



Royal Netherlands Air Force



A European-wide BIRD TAM system using the weather radar network

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Chapman

Bird/Wildlife Strike Prevention Conference,
20-24 October, 2014, Mexico City, Mexico



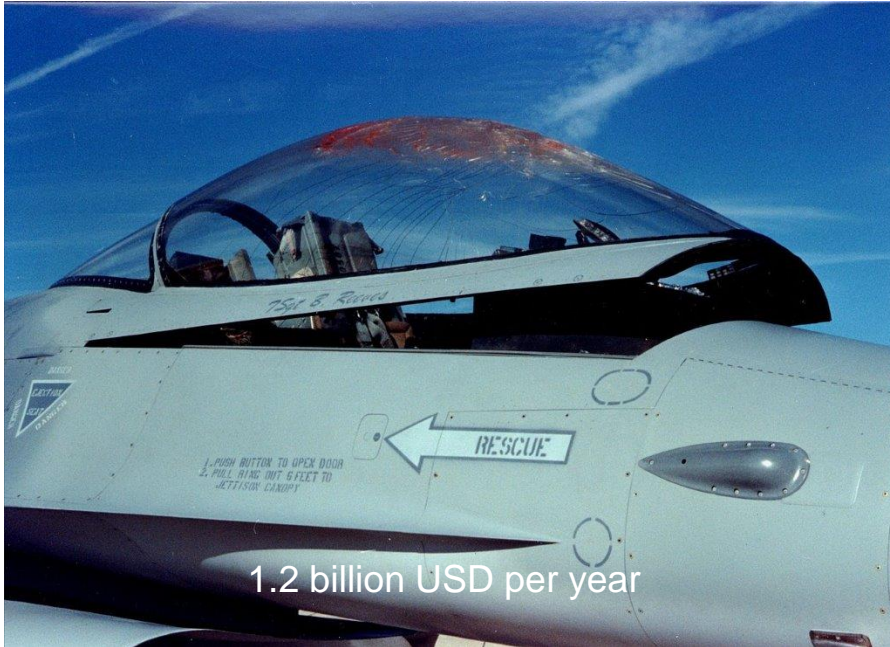
Bird movements – why birds move

- Billions of birds, bats & insects use the aerosphere for migration, dispersive movements and foraging
- The problem is how to simultaneously monitor & track multiple organisms with different size, movement patterns and ecology
- The operational weather radar network is continuously recording atmospheric conditions all over Europe
- ENRAM the way ahead?

