



GPS tracking of
Leisler's bat reveals
important
information for
mitigating measures
at wind power plants

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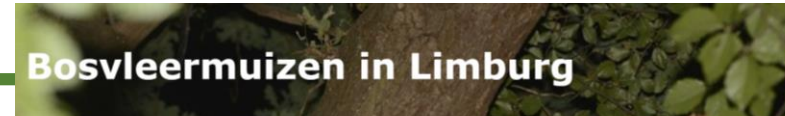
Process and their earlier presentations

Some repetition, new analyses and new data and

- Beerssel (2019)
- VLEN-dag Utrecht (2019)
- Oostende (2020)
- EBRS (2021)

In English, because... Some Flemish guys don't understand my Dutch,

et je ne parle pas français; und auf Deutsch verstehen es nur wenige...



Projectteam:
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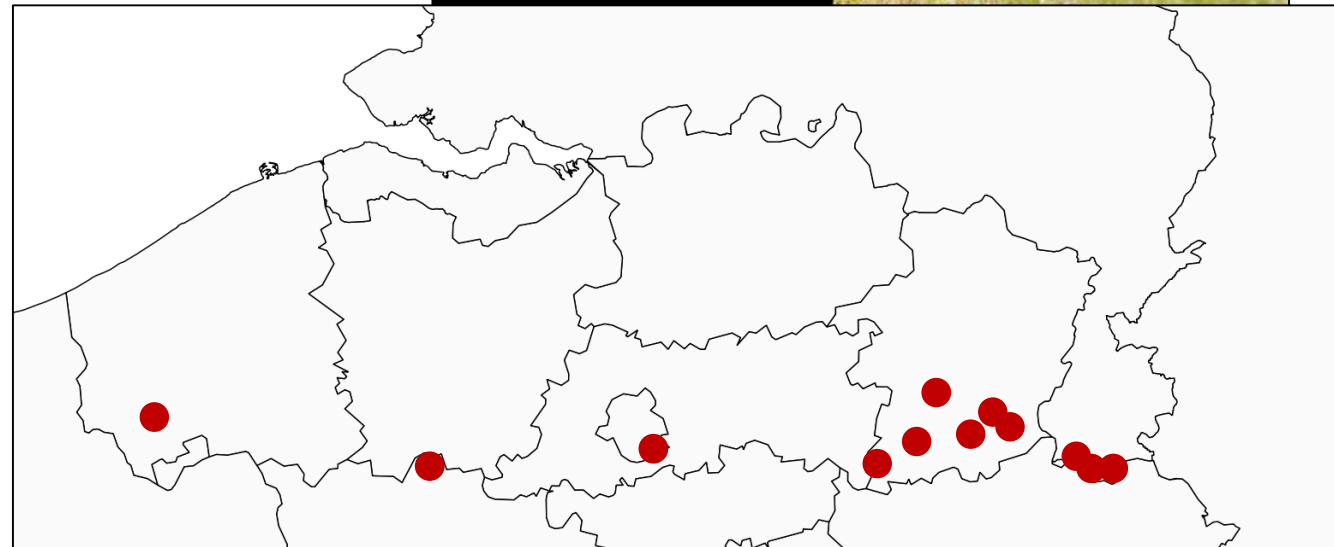


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Leisler's bat (*Nyctalus leisleri*)

- Bosvleermuis or Noctule de Leisler
- Very low numbers of found colonies in Wallonia
- Rare and threatened in Flanders
 - Tree roosting species
- Batdetector observations in all regions
- Maternity roosts in the south
 - 9 known colonies in Flemish Limburg!



Bats and wind turbines

- Wind turbines cause highest mortality late summer & autumn
- Mostly victims by low winds and warm nights
 - Factors behind this still unclear
- Open-landscape foragers most vulnerable
- Evidence: Leisler's bat migrate from Belgium up to Spain



Noctule bat
©Bram Conings

Foraging behaviour

- Movement behaviour not well known
- VHF radio tracking studies UK and Ireland fly up to 14 km
 - No height data

⇒ Difficult to follow!

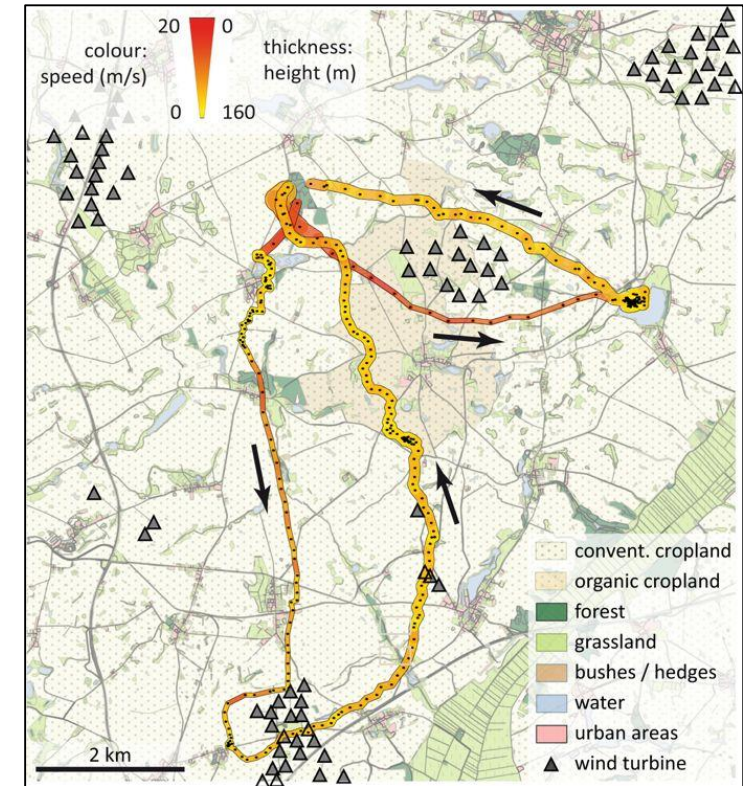
⇒ Few data, especially in late summer



Victims depends on foraging behaviour of Leisler's bats?

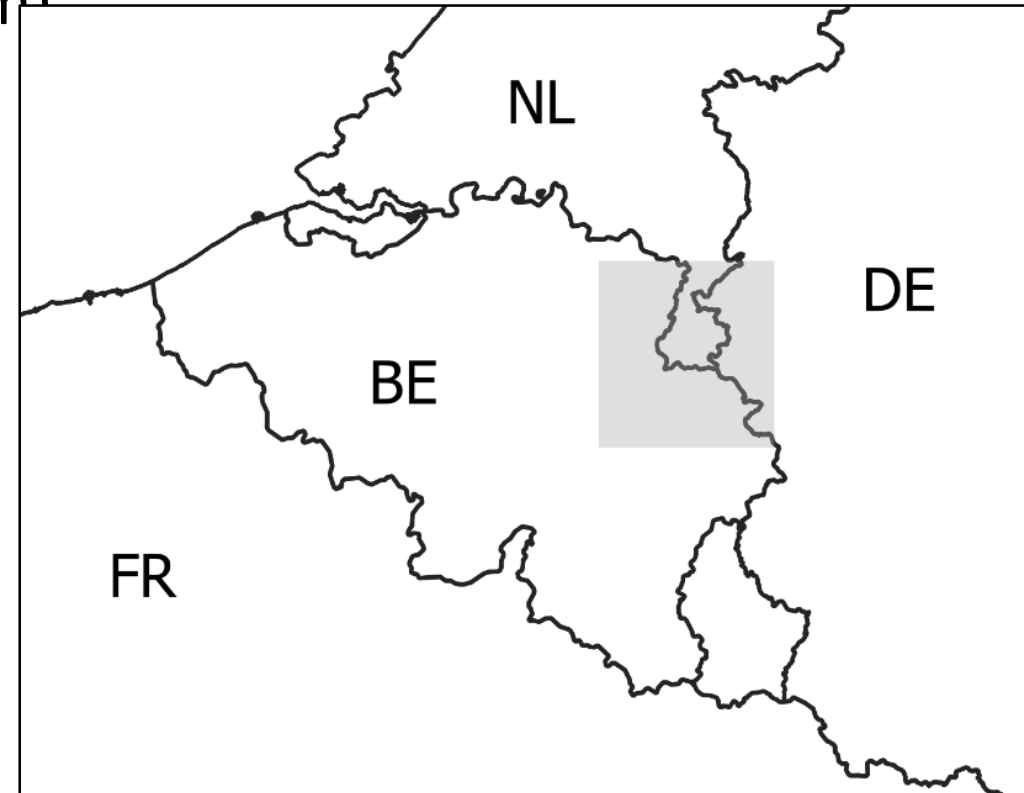
GPS tags

- Recently: small GPS loggers incl battery: < 1 gr
 - Precise location
 - Altitude
 - Need to recover tag
- Tracking studies possible with bigger species
 - Noctules, Free-tailed bat...



