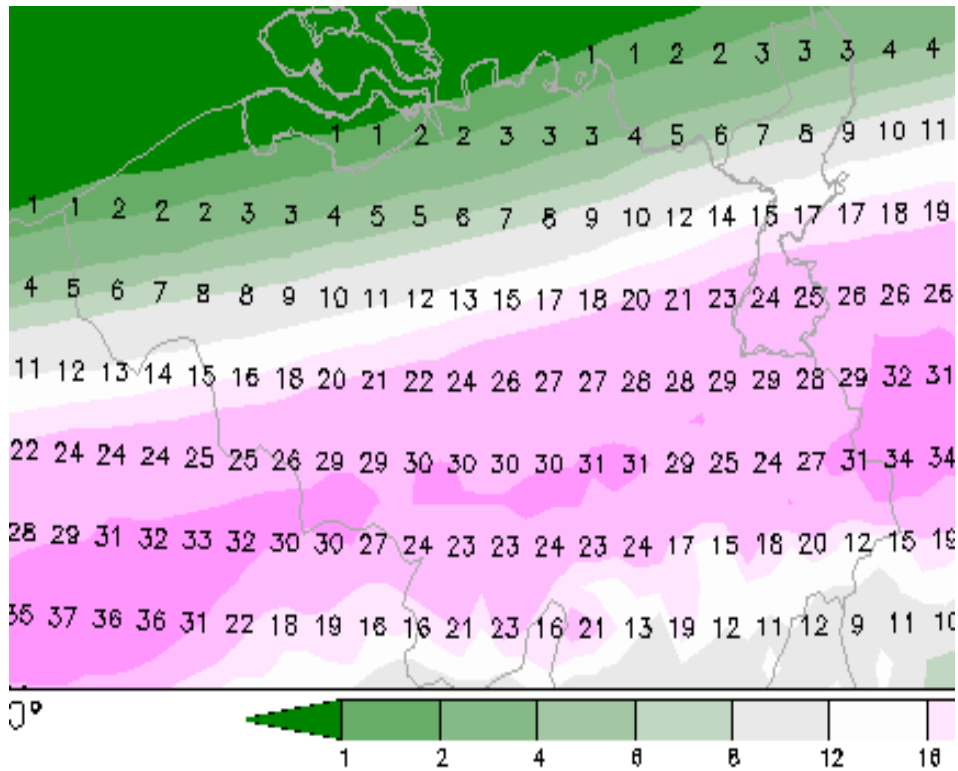
Histogram of user reputation scores



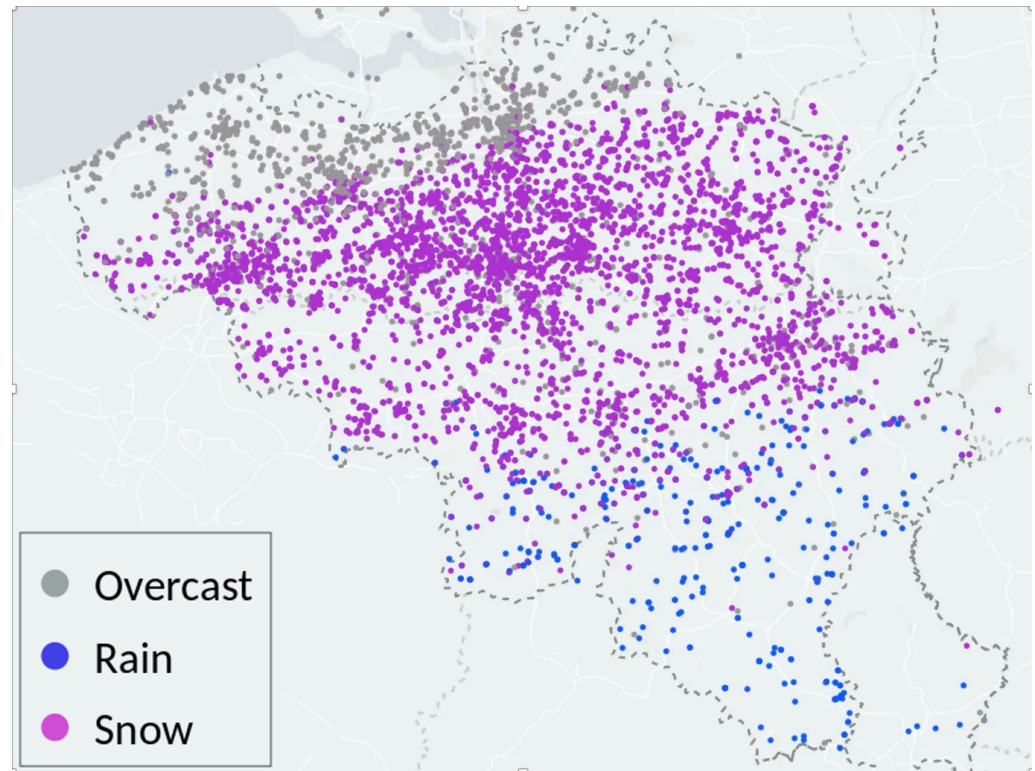


Snow

Snow episode 17.01.2024

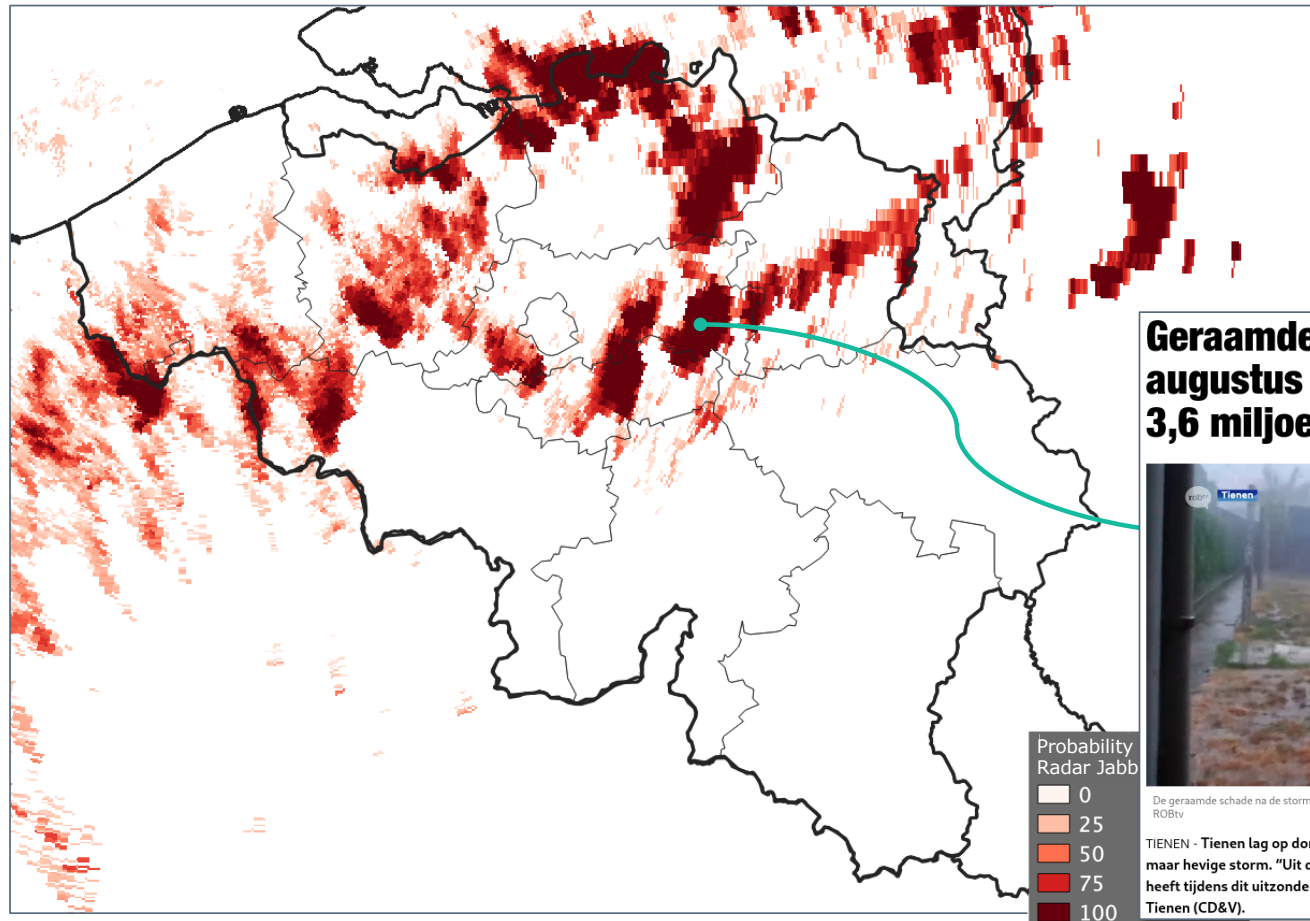


Snow height model forecast



Citizen observations

13/08/2020



Geraamde schade na noodweer augustus loopt op tot meer dan 3,6 miljoen euro



De geraamde schade na de storm van 13 augustus vorig jaar in Tienen loopt op tot meer dan 3,6 miljoen euro. — © RO&V