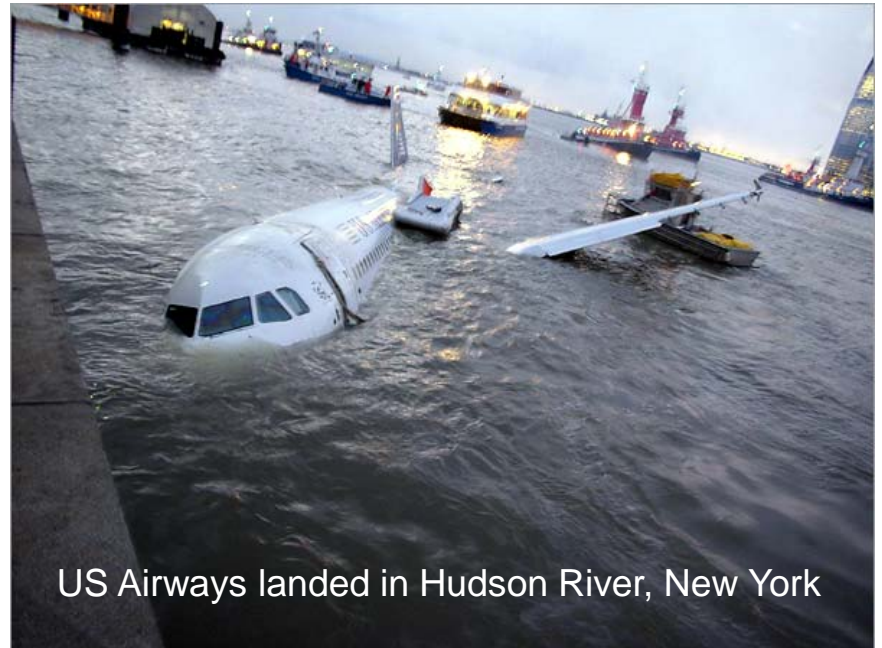




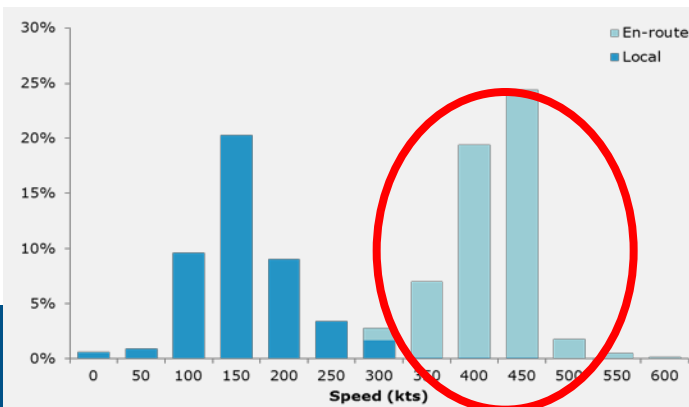
Radar aeroecology and flight safety

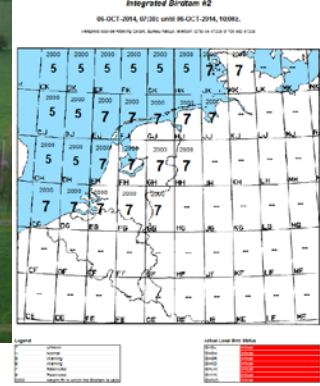


1.2 billion USD per year



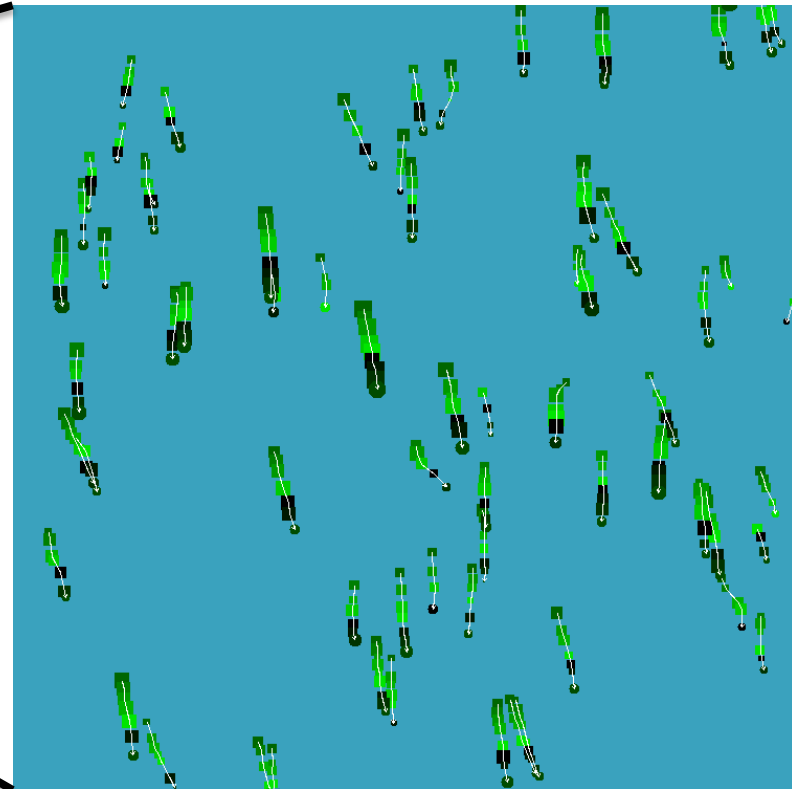
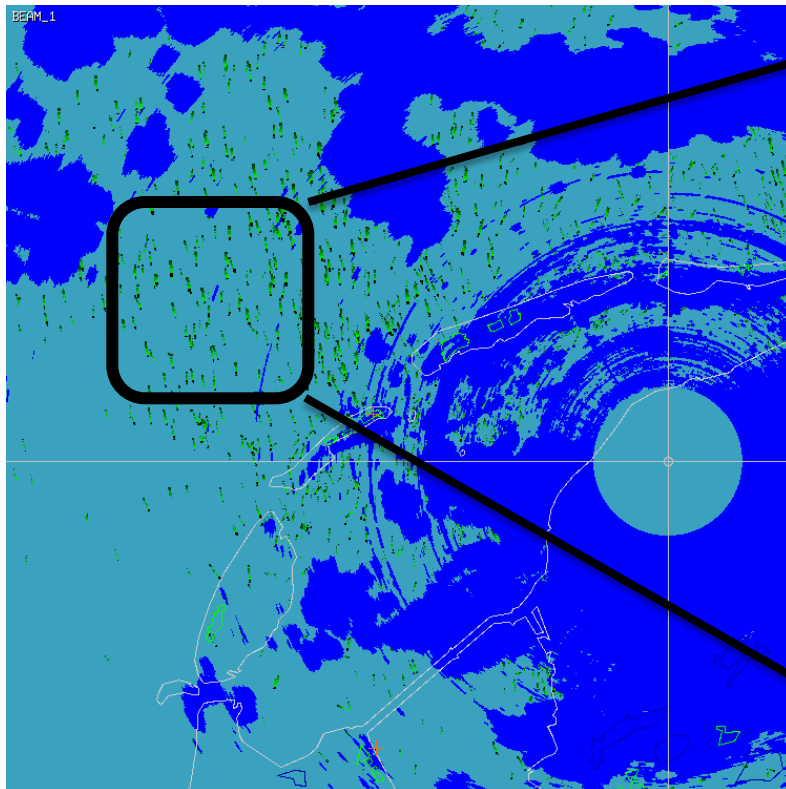
US Airways landed in Hudson River, New York





