

Using full 3D bird radar to assess bird flight behaviour in and around wind farms

Jonne Kleyheeg-Hartman



Bureau Waardenburg
Ecology & Landscape





Radar ornithology



Why radar?

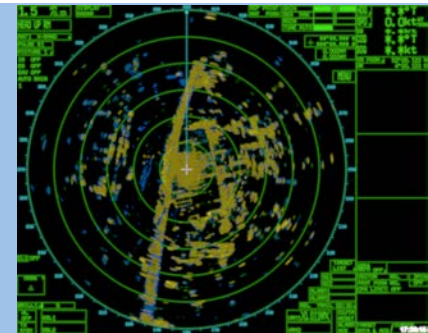
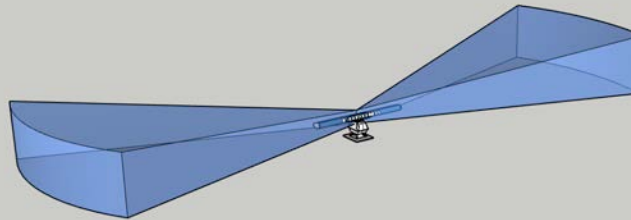
- Larger detection range
- Observations in the dark
- Multiple directions and distances
- Automation and standardisation



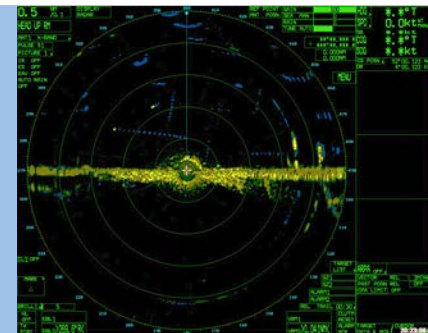
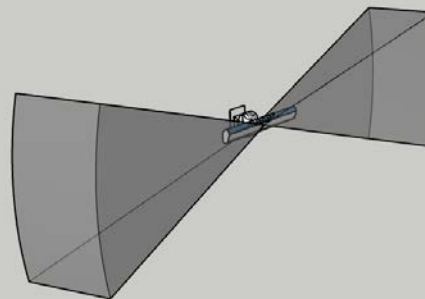


Radar ornithology

Horizontal



Vertical



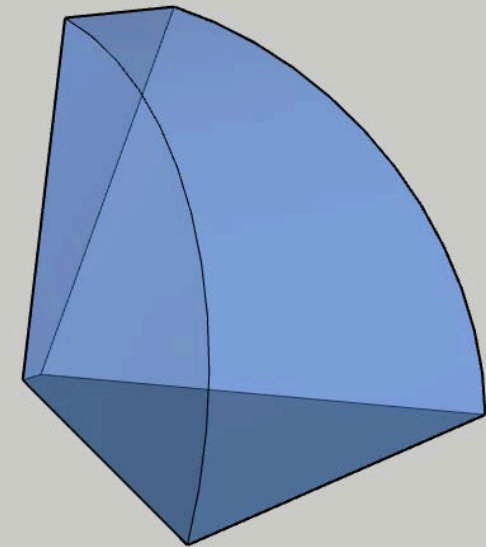
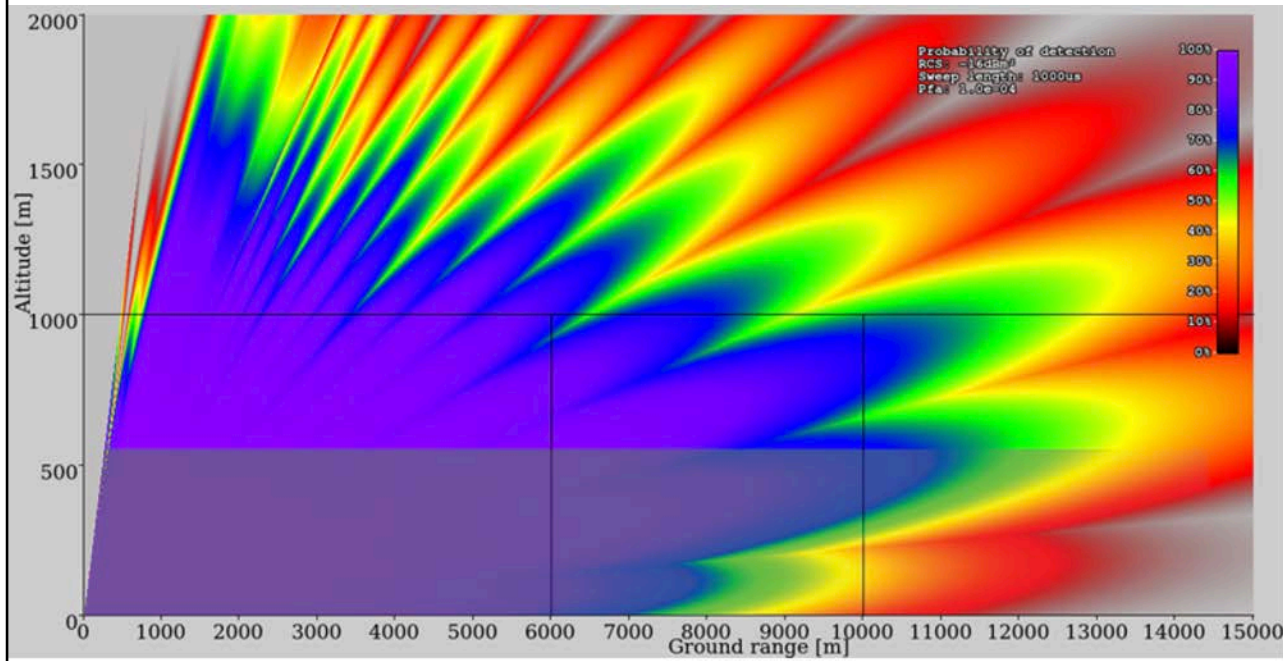


