The European Network for the Radar Surveillance of Animal Movement
ENRAM: overview

- October 2013 – October 2017
- 24 countries participated
- 15 meetings
- 32 short-term scientific missions
- Training school and conference
- 4 working groups
  - Classification and Retrieval of Biological Data from European Weather Radars
  - Improvement of Weather Radar Data Quality and Validation of Biological-classification Algorithms
  - Visualizing Spatio-temporal Patterns of Animal Movement
  - Significance and potential of Animal Movement Research
- www.enram.eu
Background

Bauer et al 2017 BioScience
Bird migration retrieval from weather radars
Bird migration retrieval from weather radars

- Open-source software package bioRad
- Written in R and C
- Includes radar analysis and visualization tools
- Github.com/adokter/bioRad

Dokter et al 2011 Interface;
Dokter et al 2018 Ecography
Potential in Europe

- Strong links with OPERA (European weather radar network)
- License for access to data from most European weather radars
- Feedback to and from OPERA about the use and quality of the data

Shamoun-Baranes et al 2014 Movement Ecology
Potential in Europe

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Shamoun-Baranes et al 2014 Movement Ecology
Campaigns for calibration and validation

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- Several calibration campaigns
- Clearer idea of differences between radar types
- We have confidence in weather radars

_Liechti et al 2018 Ecography_
Visualizing migration data from radars

- Helps interpretation
- Summarizes complex data
- Scalable and transferable
- Open-source software
- enram.github.io/bird-migration-flow-visualization/viz
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Shamoun-Baranes et al 2016 PLOS ONE
Large-scale migration

- We can now map continental-scale bird migration
- More than 70 weather radars are used, and this number is growing
- Many unresolved questions can be answered

Nilsson et al 2018 Ecography
Migration wave through Europe

Nilsson et al 2018 Ecography
Even larger-scale...
Thank you!