En-route BIRD TAM system

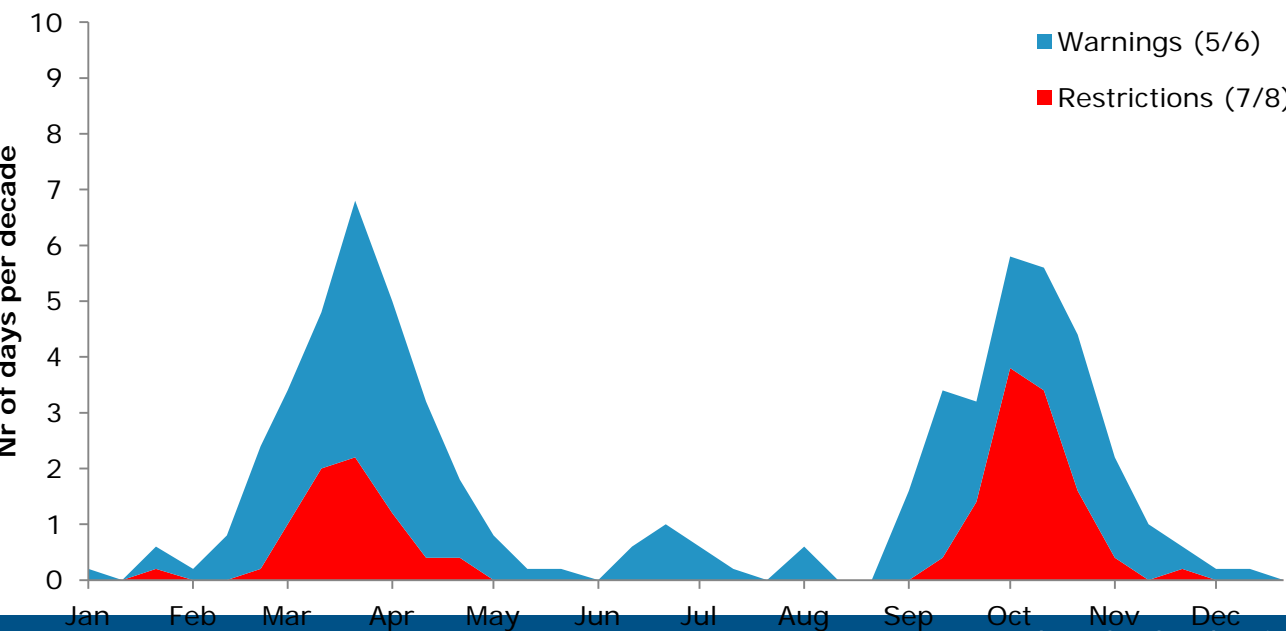
- Bird detection system installed on air defense radars



