

Radar detection of avian responses to sonic booms

An exploratory investigation into a supersonic F-16 event over Belgium (16 December 2025) and a survey of Belgian sonic boom cases, 2020 to 2025

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01 Background & question

SONIC BOOMS & WILDLIFE

An abrupt acoustic shock

Supersonic aircraft generate sonic booms: sudden pressure pulses that can startle wildlife and trigger collective escape, such as the mass take-off of resting birds.

A KNOWN RADAR ANALOGY

Birds that radar can see

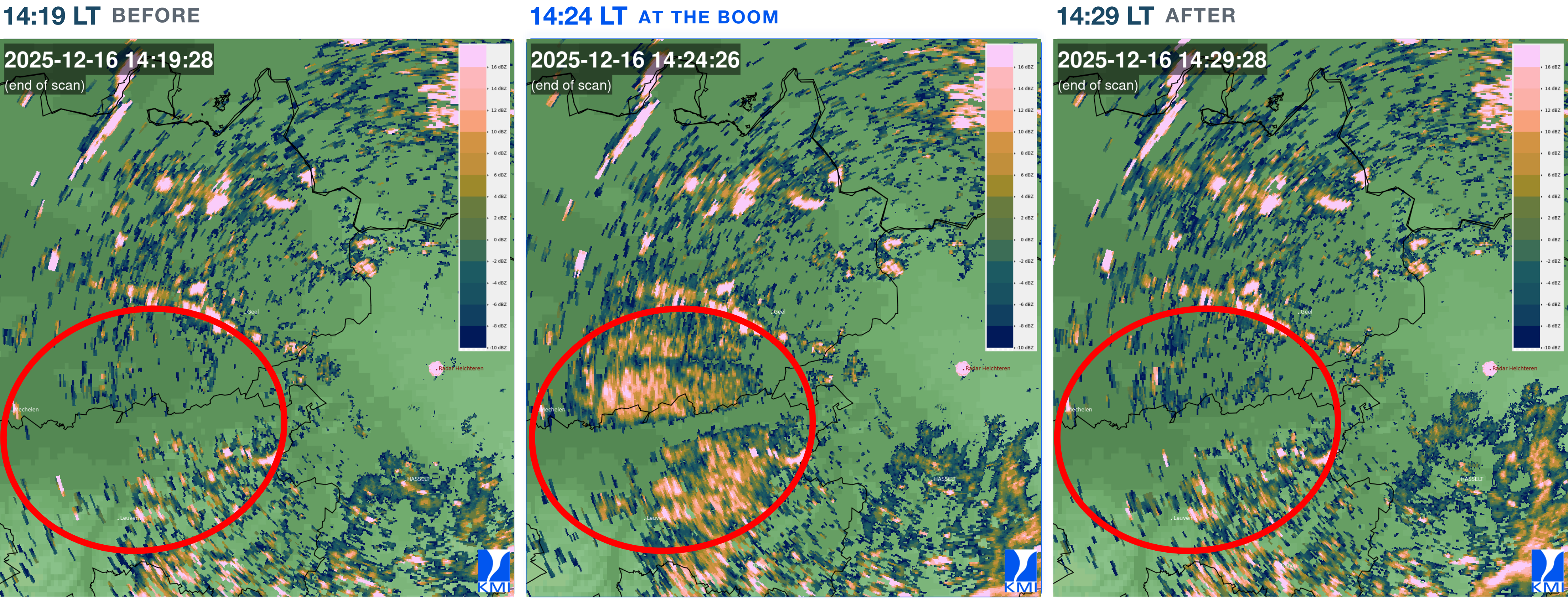
Weather radars routinely record biological echoes. During fireworks they have captured sudden, large-scale bird departures, showing that abrupt disturbances leave a clear signature in radar data.

THIS STUDY

Can a boom be seen?

Does a sonic boom leave a detectable biological signal in weather radar? Our approach is a posteriori: starting from media-reported booms, we searched radar archives for coincident biological responses.

02 The 16 December 2025 event



Radar Helchteren 600m CAPPI (VMM), 16 Dec 2025. Within the red ellipse, biological echoes are sparse at 14:19, fill in abruptly at 14:24 (just after the boom) and fade by 14:29: a brief, spatially coherent enhancement consistent with birds taking off and resettling, like the departures radar records during fireworks.

An **F-16** crossed the sound barrier near the city of **Leuven** at $\approx$ 13:24 UTC (14:24 local time). We compared Helchteren radar scans **before, during and after** the boom.

AIRCRAFT
F-16
supersonic pass

RADAR
Helchteren
VMM · CAPPI 600m

REGION
Leuven
E Flemish-Brabant

KEY FINDING

Weather radar captures birds taking flight in response to the sonic boom. To our knowledge, this effect has rarely been documented.