TIENEN - Tienen lag op donderdag 13 augustus 2020 in het epicentrum van een korte maar hevige storm. "Uit de cijfers blijkt dat Tienen het meeste materiële schade geleden heeft tijdens dit uitzonderlijk noodweer" aldus Katrien Partyka, burgemeester van Tienen (CD&V).

Weather radar: **indirect measurement** of hail



Hail verification in the past

BULLETIN "GRÊLE"

Expéditeur : *Christian Pitout* Station de : *Wierzyca de Petit*
CODE : *H2*

Date de la grêle : *29/6/2005*
Heure de début : *16h20* Heure de fin : *16h27*

Chute de grêle pendant un orage ? OUI NON

Heure de début de l'orage : *16h* Heure de fin de l'orage : *20h30*

Chute de fortes précipitations pendant l'orage ? OUI NON

Dans quelle direction s'est déplacé l'orage ? *SW vers NE*

L'orage était-il violent ? OUI NON

Quelle était la taille des grêlons ? (diamètre en cm ou code) *de 1 à 3 cm (992)*

Avez-vous connaissance de dégâts causés par cette chute de grêle dans la région ? OUI NON

Si oui, quel type de dégâts ?
sur Pannaxien, vitesses brisées, impacte sur les véhicules

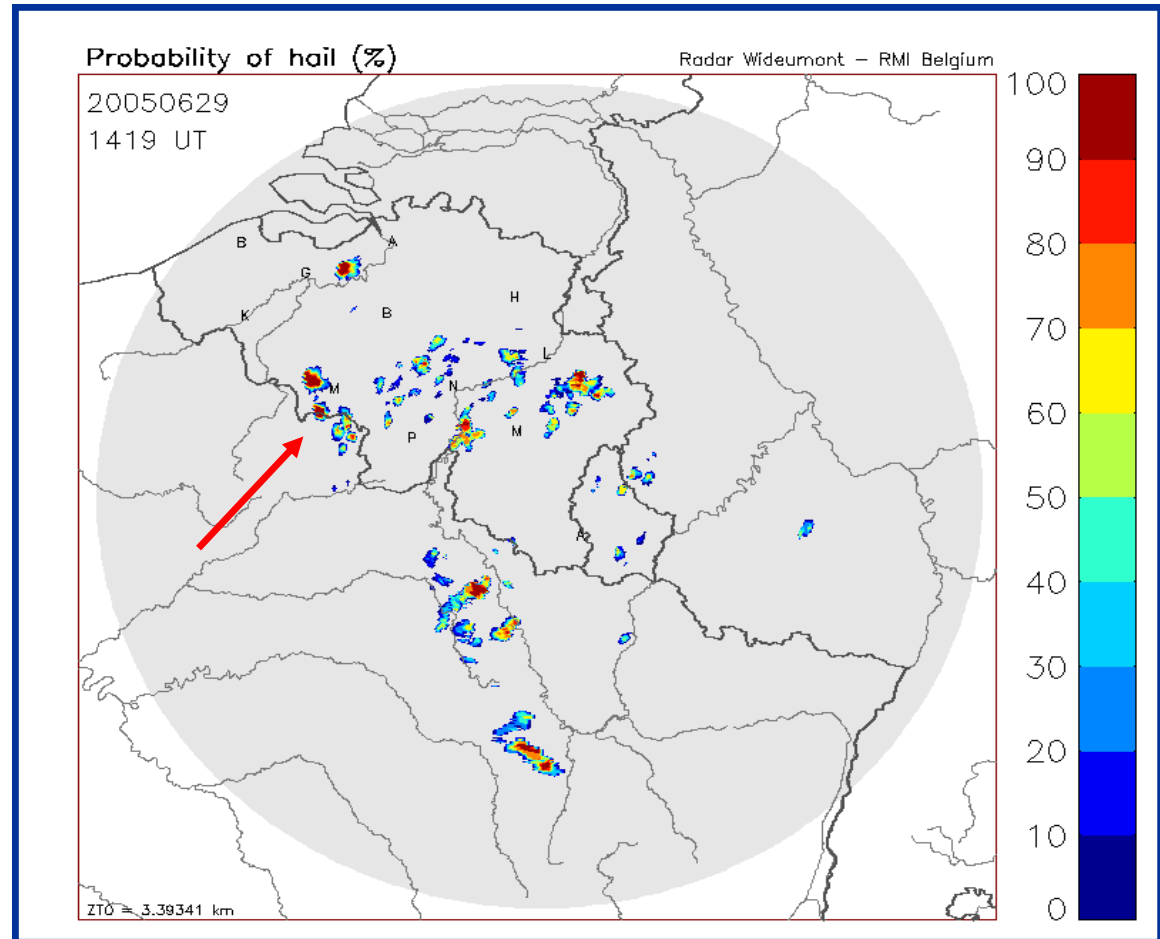
Remarques éventuelles :
inondations dans le village E.R. entre 16h et 19h30 85,4 l/m²
Total de 86/28/6/05 à 86/28/6/05 92,2 l/m²