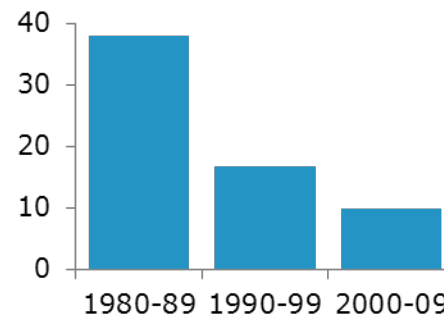


Flight restrictions induced by BIRDTAMs, 2006-12

- On average 19 days•year⁻¹ (13-25), including weekends
- Restrictions last for approximately 3 hrs
- Impact is concentrated in March and September/October
- Bird strikes dropped dramatically due to BIRDTAM warning system and reduction of low-level operations (50 : 50)

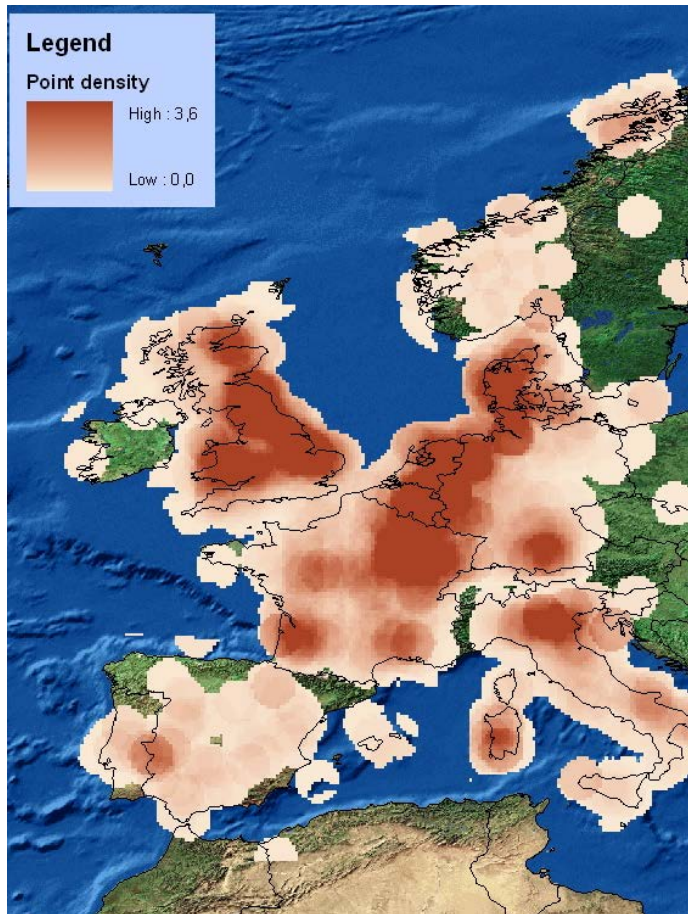


Average number of en-route bird strikes / 10,000 hrs





Relative frequency of en-route bird strikes



European Bird Strike Database, jets only, 1991-2000.