GPS tagging in Flanders, Belgium

- Nearly flat area (60-90 m asl) north of Tongeren (*Tongres*)
- Mid of August 2018
- Collar with GPS-tag and beeper tag (~1.2 gram)
 - Only fixes outside the roost
 - 8% of body mass
 - Location fix every 10 min



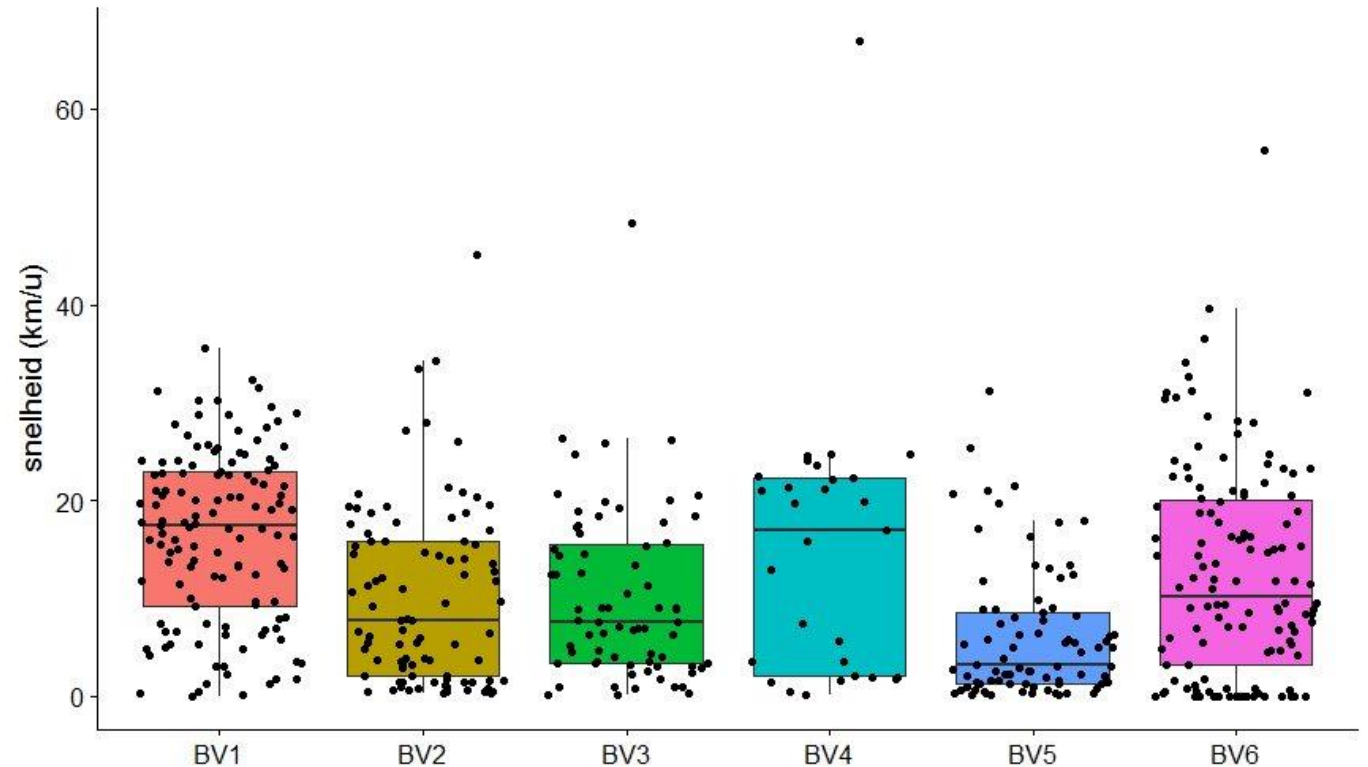
9 bats tagged, 6 tags back

- 9 bats tagged
- 6 tags recovered after 3 days or later
 - (3 ♀ ad; 2 ♀ juv; 1 ♂ juv)
 - 2-4 (6) nights of data
 - 1 vhf tag stopped; 2 escaped during recapture
- 25 tracking nights



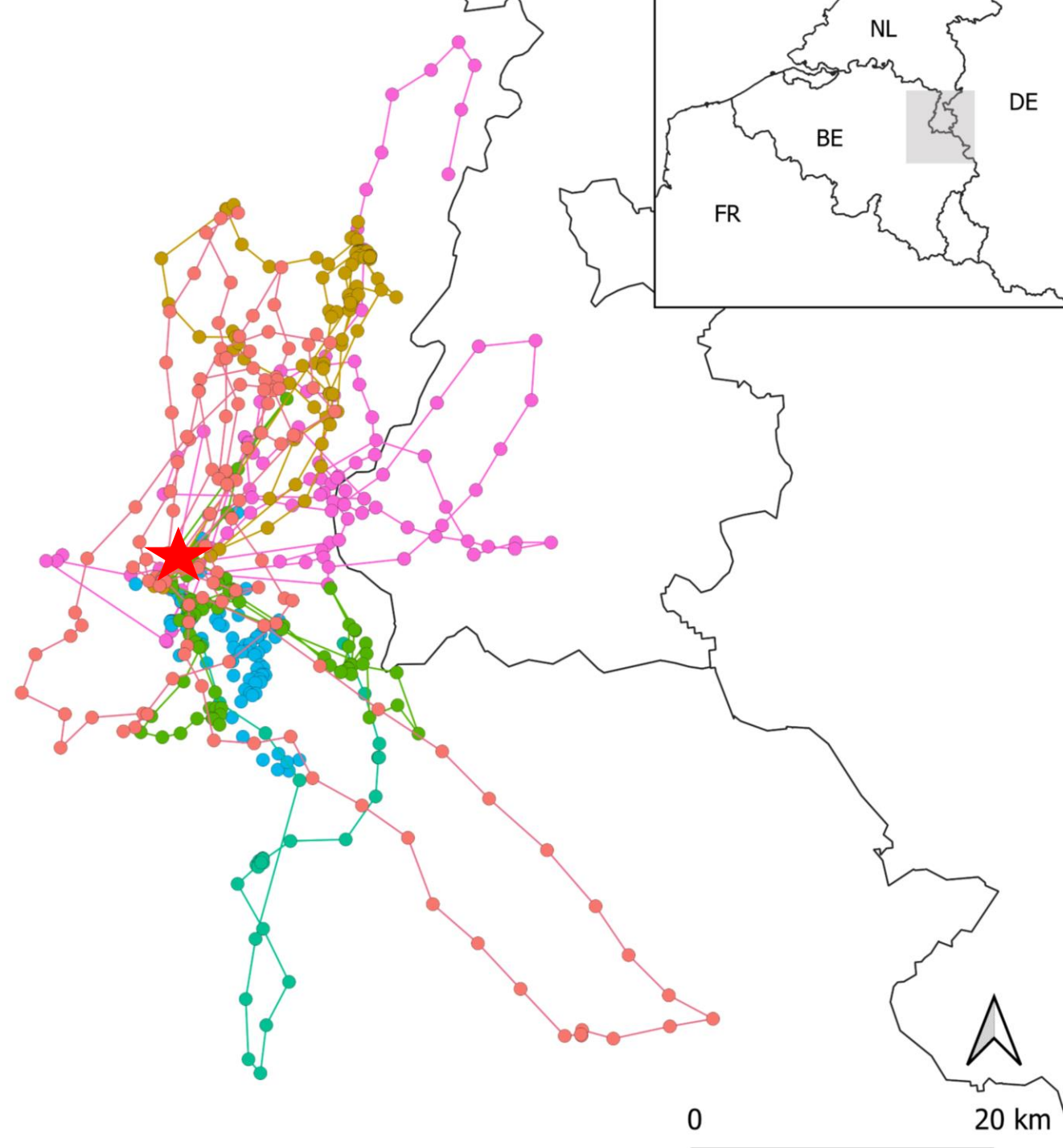
Leisler's bats fly fast!