CODES DE DÉTERMINATION DE LA TAILLE DES GRÊLONS

- 990 = taille d'un pois
- 991 = taille d'une noisette ou d'une petite bille.
- 992 = taille d'un gros raisin ou d'une noix.
- 993 = taille d'un marron ou d'une balle de ping-pong.
- 994 = taille d'un oeuf de poule ou d'une petite pomme.
- 995 = taille d'une balle de tennis ou d'une grosse pomme.
- 996 = taille d'un pamplemousse ou d'une grosse orange ou d'avantage.

CONTACTS : M. Luc Debontridder, Services opérationnels et aux usagers, Tél. : 02/373 05 21, Fax : 02/373 05 28, e-mail : luc.debontridder@oma.be

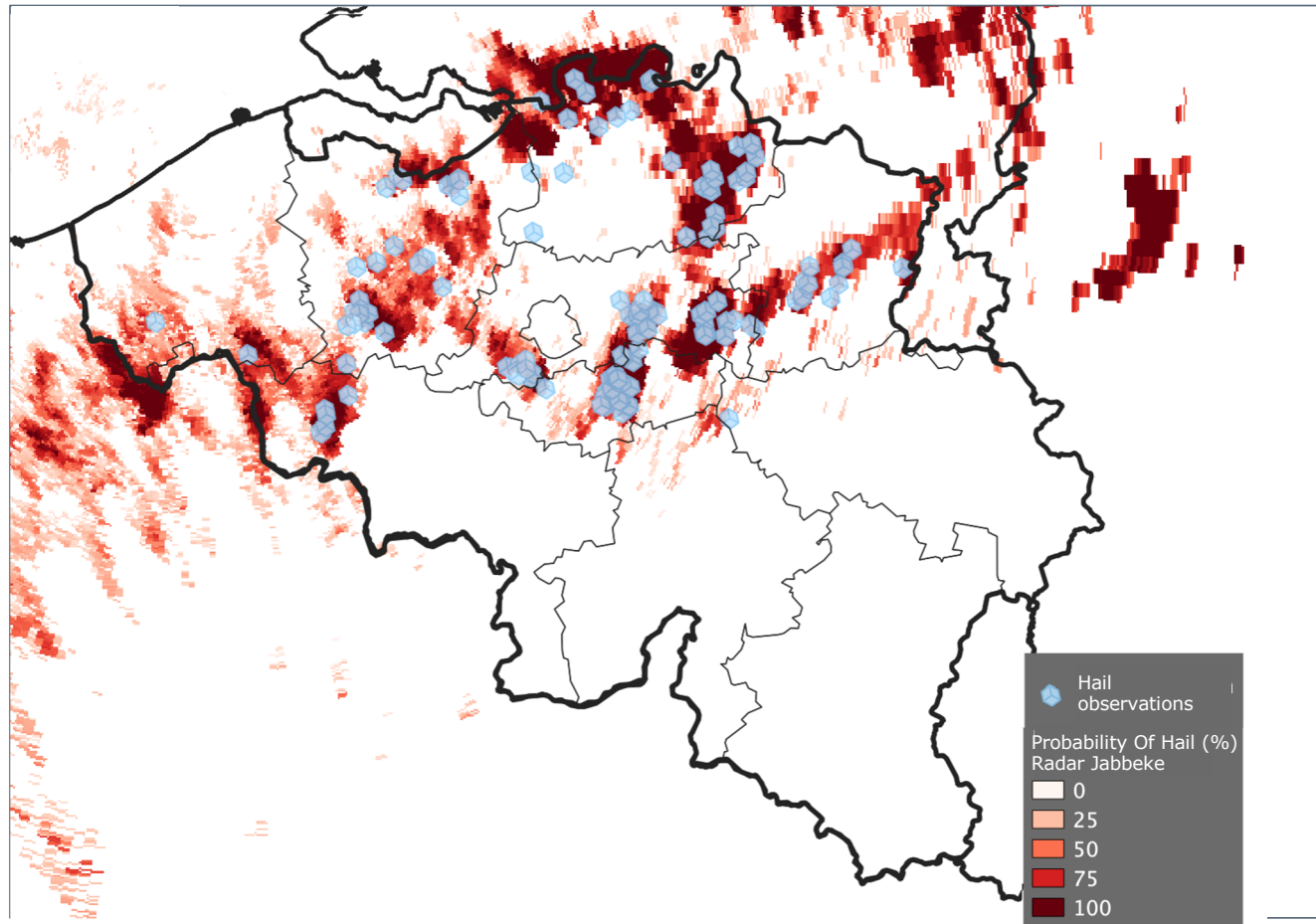
83 reports





Hail verification with app reports

13/08/2020



Weather radar: **indirect measurement** of hail



Hail verification with app reports

Probability of detection (POD)
Jabbeke radar

795

Valid hail reports
at less than
150 km
from radar

Detection if
probability > 0 %
(POH_threshold)

584 hits

211 missed

POD = 0.73

POD = 0.72

Detection if
probability > 50 %
(POH_threshold)

