

A global IOT-System – The Internet of Animals

What can we learn from the collective knowledge of animals?



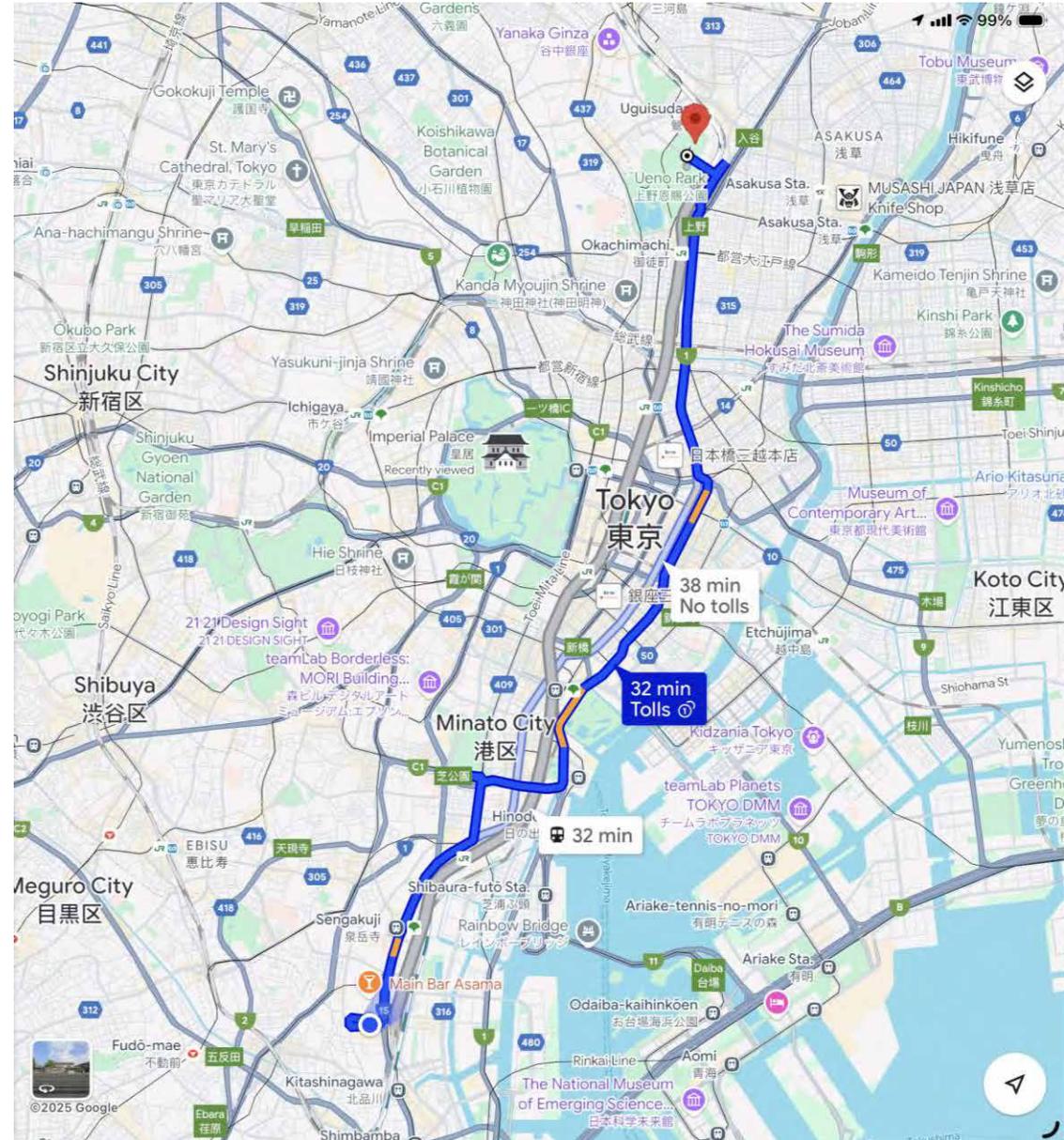
Martin Wikelski, Max Planck of Animal Behavior, Konstanz, Germany

The Internet of Animals



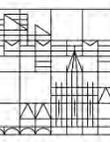


'Emergent' novel properties of sensor swarms





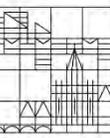
'Emergent' Sensor-swarms in animals: "The 6th sense of animals"





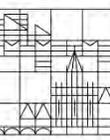


Why do we need an 'Internet of animals'





Animals: detection and prediction of the 'unknown'



Unicus anser erat, minimae custodia villae.