- On average ca. 15 km/h (between fixes of 10min)
- Up to 67 km/h

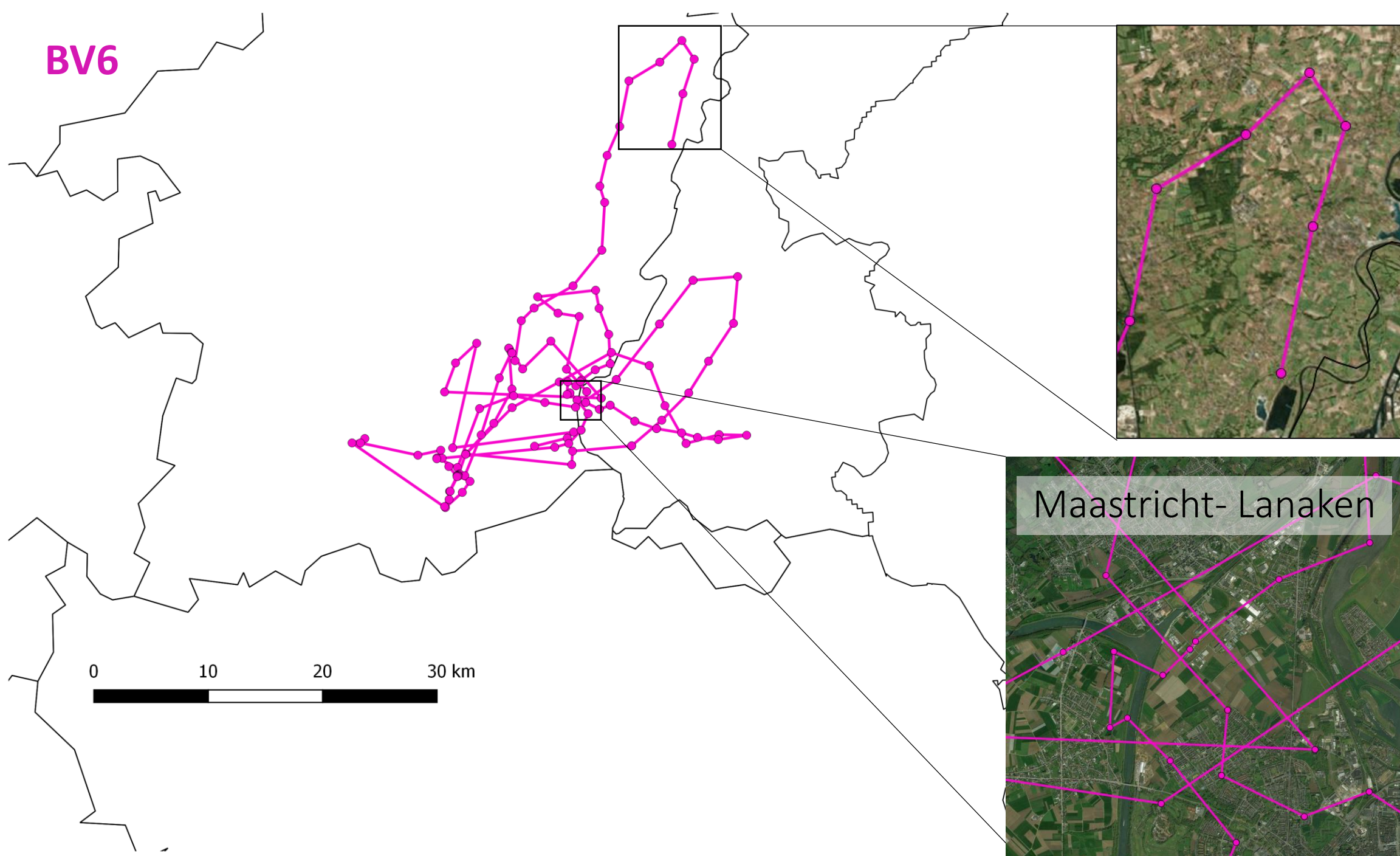


Leisler's bat fly far!

- All 6 bats fly far
 - Up to 48 km (direct line)
 - Routes of more than 100 km
- 30% of fixes in 7.5km around the roost
- Sometimes area-restricted foraging for 1.5 hour



BV6

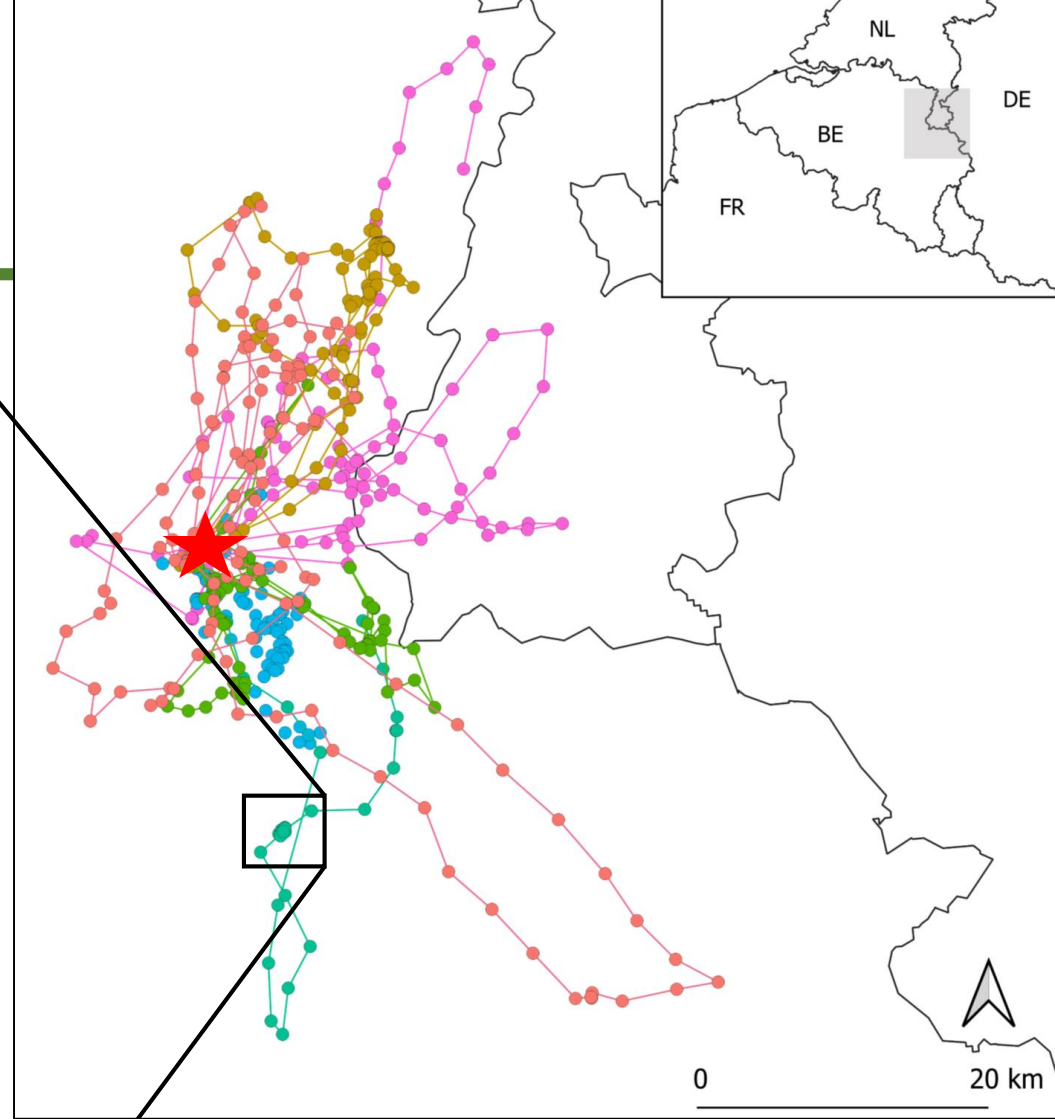
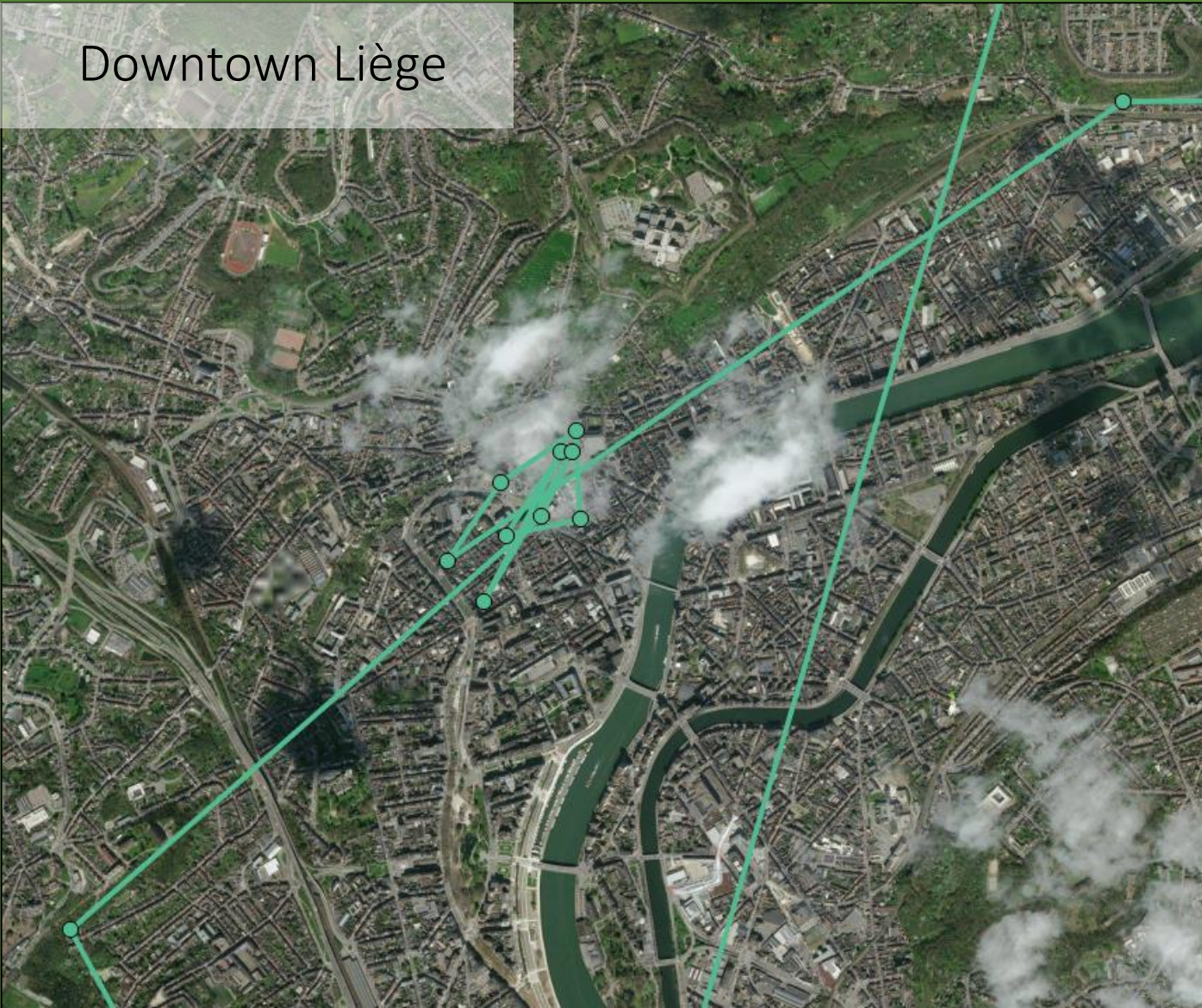