449 hits

346 missed

POD = 0.56

POD = 0.62



Jabbeke

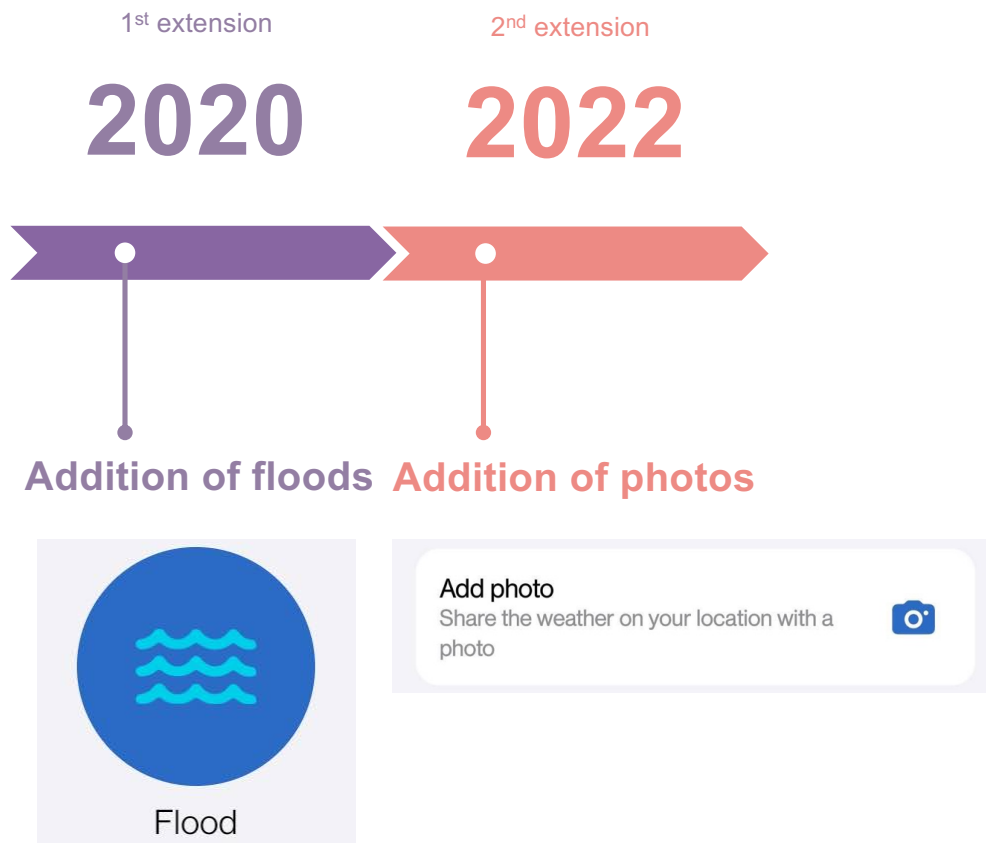
Wideumont





Value in crisis response

(1) Floods and photos per request of regional authorities for flood monitoring