03 A broader survey: Belgian sonic booms, 2020 to 2025

Eight **media-reported** sonic booms over Belgium were screened in radar archives. Outcomes range from a clear biological response to cases that could not be assessed because of precipitation or radar-data gaps.

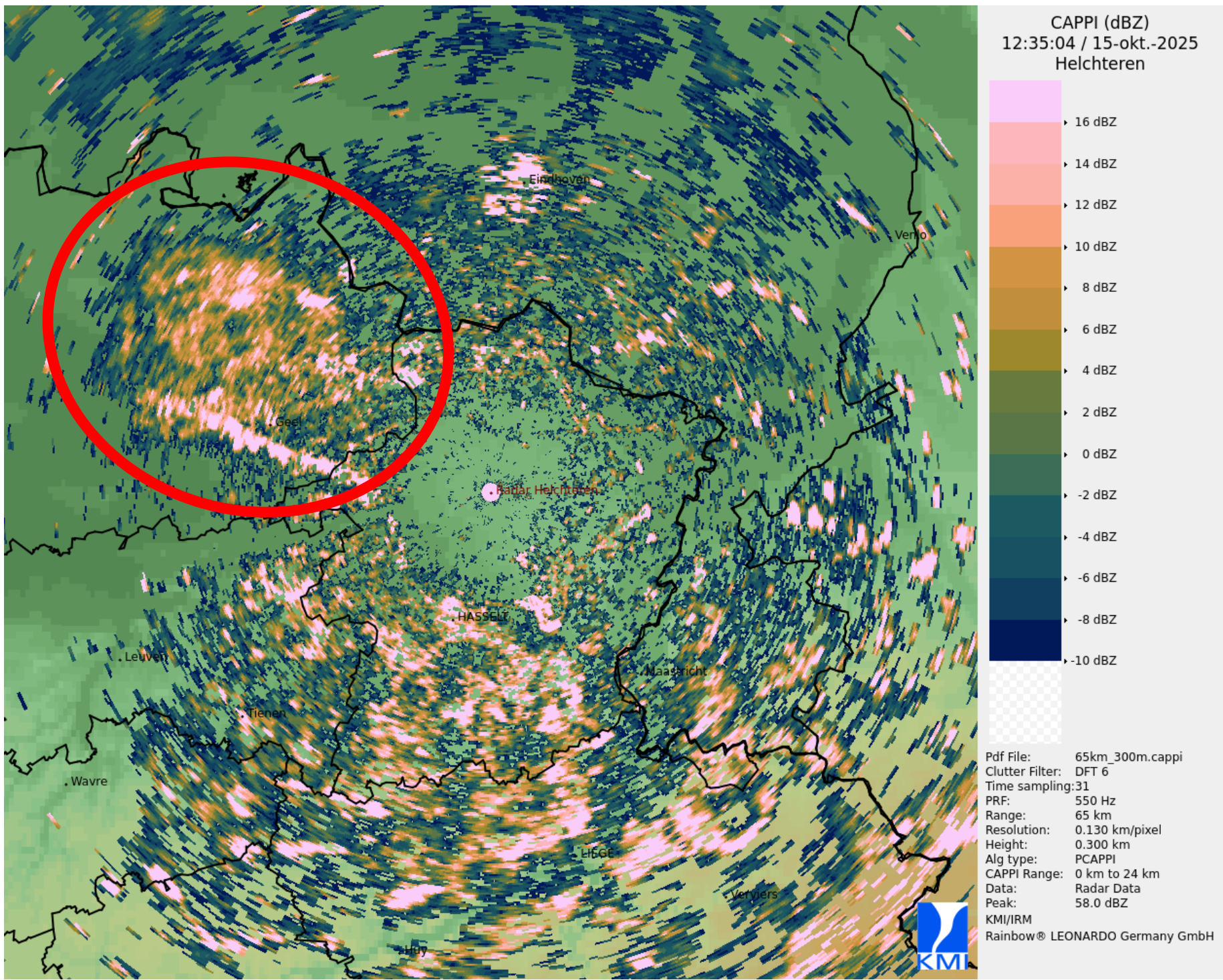
3
effect confirmed

1
uncertain

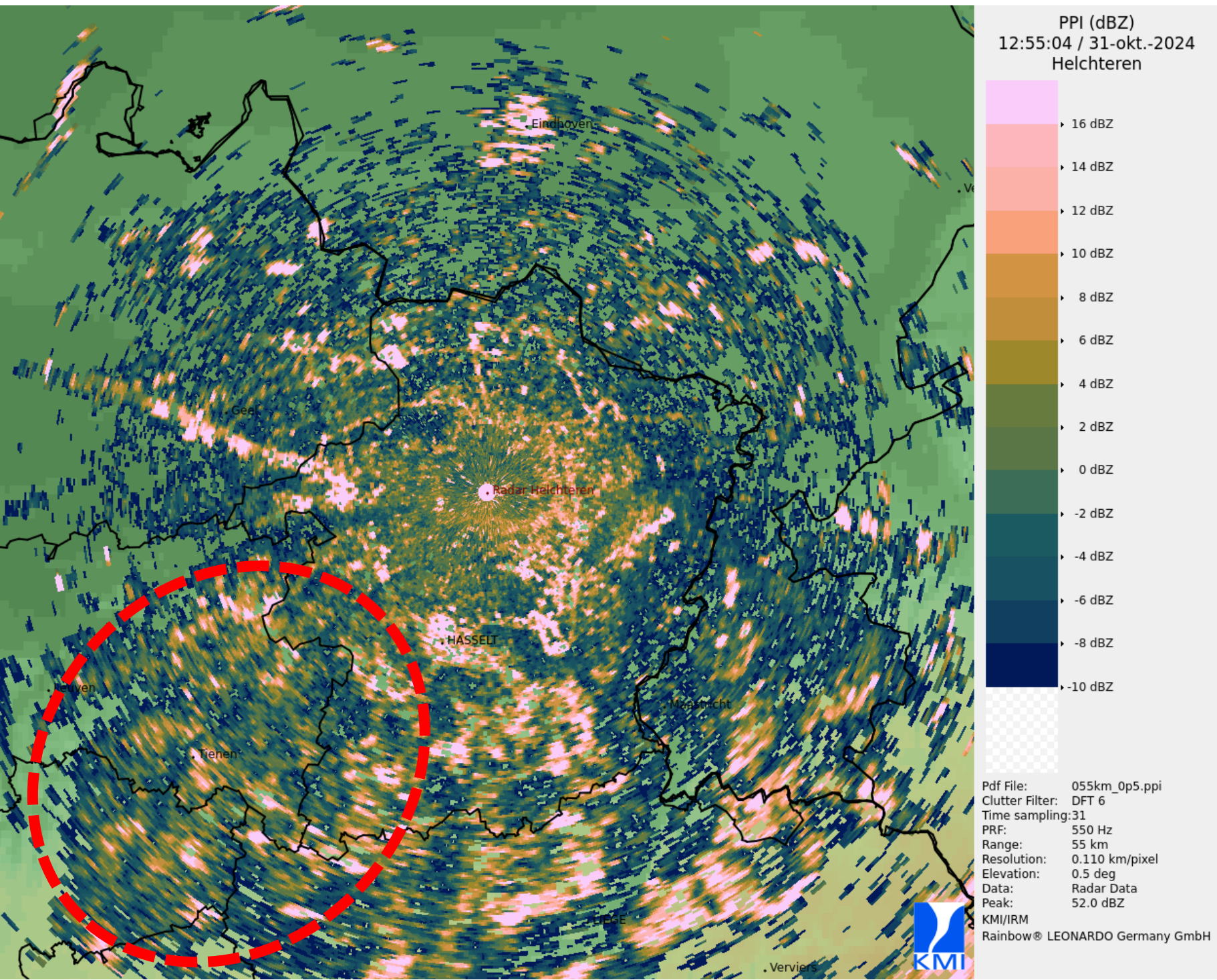
1
no effect

3
not examinable

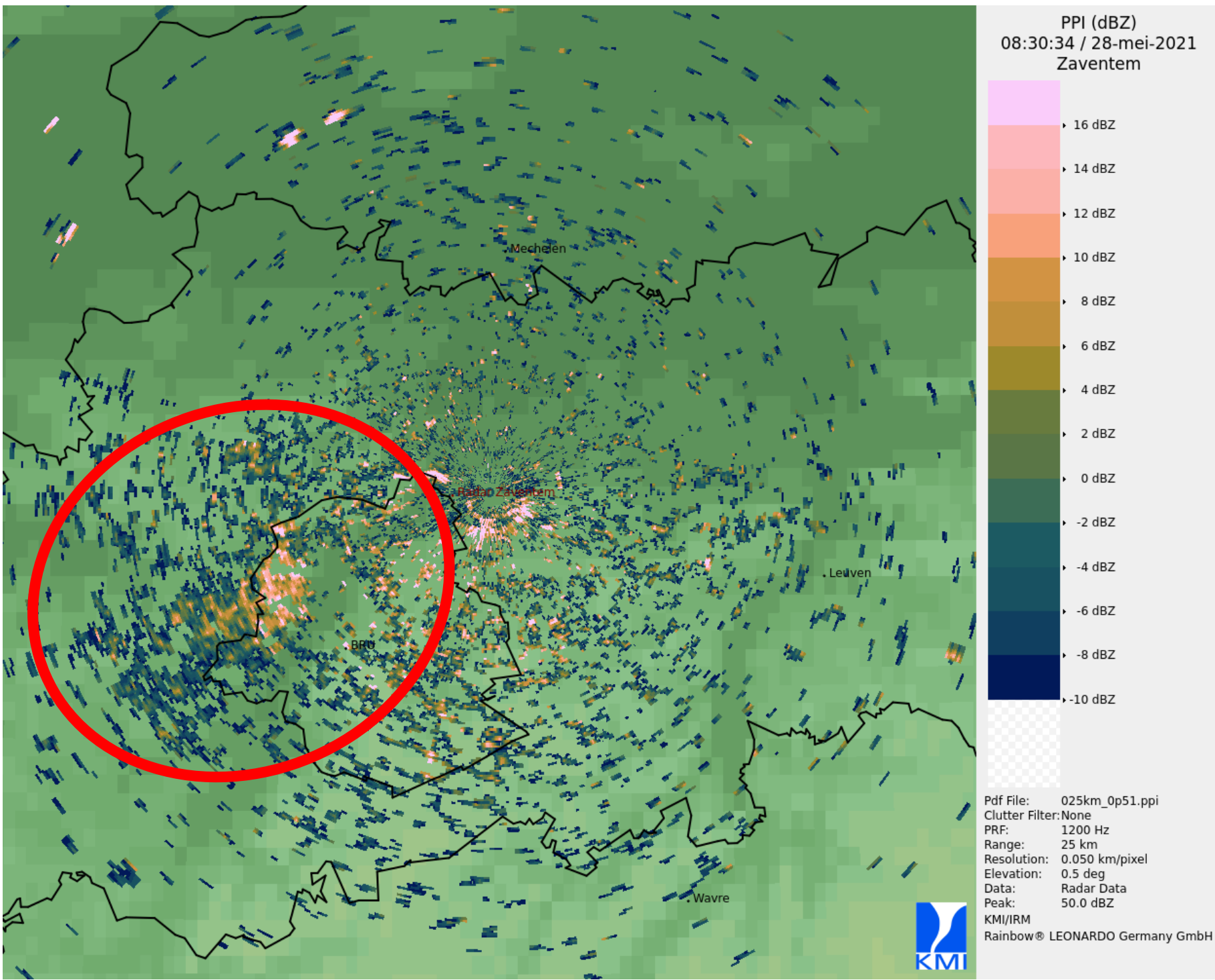
Date	Local time (from media reports)	Radar	Province or region	Result
16 Dec 2025	14:24	Helchteren	E Flemish-Brabant (Leuven)	Confirmed
15 Oct 2025	14:40	Helchteren	Kempen (N-E Flanders)	Confirmed
14 Apr 2025	13:45	Helchteren	Limburg	Not examinable · radar unavailable