0 10 20 30 km

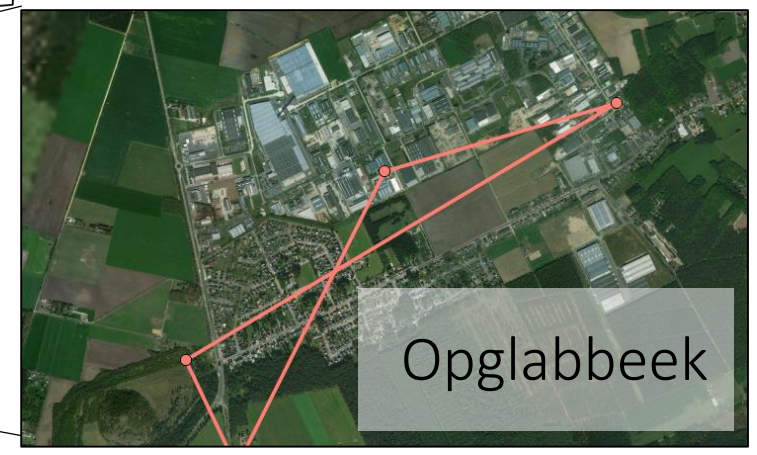
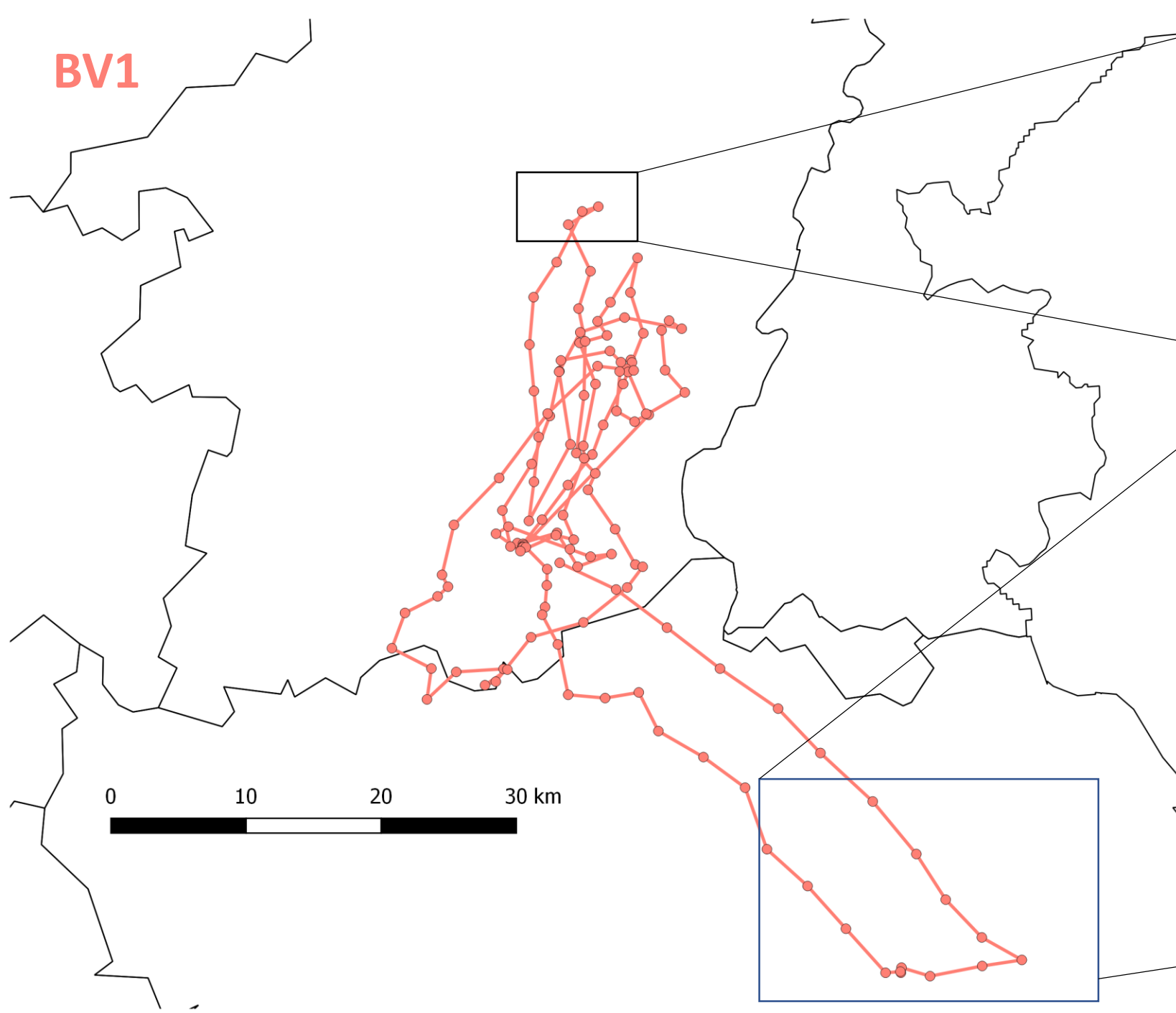
Maastricht- Lanaken

Area-restricted foraging

Downtown Liège



BV1



They fly high

BV1

GPS height (asl)