Figures are corrected for flight hours, no data from eastern-European countries

Note both high bird strike areas as bombing ranges

Dekker & Van Gasteren 2005 EURBASE: Military bird strike frequency in Europe

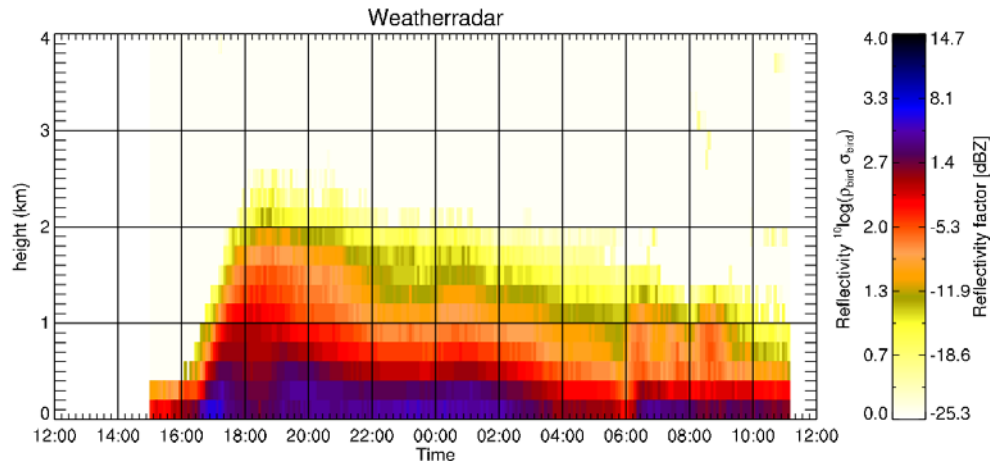


Radar aeroecology and flight safety

Flysafe: An ESA Integrated Application promotion program

- Calibration with bird detection radar at 3 locations
- NL & BE: C-Doppler, FR - Dual polarization
- Reflectivity & radial velocity
- Density, speed and direction
- Altitude profiles every 15 minutes
- Development of bird detection algorithm

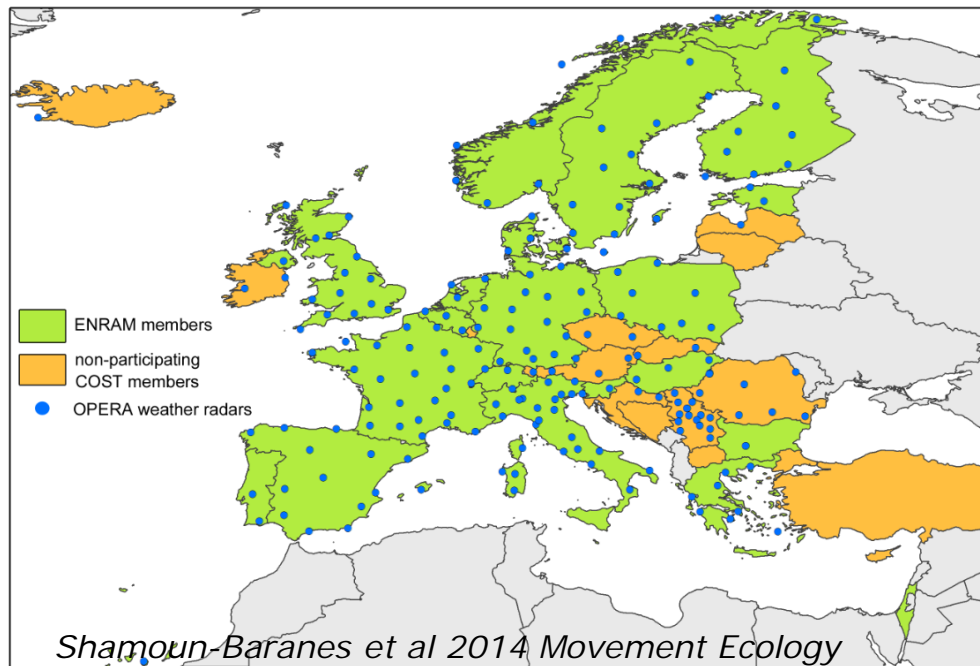
FlySwift: real time monitoring of bird movements 24/7, BE (3 radar), NL (2 radar) <http://www.flysafe-birdtam.eu/>





European Network for the Radar surveillance of Animal Movement

Foster international and multidisciplinary collaboration to monitor and study animal movement at a continental scale



- e-COST Action
- Research networking
- 23 countries (incl. Austria / Turkey)
- Management committee
- 4 working groups
- STSM (Short term scientific mission)
- www.enram.eu