Why we need information from animals globally?



Prediction of catastrophes



Food safety



Ecosystem services
Pollination - Reforestation



Health and well being

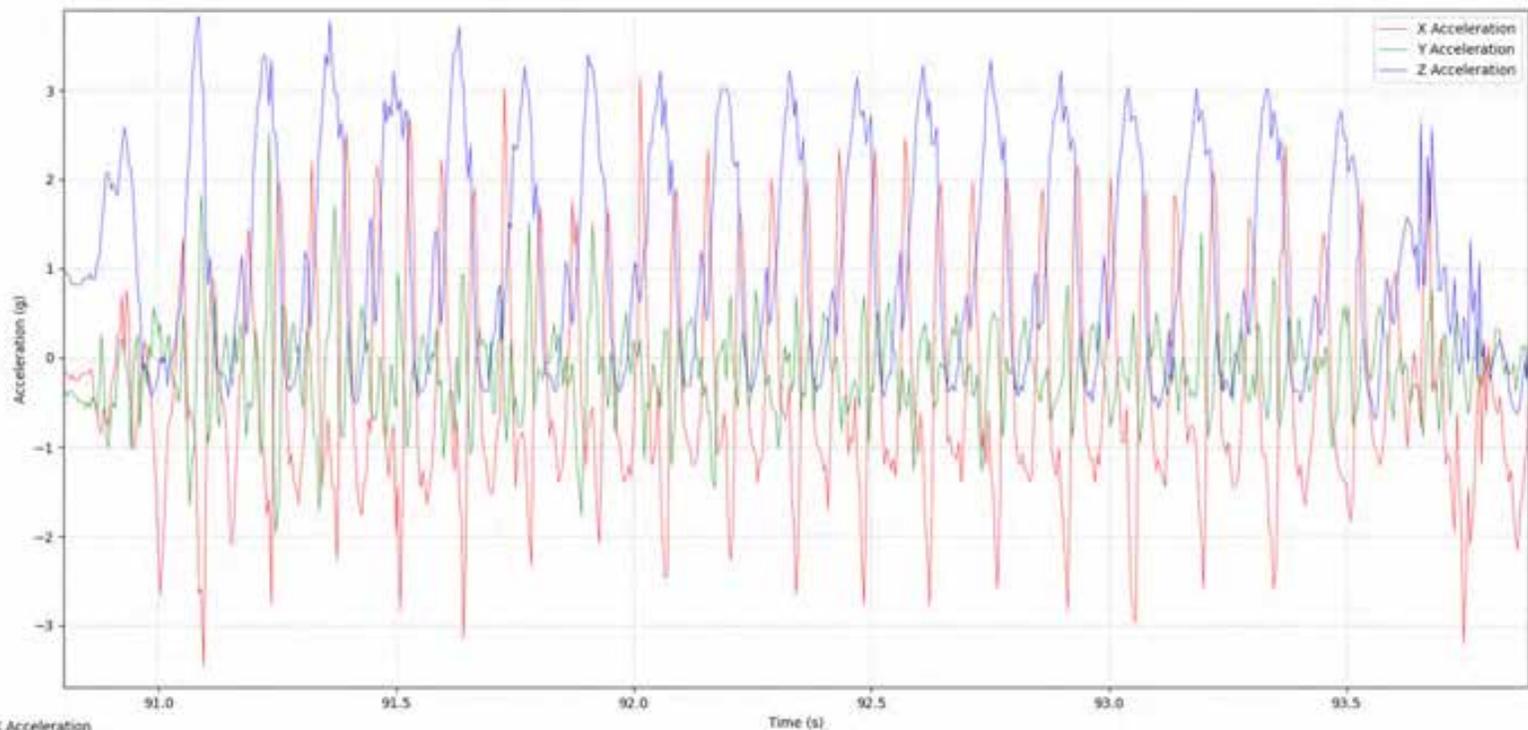
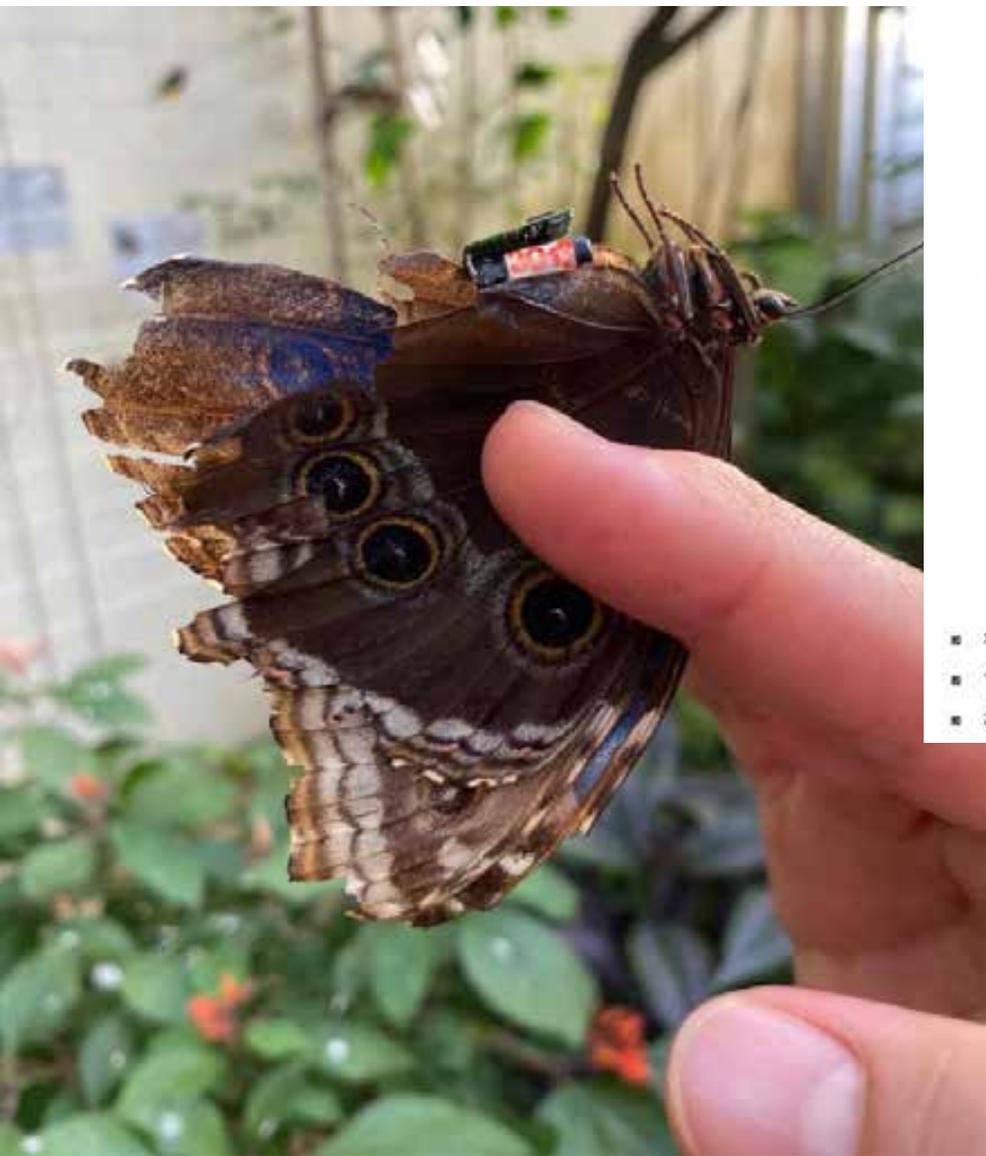