- 0-150
- 150-300
- 300-600
- 600-900
- 900-1200

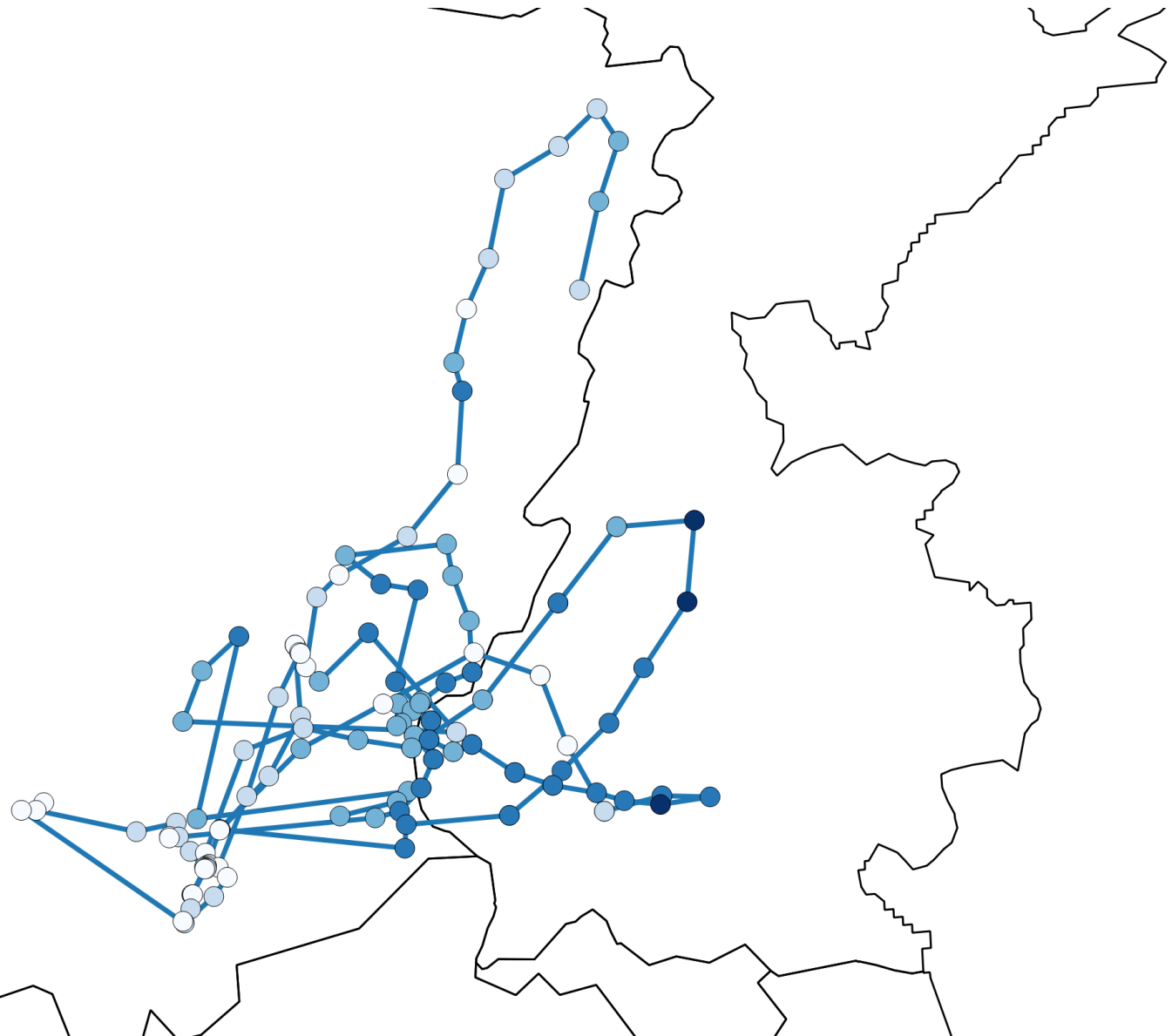
0 10 20 30 40 km



1100 m asl above E314 and
Nationaal Park Hoge Kempen

They fly high

BV6

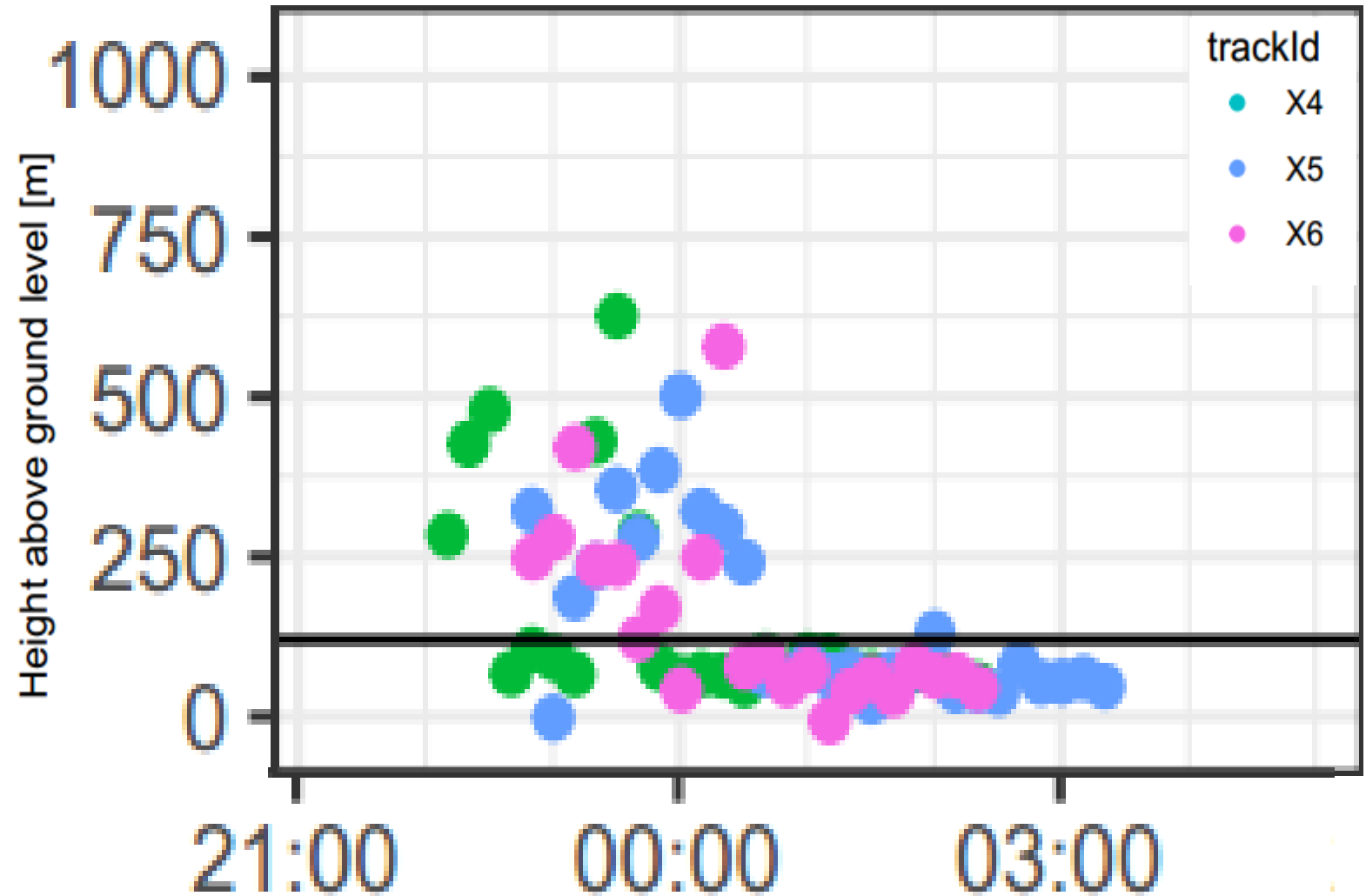


GPS height (asl)

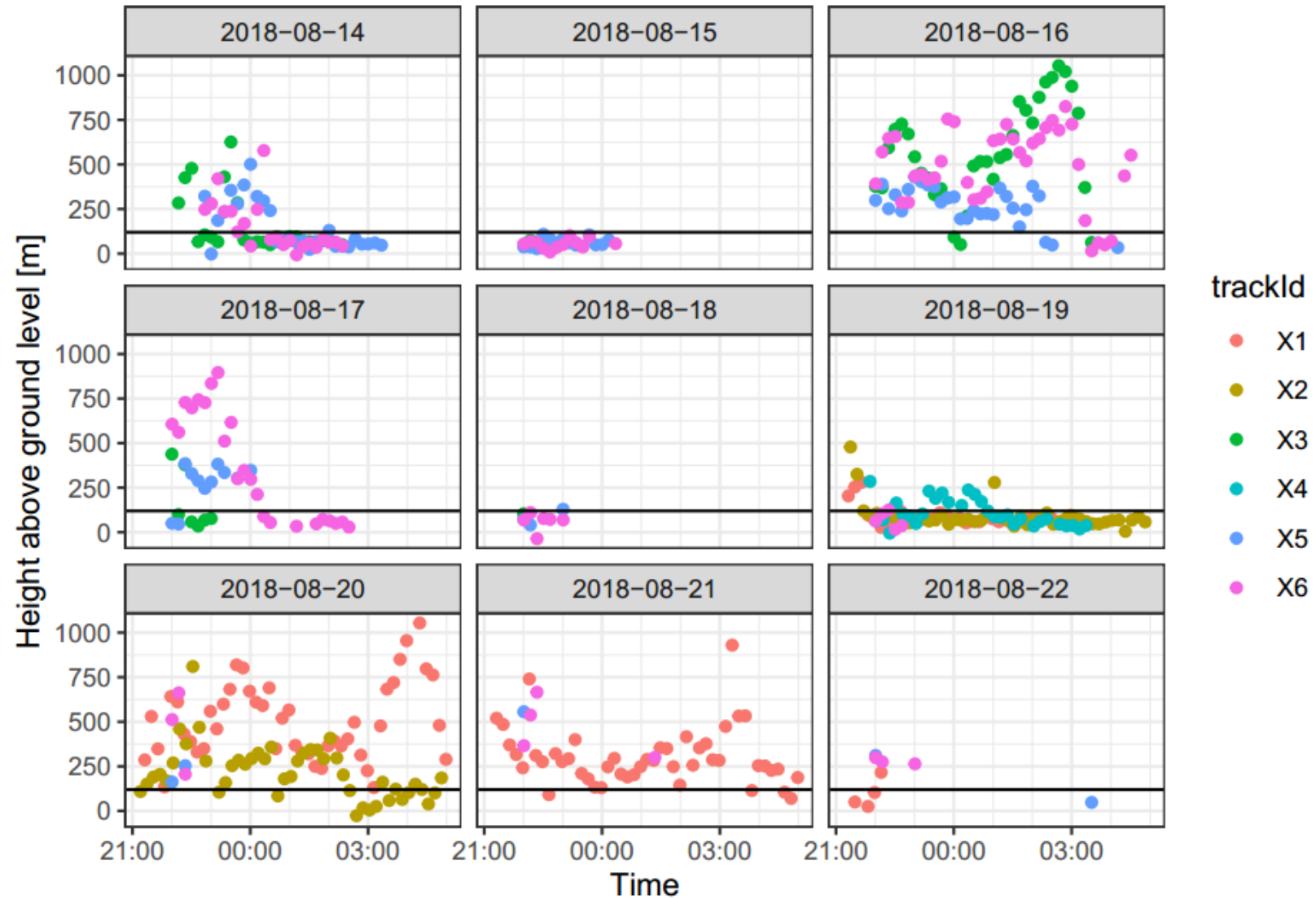
- 0-150
- 150-300
- 300-600
- 600-900
- 900-1200