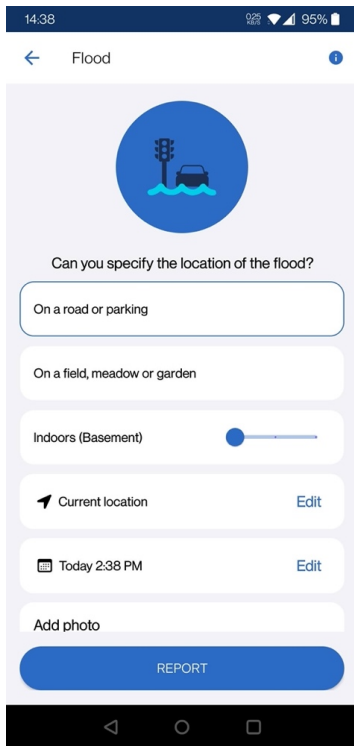


Herve
17/05/2024 21:15



Value in crisis response

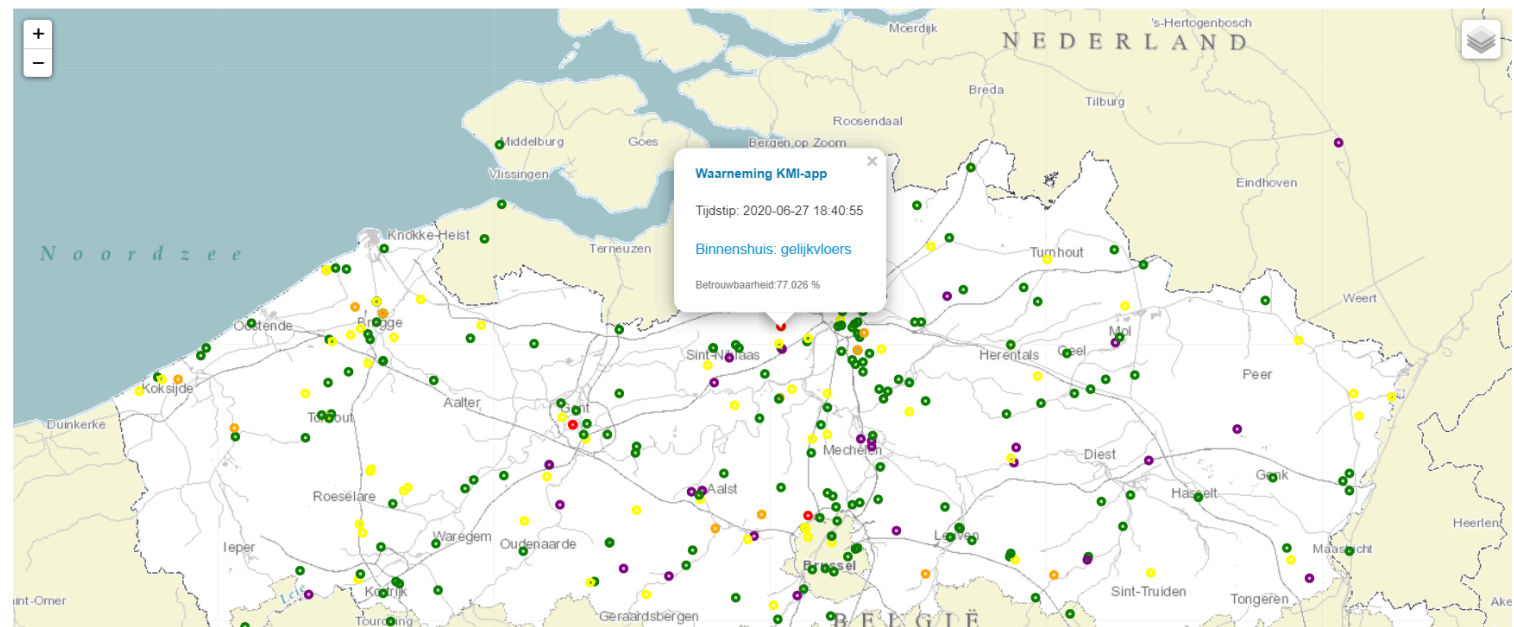
(1) Floods and photos per request of regional authorities for flood monitoring