Full 3D bird radar – MAX®



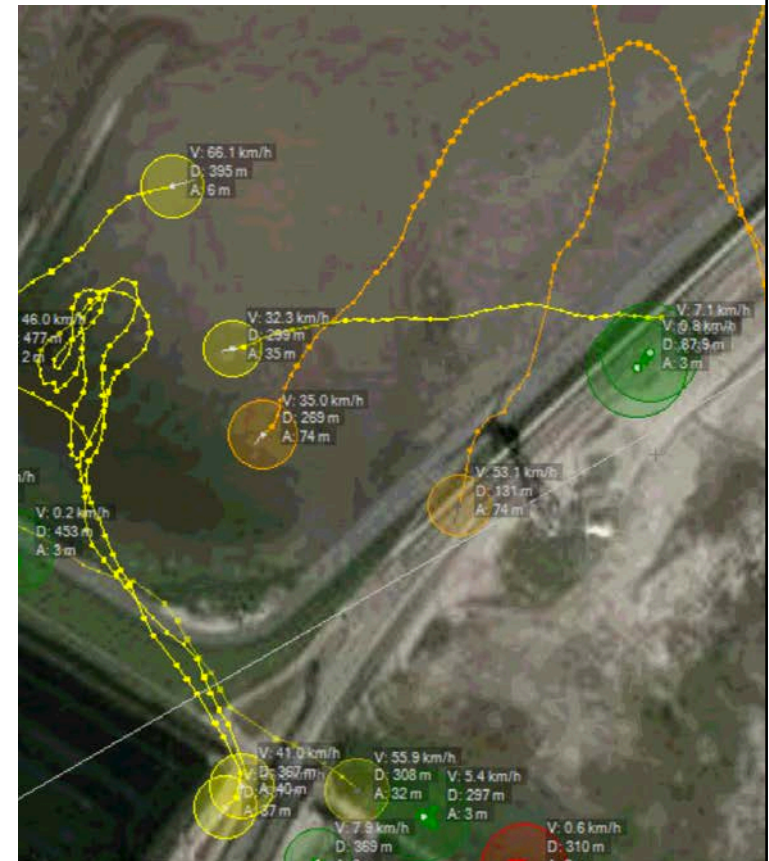
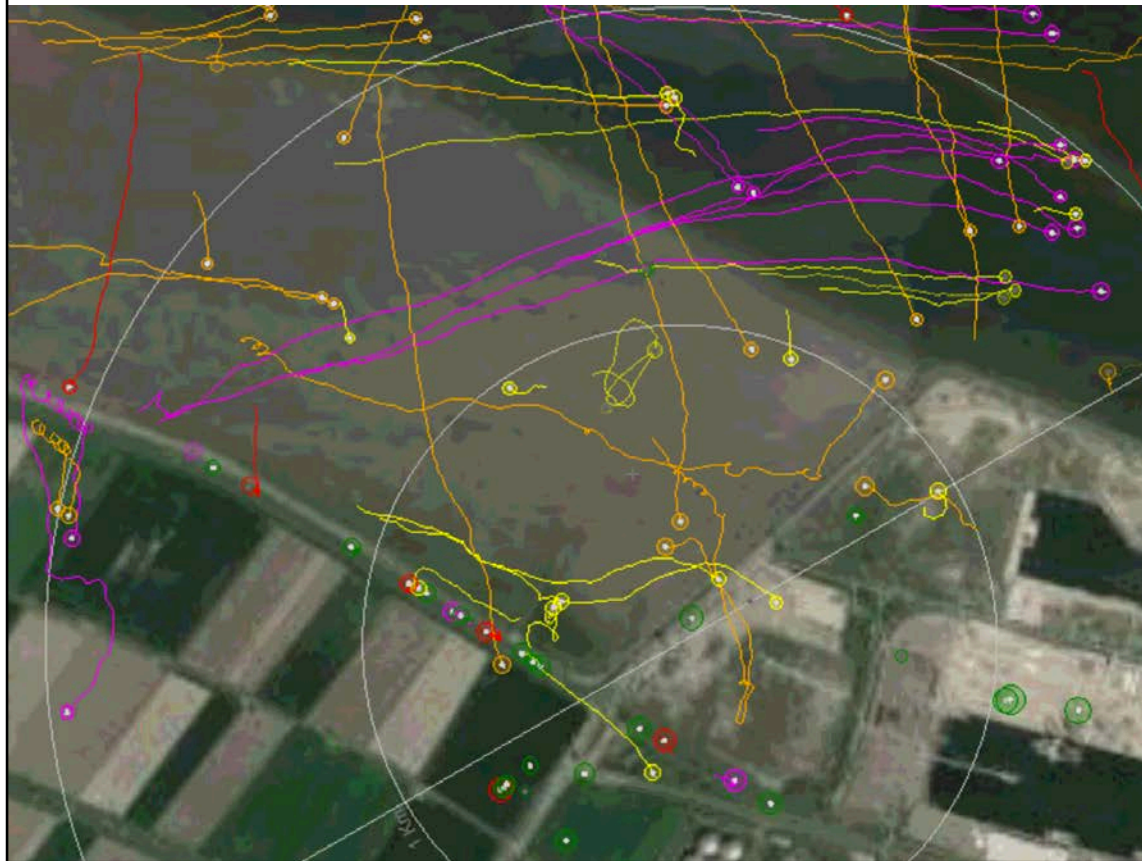