Together stay low or go high

- Same time:
 - all go high or stay low
- Same region
 - but ~5-40 km away from each other
- Split = 120m agl

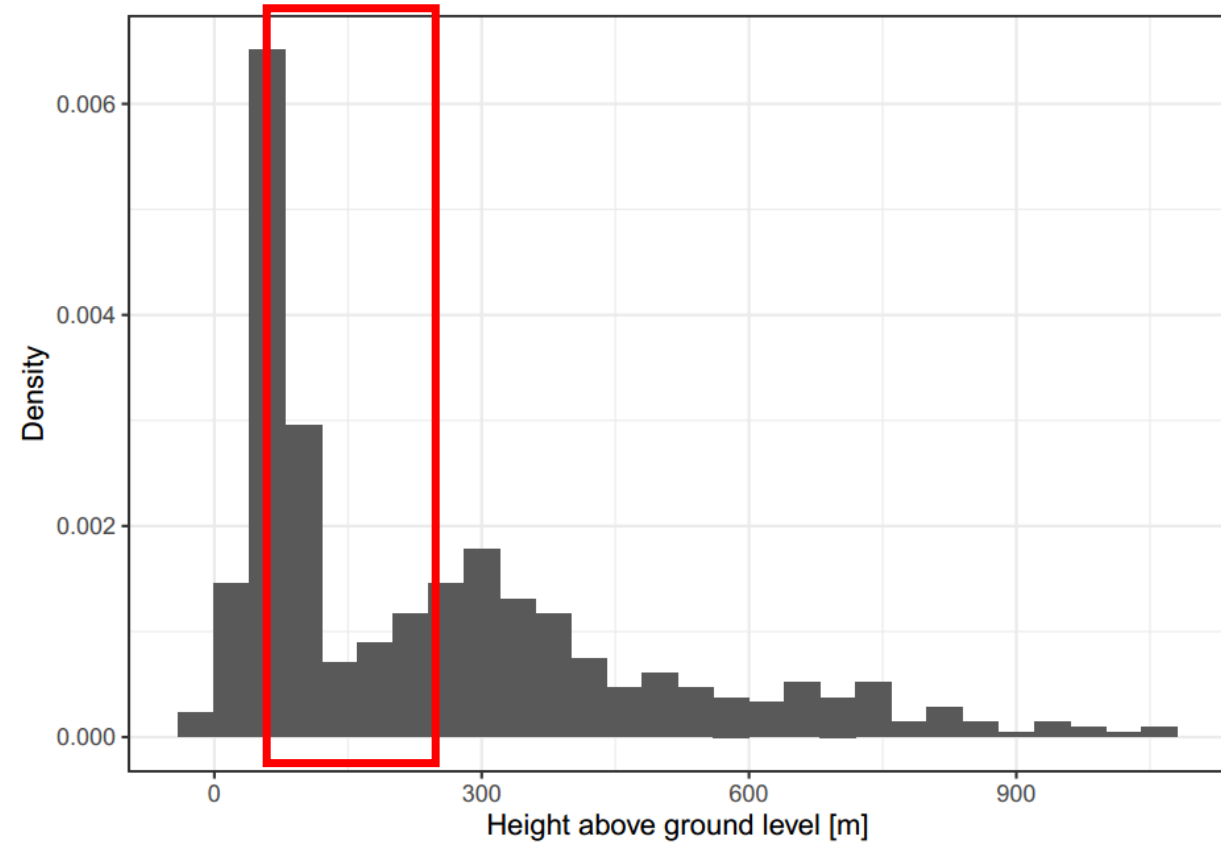


All 9 nights same pattern



Leisler's bat fly high!

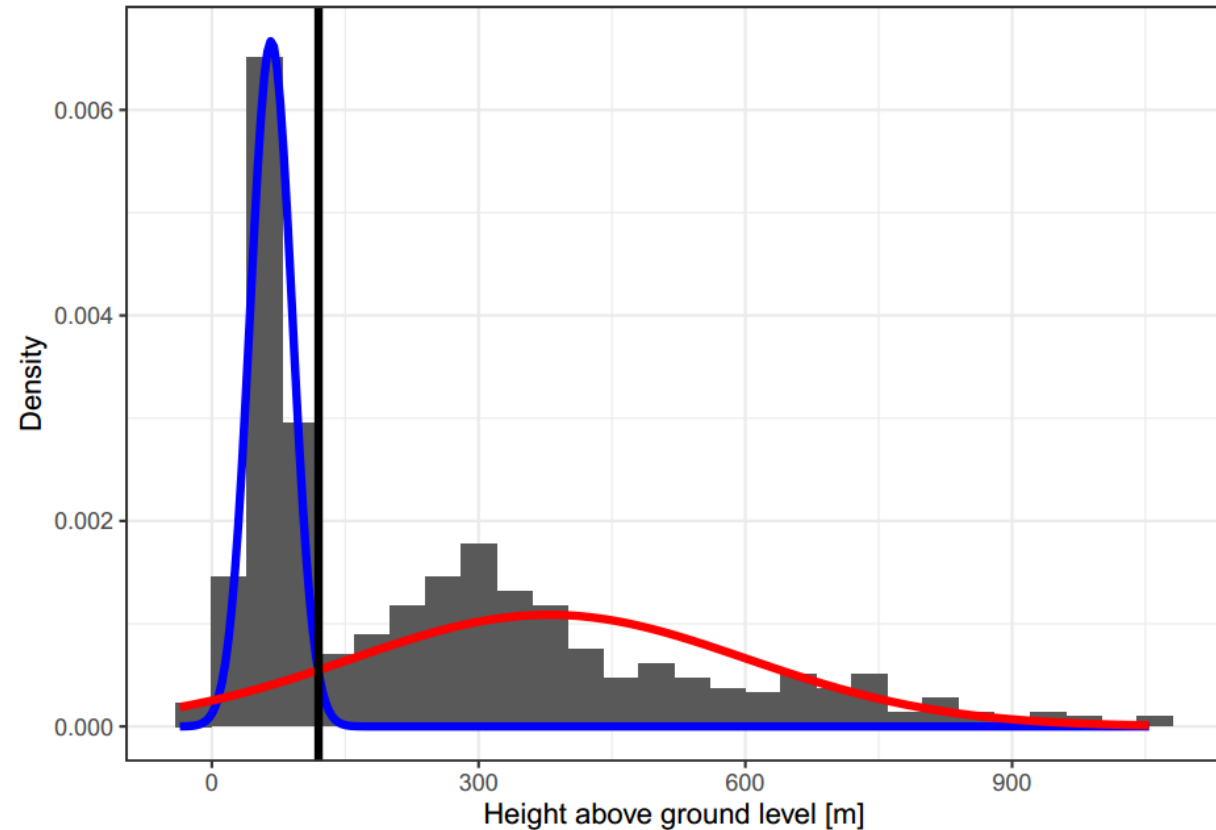
- Up to 1054m agl
- Uplift unlikely
- Swept area



Bimodal system (stay low or go high)

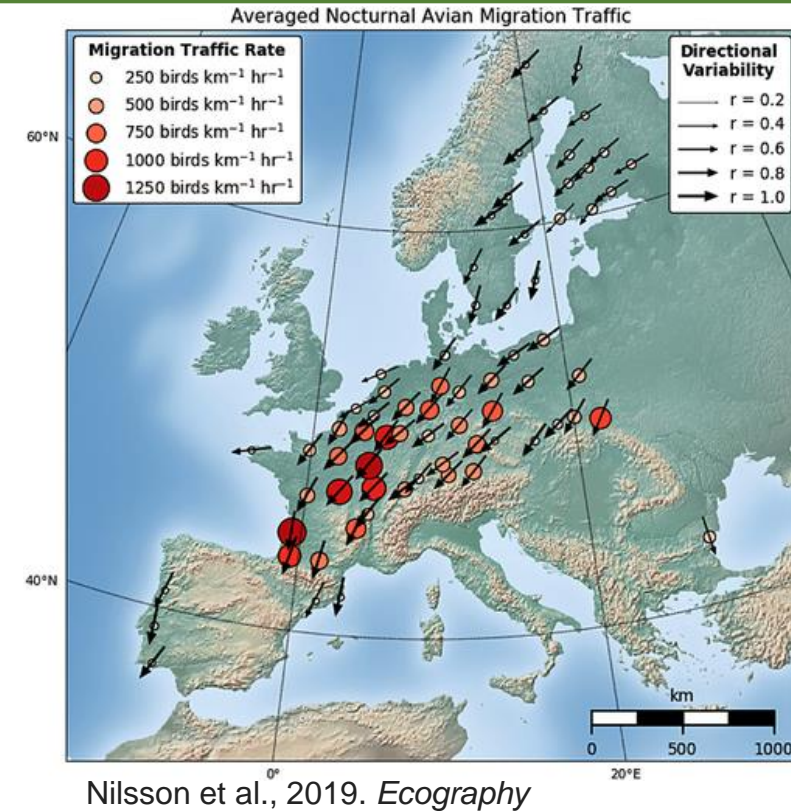
- Bimodal distributed
 - Mean¹: 67m agl
 - Mean²: 379m agl
- Split: 120 meter agl

Danger zone is not only a sum of distribution (also attraction is playing a role!)