Bekijk hier de observaties wateroverlast uit de KMI-app

Kies voor welke periode je de observaties wil zien:

Dit is de kaart voor het laatste jaar

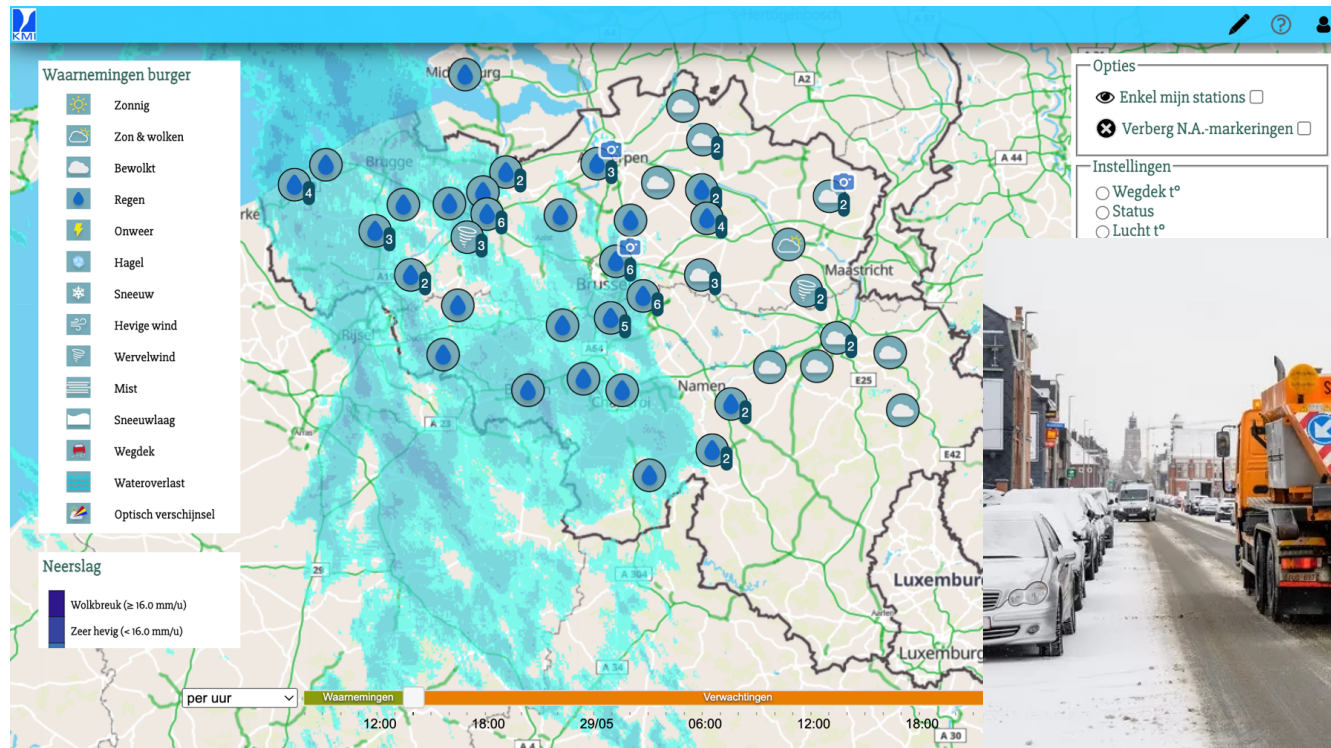
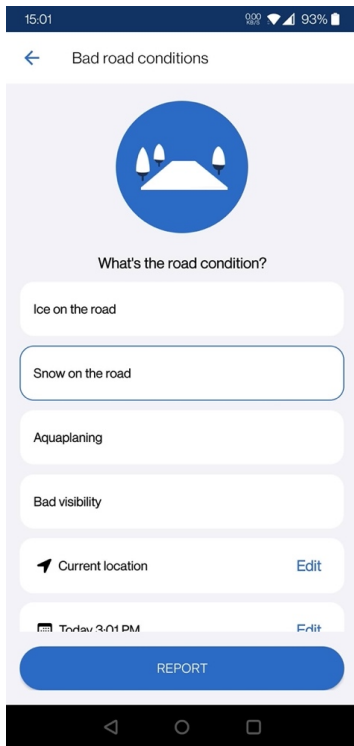