Full 3D bird radar – MAX®



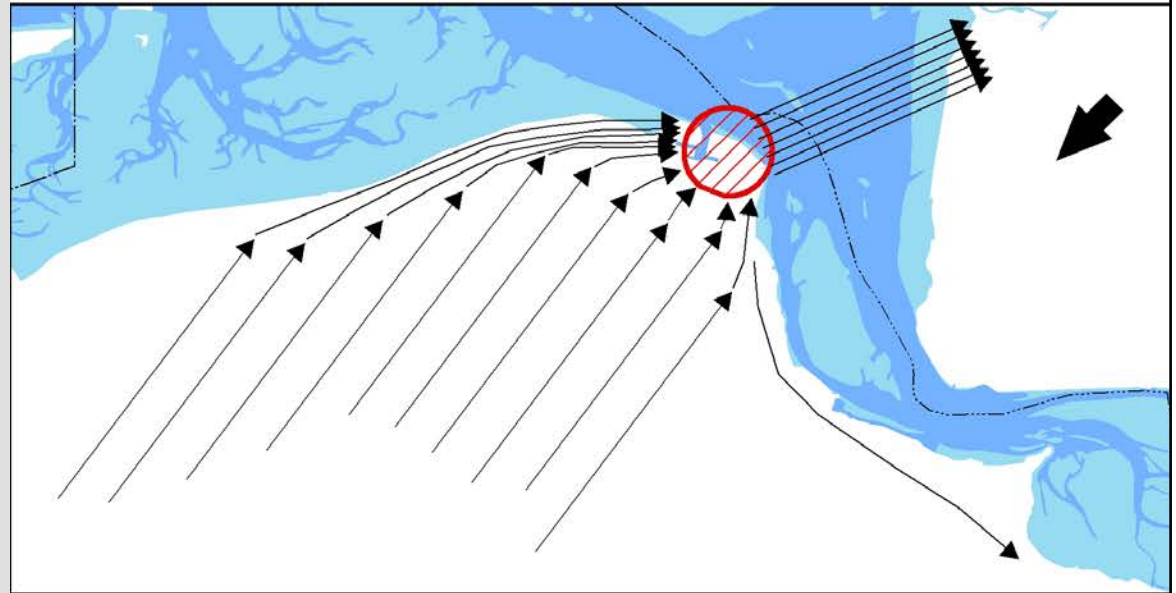


Full 3D bird radar – MAX®





Eemshaven project - location







Eemshaven project - aims

- Reduce collision victims
 - Migrating birds (passerines)
- Shutdown on demand
- Predictive model
 - 48 hours ahead

Commissioning parties:



Rijkswaterstaat
Ministry of Infrastructure
and Water Management



Government of the Netherlands





Eemshaven project - consortium

Meteorological radar(s)
Historical data, large scale bird migration monitoring



3D bird radar
Local bird migration monitoring, low altitudes



Collision victim searches
Existing wind farm, 20-30 wind turbines



Predictive model – periods with high collision risk – shutdown on demand



Eemshaven project - consortium

Meteorological radar(s)
Historical data, large scale bird migration monitoring



3D bird radar
Local bird migration monitoring, low altitudes



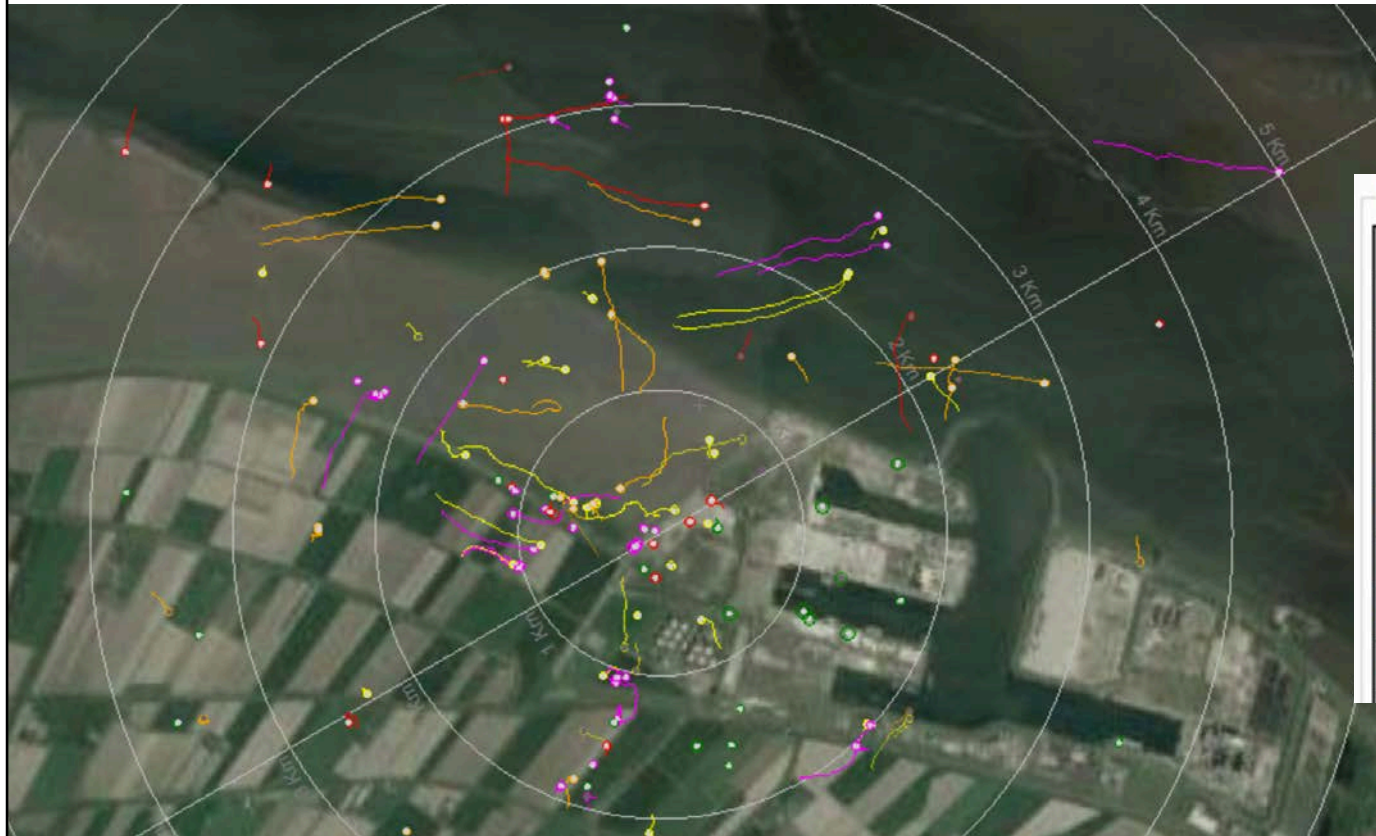
Collision victim searches
Existing wind farm, 20-30 wind turbines