When there is advantageous wind for insect migration, bats forage at high altitudes?

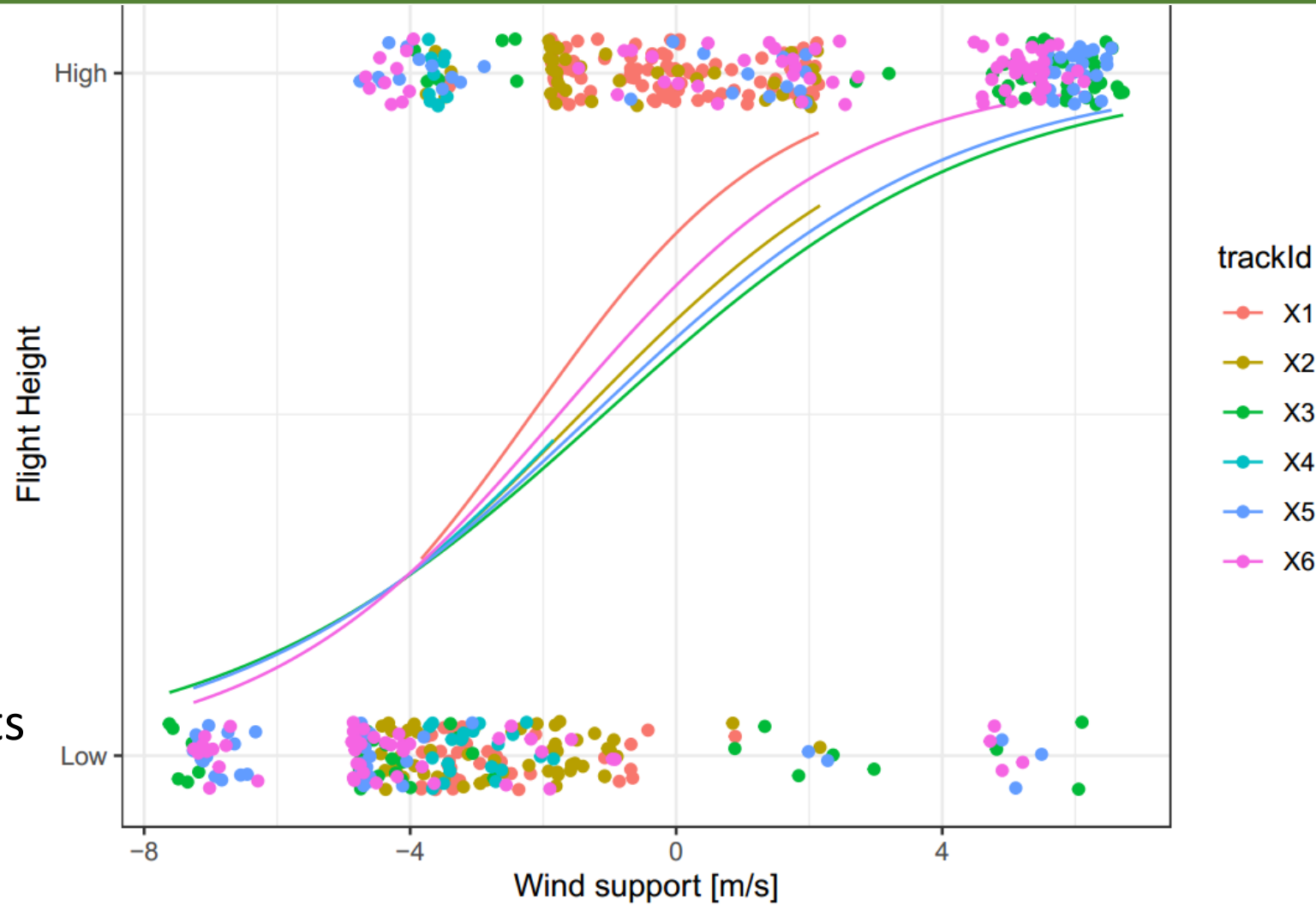
- Bird migration \approx direction insect migration
 - Western Europe ca 30°
- Wind support \rightarrow direction in m/s 30° (from NNE to SSW)
- Annotation ECMWF wind data set at 950 mBar = ~ 550 m agl



Beneficial wind for insect migration

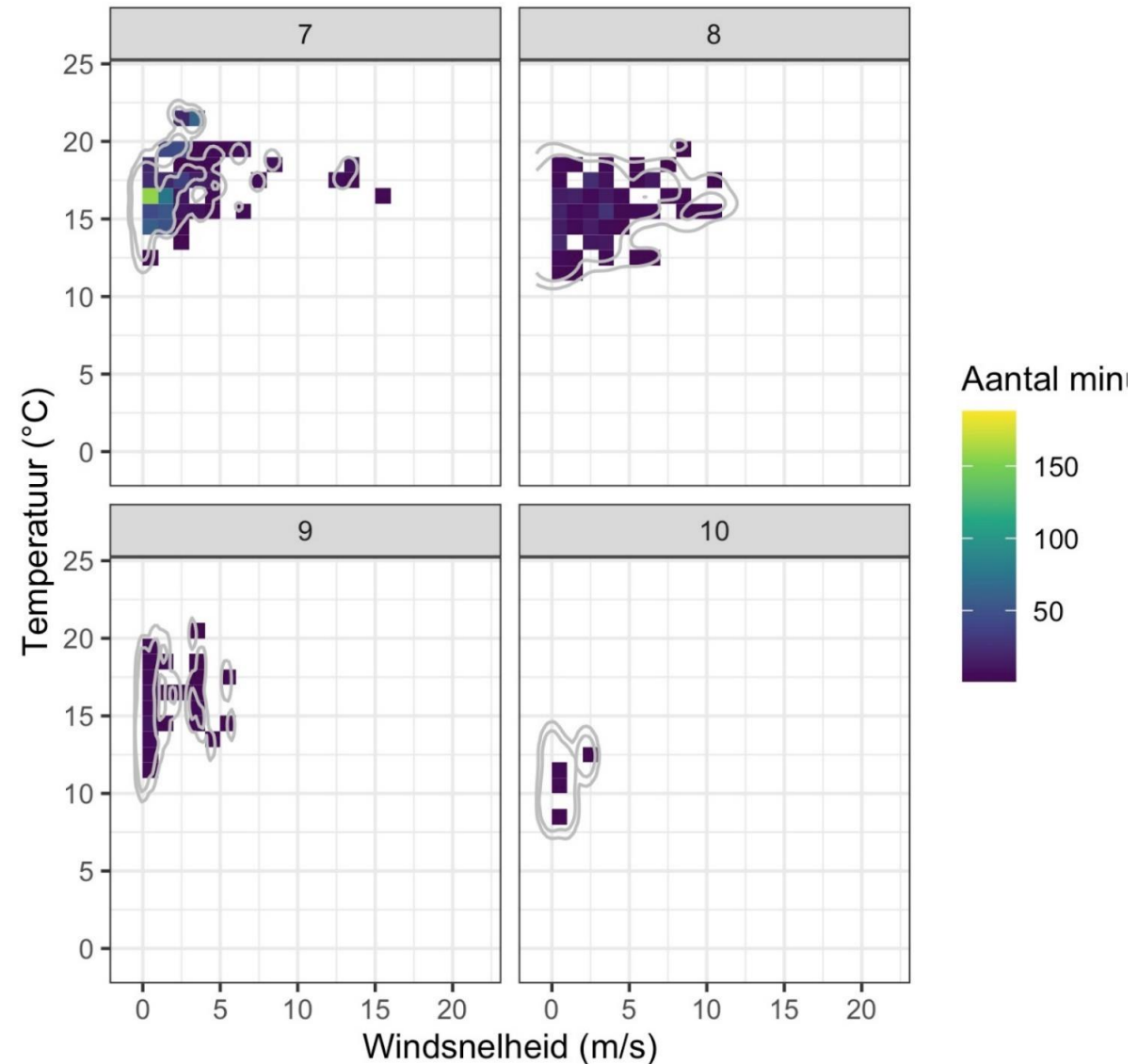
- Significant correlation wind support 30°
(from NNE to SSW)
- Randomisation test ECMWF dataset 1980-2020
(by 100 permutations)