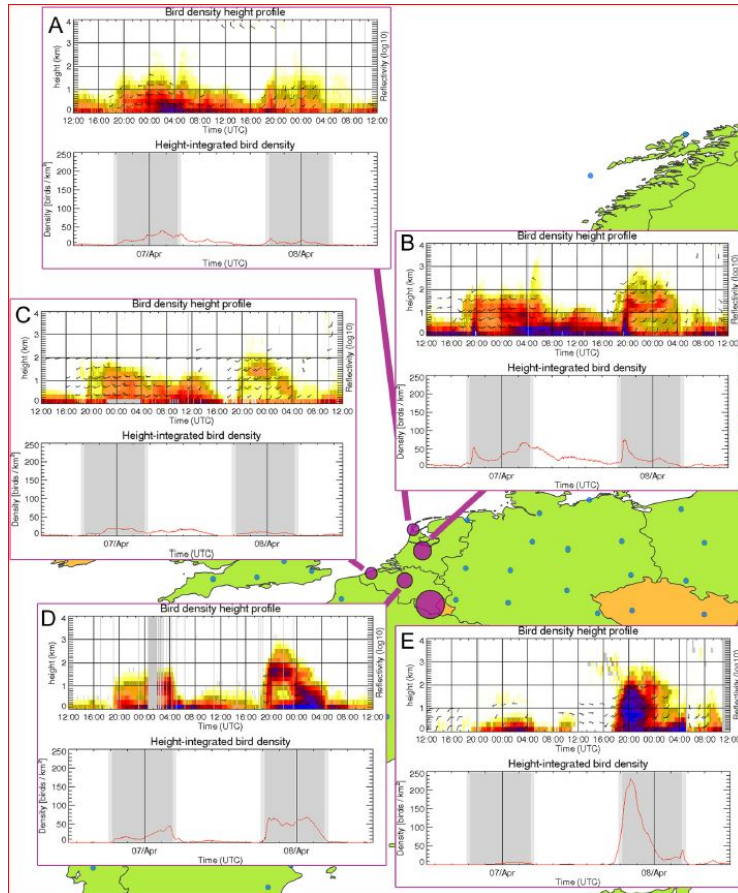


ENRAM aims through 4 working groups

- WG1: improve classification and retrieval algorithms
- WG2: data quality and validation of biological-classification algorithms
- WG3: visualizing spatio-temporal patterns of animal movement
- WG4: integrate information in animal research across multiple taxa

Mass migration case study

- Mass migration April 7-8 2013
- Layering at several locations
- Coldest spring in 40 years
- Complex wind conditions
- Challenge: how do we visualize movement dynamically with minimal amount of information?