Predictive model – periods with high collision risk – shutdown on demand



Automatic classification

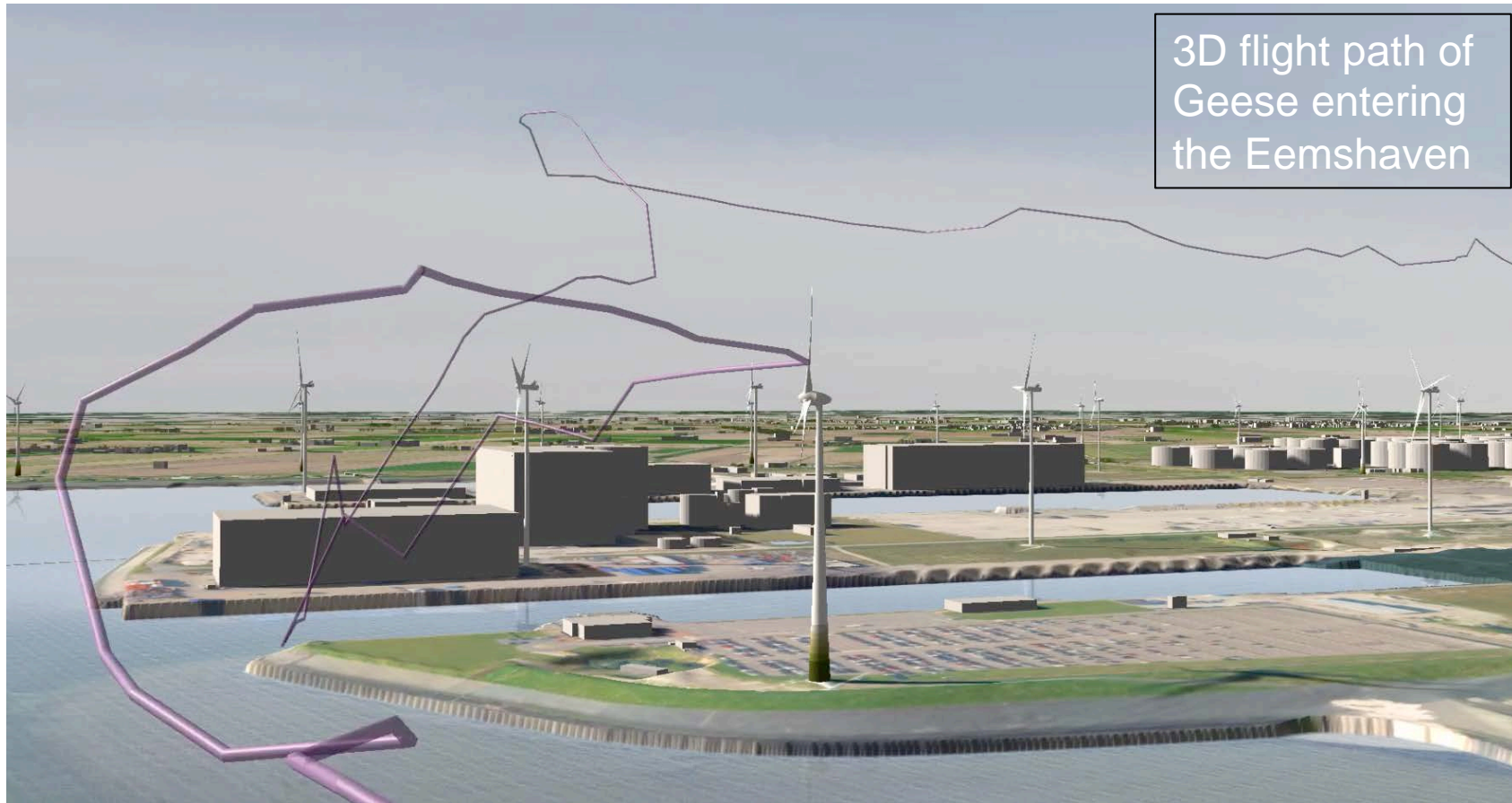


Track classification options

Classification	Color
Aircraft	DeepSkyBlue
Fast Target	#007DFF
Flock	Magenta
Large bird	Red
Medium bird	Orange
Slow Target	Green
Small bird	Yellow
Vehicle	Lime