2 May 2024	afternoon	Helchteren	Kempen (N-E Flanders)	Not examinable · precipitation
31 Oct 2024	~14:00	Helchteren	Leuven region	Uncertain · very faint, debatable
1-2 Aug 2023	12-13 / 16-17	Helchteren	Diest region	Not examinable · precipitation
14 Apr 2023	10:30	Zaventem / Helchteren	E Flemish-Brabant & Antwerp	No effect
28 May 2021	10:30	Zaventem	Brussels (W) & W Flemish-Brabant	Confirmed



15 October 2025
Radar Helchteren · CAPPI 300 m · Kempen
Effect confirmed



31 October 2024
Radar Helchteren · PPI 0.5° · Leuven region
Uncertain signal



28 May 2021
Radar Zaventem · PPI 0.51° · Brussels region
Effect confirmed

04 Conclusions & outlook

What we found

A sonic boom can leave a detectable biological signature in weather radar through birds startled into flight.

The 16 Dec 2025 F-16 event near Leuven shows a clear avian response, rarely documented before.

Three of the five assessable cases show a comparable response, indicating it is not a one-off.

Limitations & outlook

This is **exploratory work**, not a comprehensive scientific study of the effect.

Precipitation, radar gaps and uncertain boom timing limited several cases.

Next: scan other radar archives; cross-check against seismometers, which record booms too.

RADAR DATA

Radar Helchteren: VMM (Flanders Environment Agency).
Radar Zaventem: skeyes.

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