→ not a factor by chance
(Corrected for individual effects and temporal autocorrelation)



NL: Wind speed by Leislars' high mounted detectors

- Four detectors four months on height

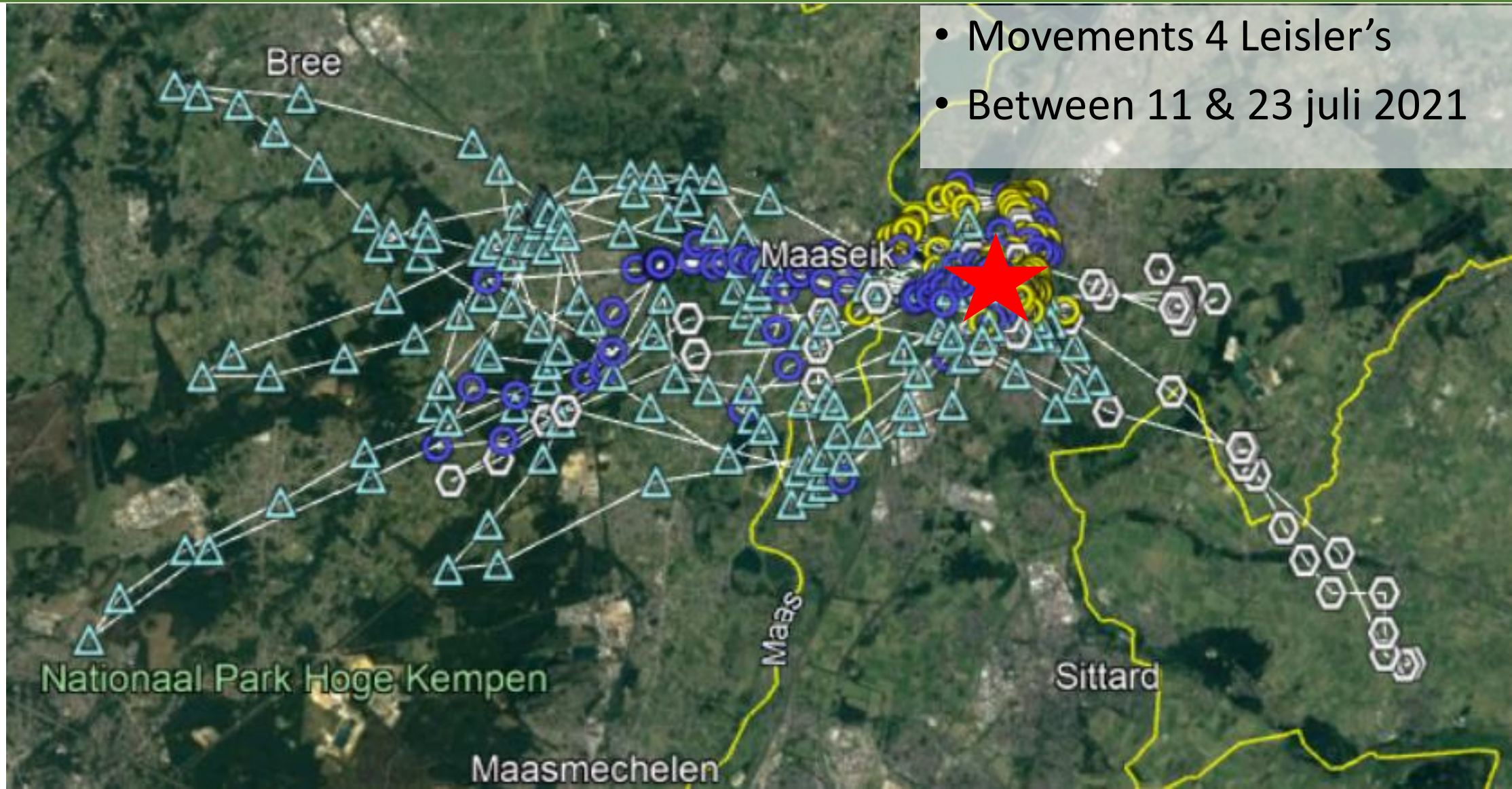


NL: First glimpses during lactation – 't Hout

- Movements 3 Leisler's
- Between 10 & 20 juli 2021

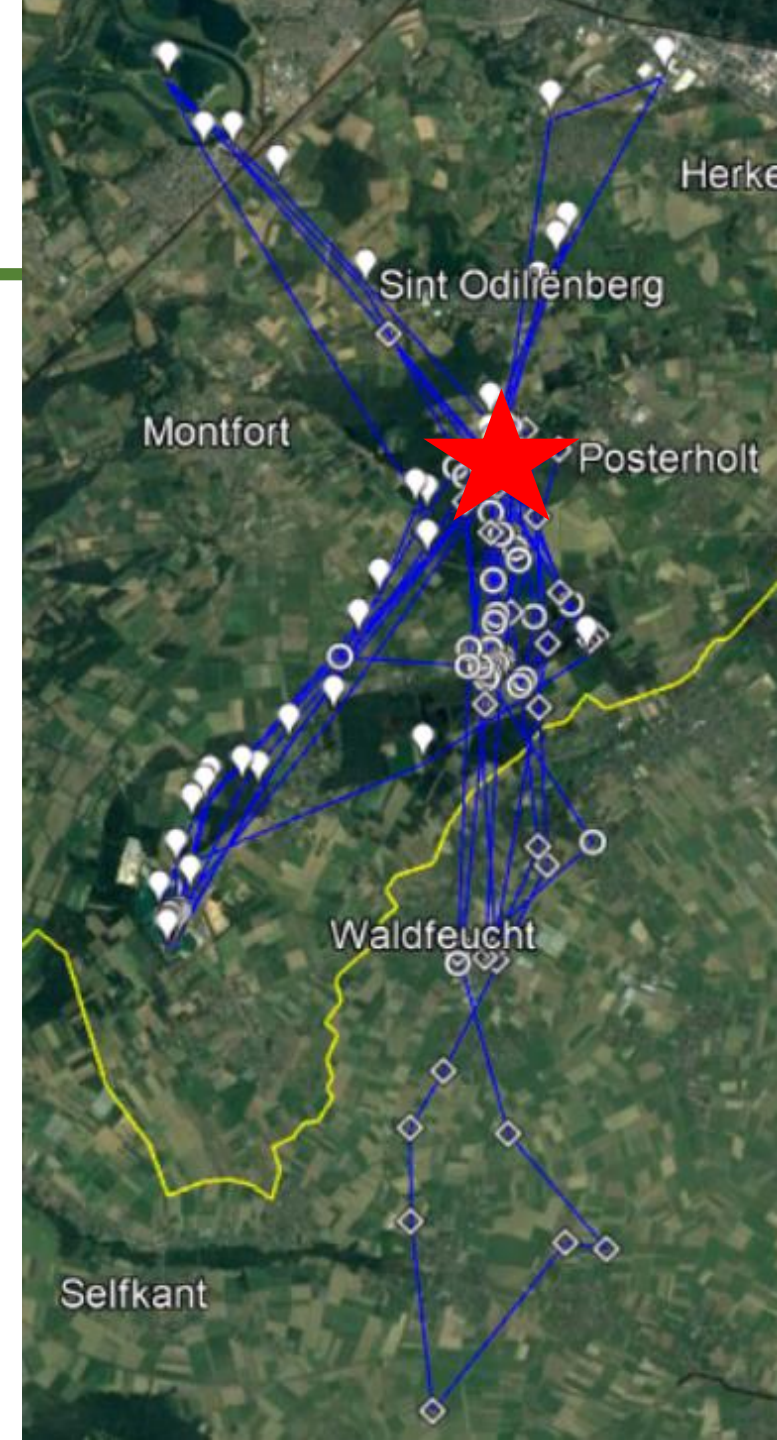


NL: First glimpses during lactation – De Doort



NL: First glimpses during lactation - Aerwinkel

- Movements 3 Leisler's
- Between 11 & 15 juli 2021



Conclusions

©Rollin Verlinde



- Long flight distances daily. Increased chance to encounter turbines or become attracted & could be killed by turbines
- Leisler's fly high by NNE wind; same conditions as insect migration (partly in rotor swept area)
- Leisler's stay low (under 120m) by SSW wind (mostly in rotor swept area)
- Third of the time in swept area of wind turbines; in danger by both wind conditions.

Discussion



- Collisions risks by migratory species not only by migration! Fly further than known or expected.
- This bimodal system also in other seasons with detour flight. How is this in other species?
- Value bat detector recording? What does it measure (and miss) at ground/ tower/ nacelle height?
- Getting behaviour data is important for understanding and protecting bats



Thanks!

- Funding: ANB for Flemish project
- Funding Gemeente Echt-Susteren for Dutch data
- Paul Voskamp for helping with fieldwork
- Jens Rydell, James Chapman, Birgen Haest & Felix Liechti for discussion about insect migration and bats
- the whole project team for all help

All tagged Leisler's bats fly high!

- On average ca. 300m
- Up to 1150 m asl (!)
- Flying at Wind turbine rotor height