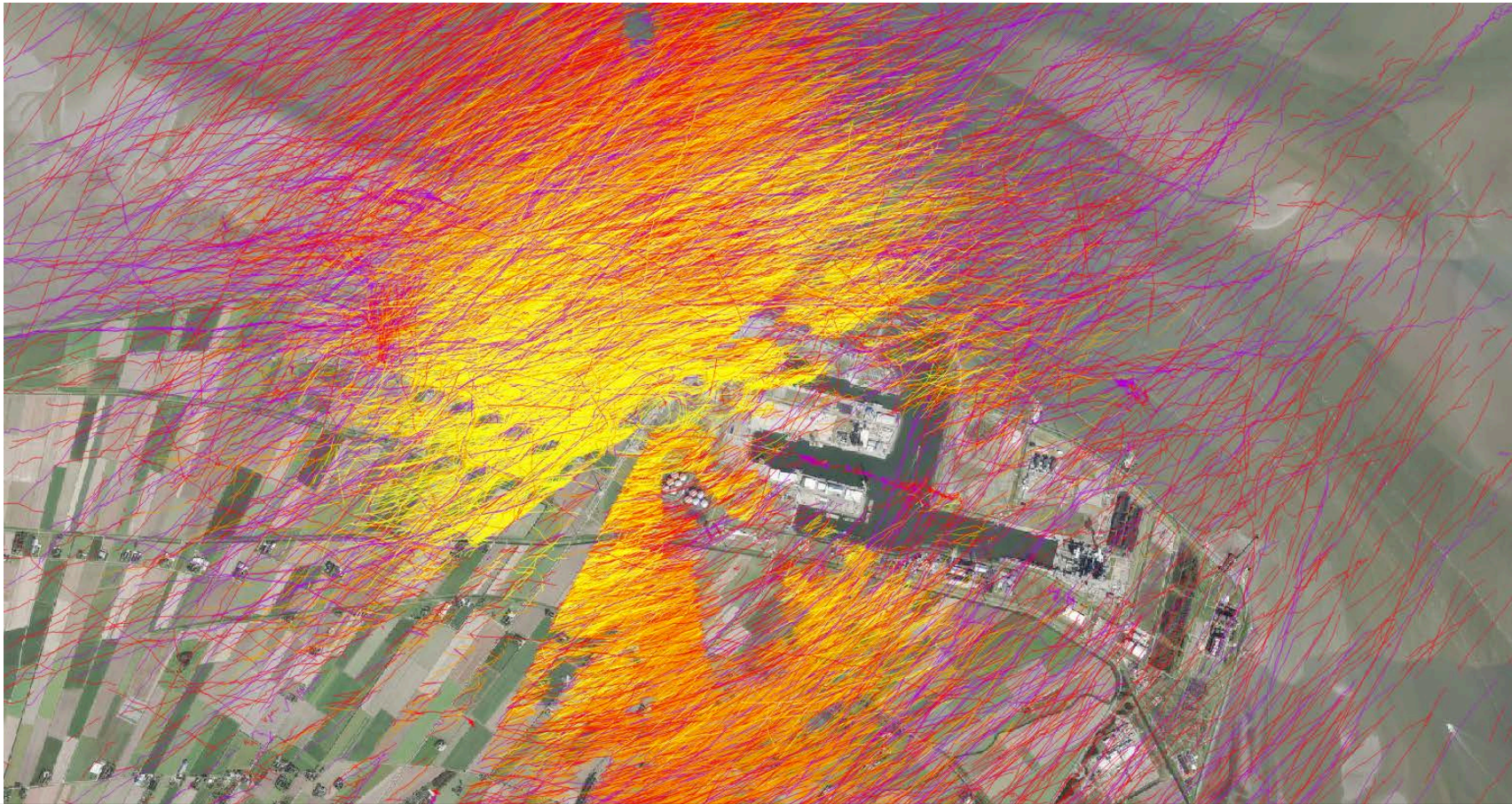


First experiences – species identification





Spatial coverage



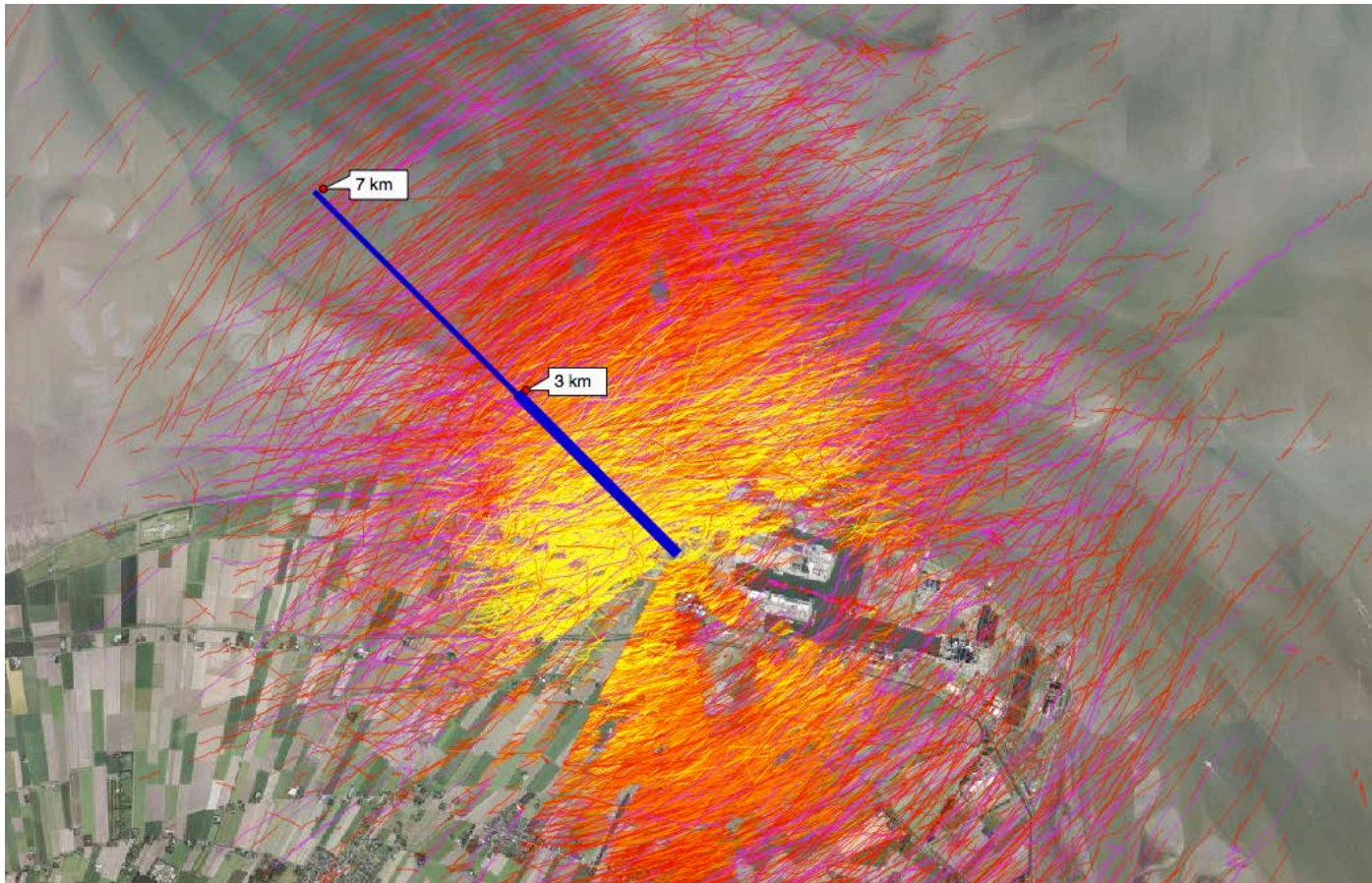


Spatial coverage



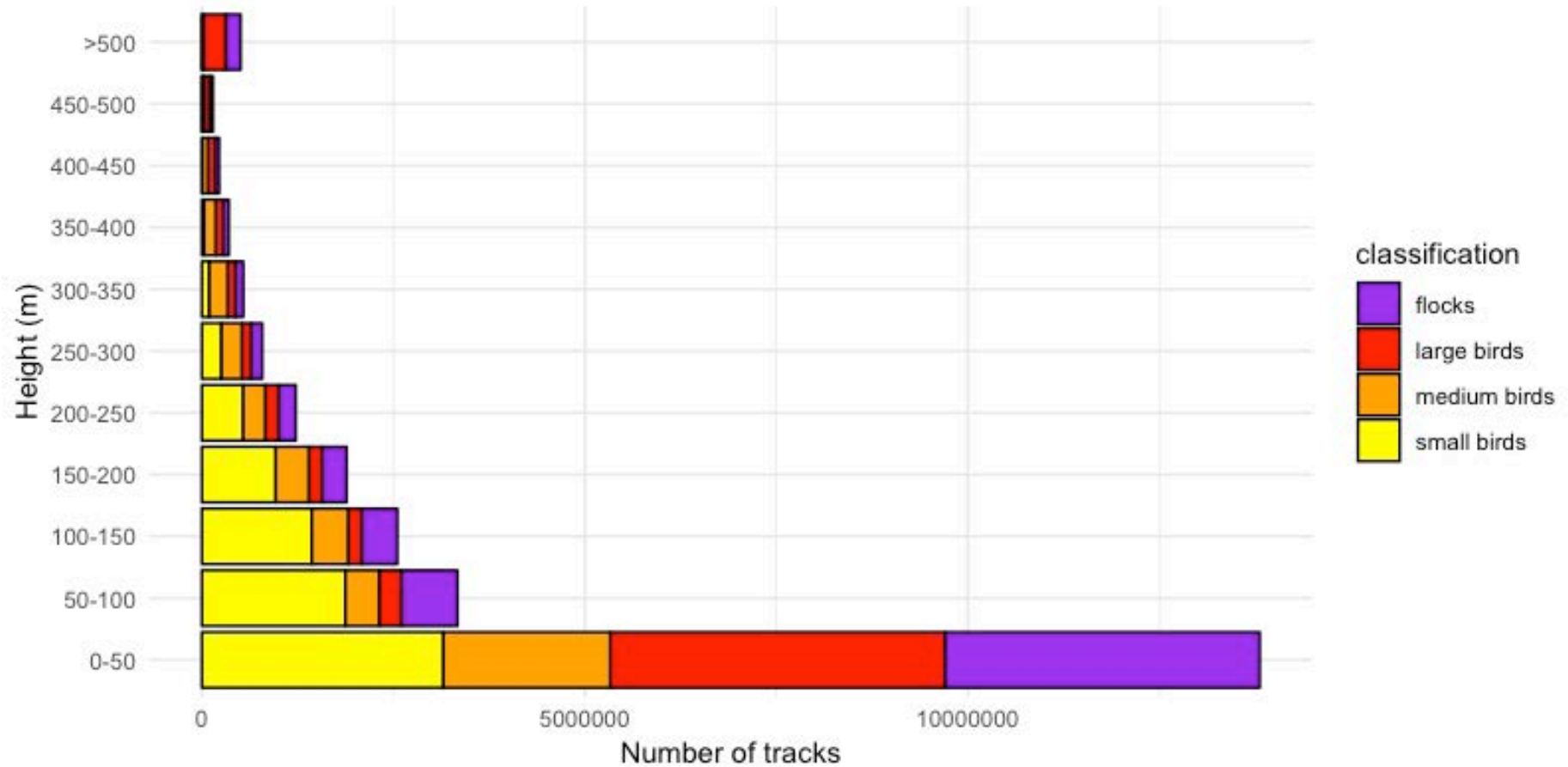