Transferred to regional hydrological authorities for real-time consultation (here: VMM)



Value in crisis response

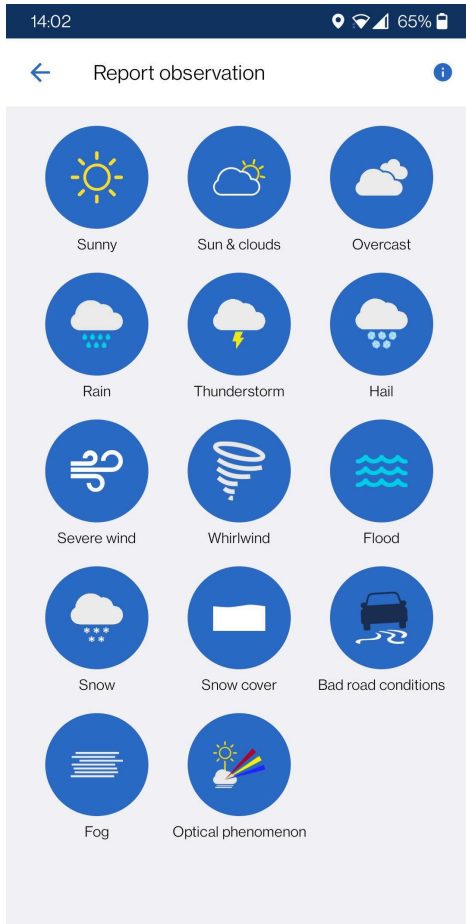
(2) Observations of dangerous road conditions & snow for road management



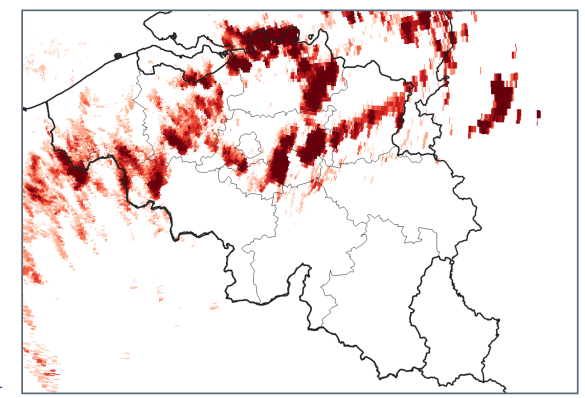
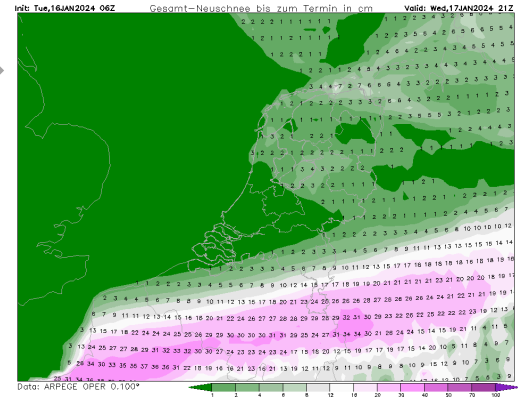
Transferred to regional road authorities for road management, e.g. road salt planning.



App obs became an essential new dataset!



BETTER MODELS



RESPONSE HAZARDOUS WEATHER



THANK YOU

**The Royal Meteorological
Institute**

**Het Koninklijk Meteorologisch
Instituut**

L'Institut Royal Météorologique

**Das Königliche Meteorologische
Institut**



The RMI provides reliable public service realized by empowered staff and based on research, innovation and continuity.

Het KMI verleent een betrouwbare dienstverlening aan het publiek en de overheid gebaseerd op onderzoek, innovatie en continuïteit.

L'IRM fournit un service fiable basé sur la recherche, l'innovation et la continuité au public et aux autorités.

Vertrauenswürdige Dienstleistungen für Öffentlichkeit und Behörden begründet auf Forschung, Innovation und Kontinuität.