2013-04-07 20:00 UTC, wind 925 mb

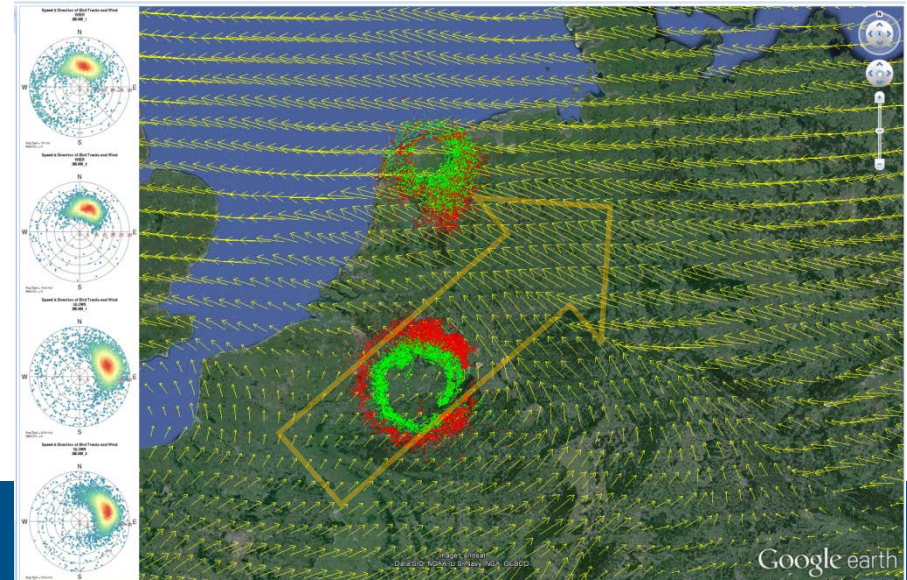


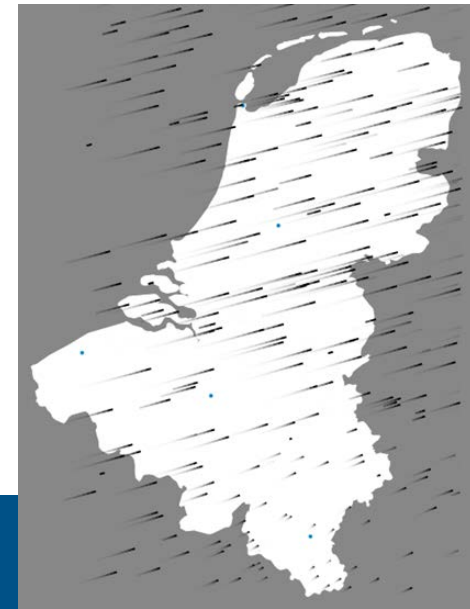
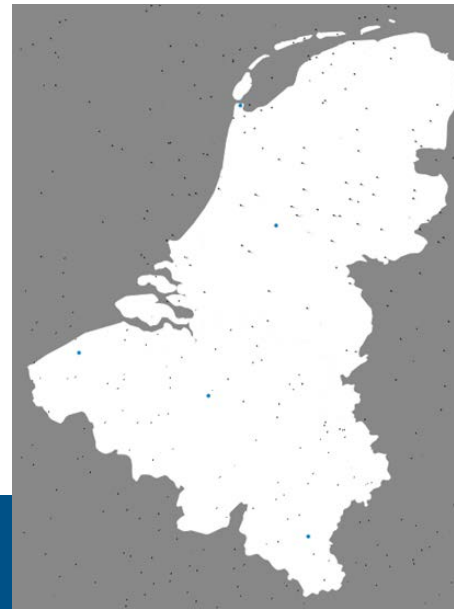
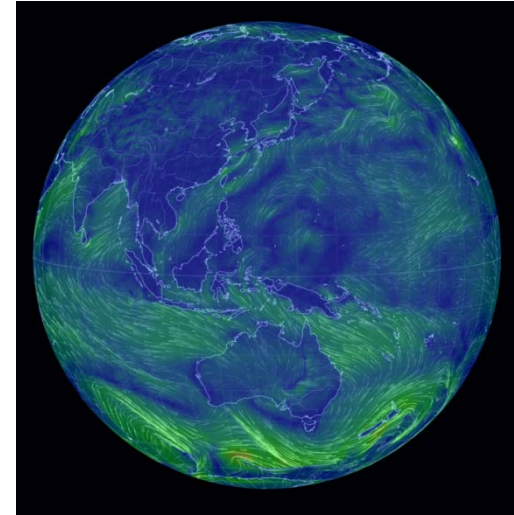
Fig 2, Shamoun-Baranes et al 2014 Movement Ecology



Mass migration case study data visualisation hackaton

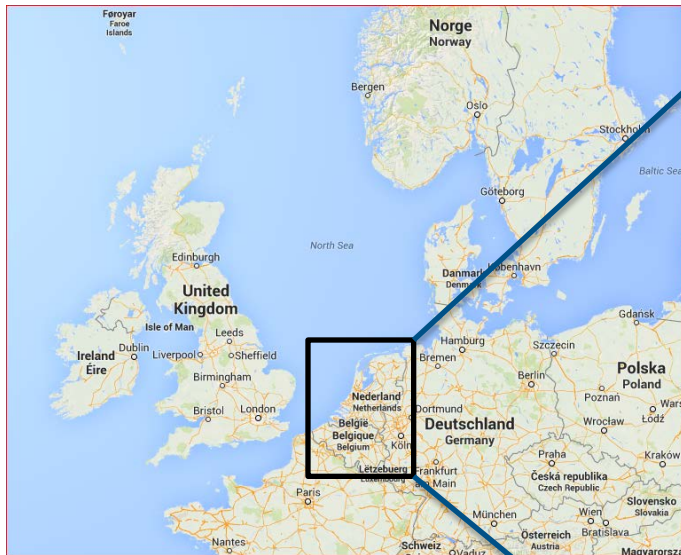
**Peter Desmet, Bart Aelterman,
Kevin Azijn** (INBO Belgium)

- ENRAM STSM hosted at UvA, NL
- Assume passerine migration
- Height integrated bird density (threshold)
- Use mean ground speed & direction
- Inverse weighted distance interpolation
- Inspired by earth.nullschool.net and re-engineering Tokyo wind visualisation





Data visualisation hackaton



Peter Desmet, Bart Aelterman, Kevin Azijn (INBO Belgium)

<http://enram.github.io/bird-migration-flow-visualization/viz/>



Summary

- ENRAM:
 - International and interdisciplinary network
 - Improve existing algorithms
 - New ways of exploring and visualizing movement data
 - Integrating techniques
 - Continental-scale monitoring
- Applied applications for Air Forces:
 - **European BIRDTAM warning system**
 - No access needed to secure air defence systems, standardization
 - From FlySafe in The Netherlands and Belgium towards ENRAM on a European wide scale
 - Reducing en-route bird strikes (50%) in the militaries against minimum operational impact and costs. Who will join us?