Detection range - horizontal



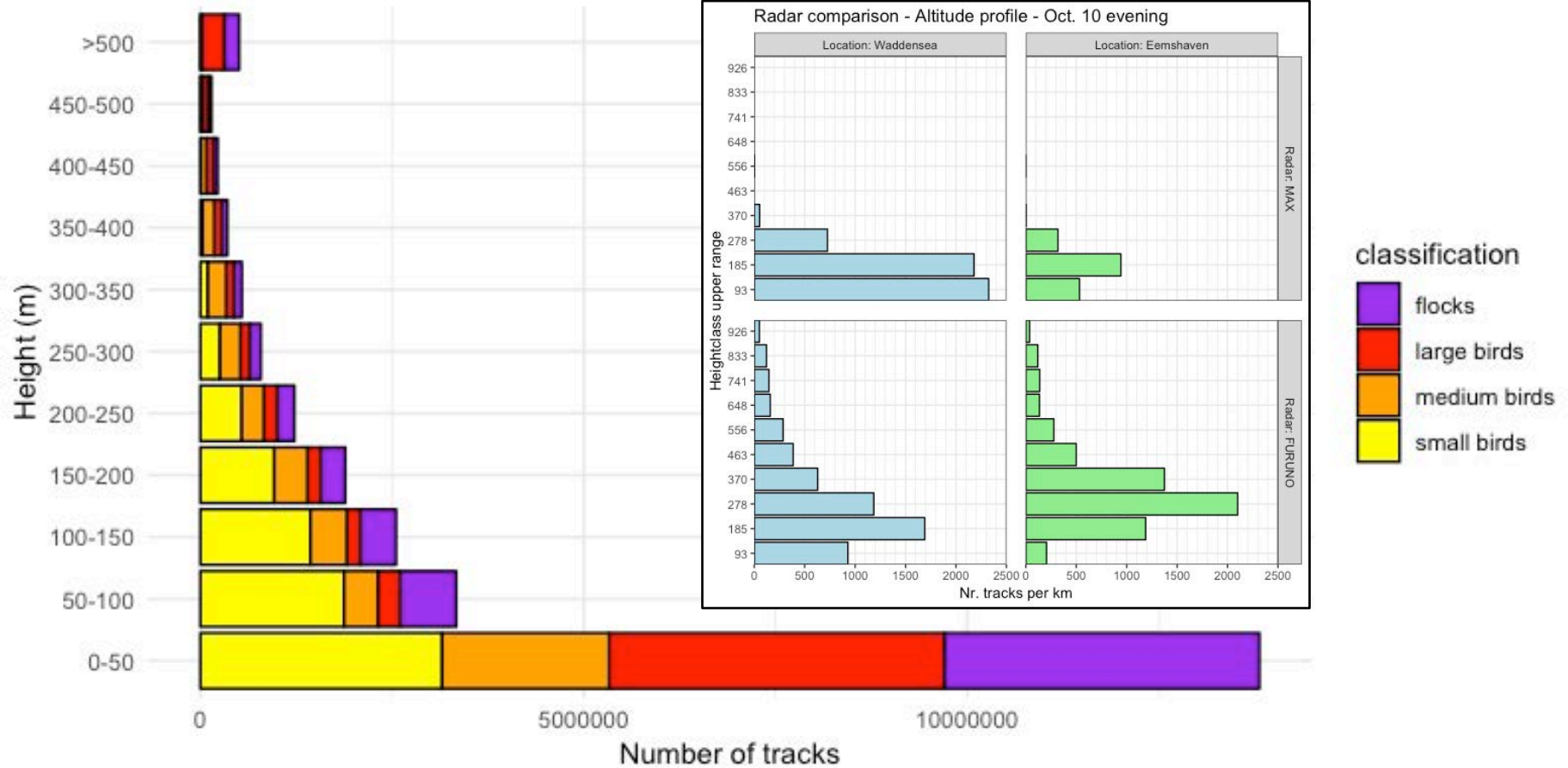


Detection range - vertical





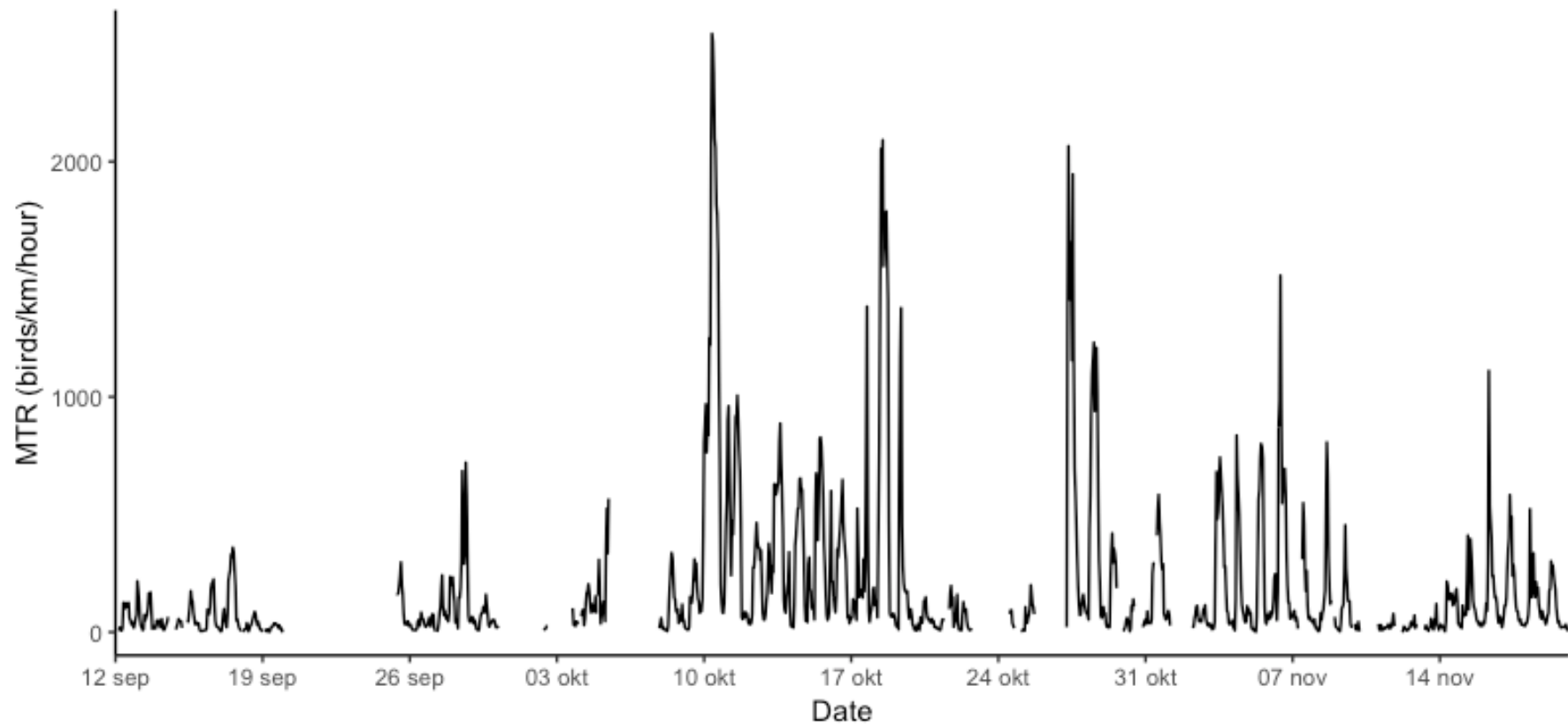
Detection range - vertical





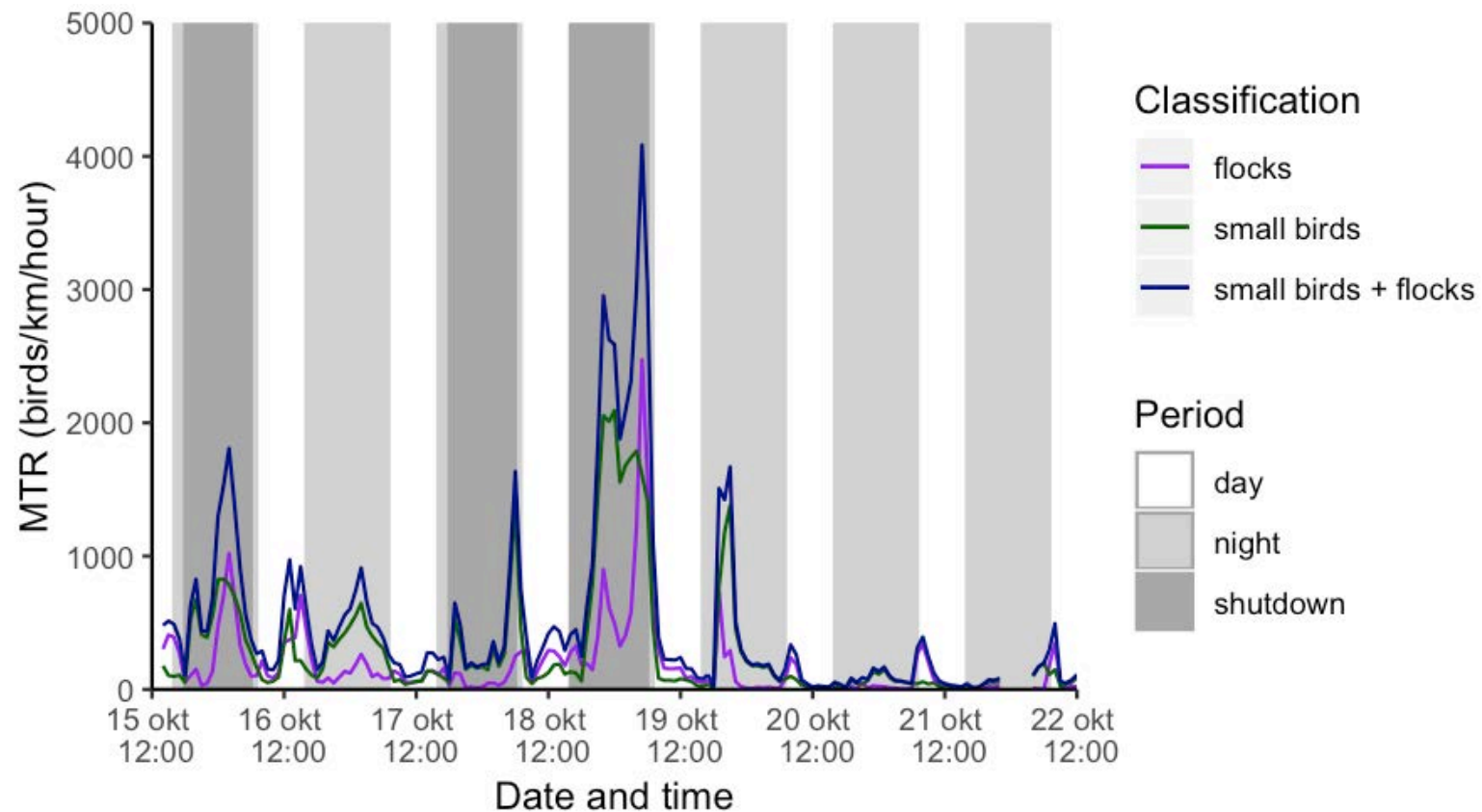
Temporal coverage

Migration intensity small birds





Temporal coverage





Concluding remarks

- Very high data resolution (spatial and temporal)
- Huge amounts of data can be collected
- Detection of individual birds is no problem
- No species identification





Thank you for your attention

Jonne Kleyheeg-Hartman MSc.
Bureau Waardenburg bv
www.buwa.nl
T: +31 345 51 27 10
j.c.kleyheeg-hartman@buwa.nl