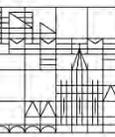




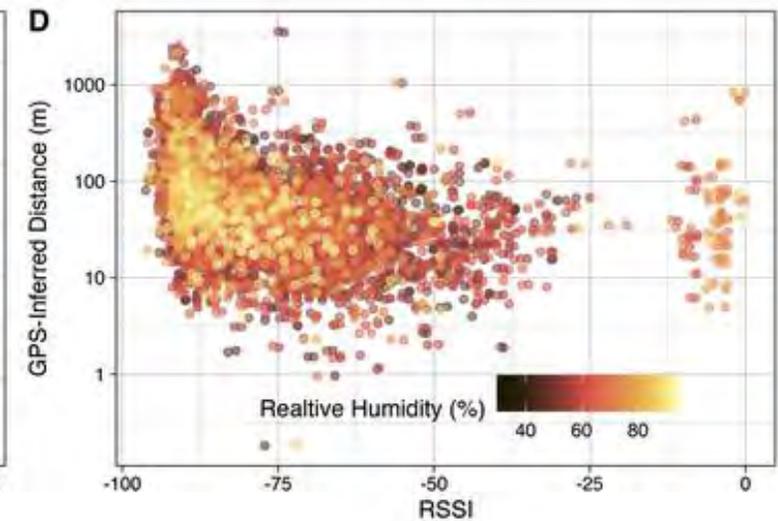
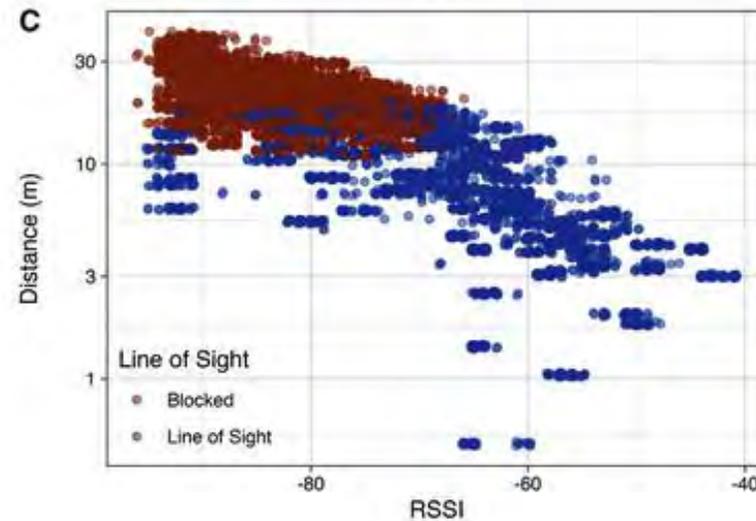
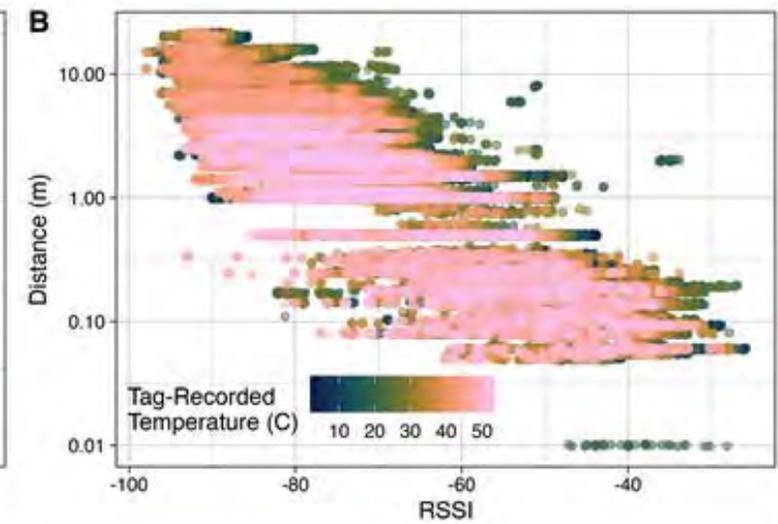
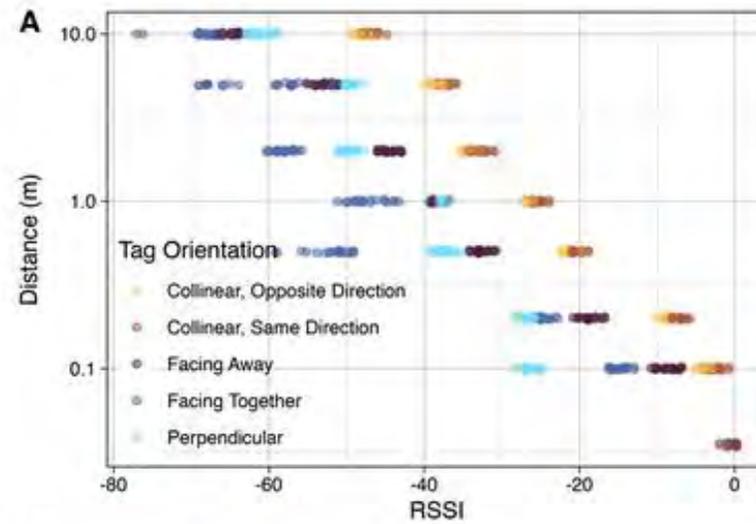




- X Acceleration
- Y Acceleration
- Z Acceleration



Personal distance: WiFi ear tags



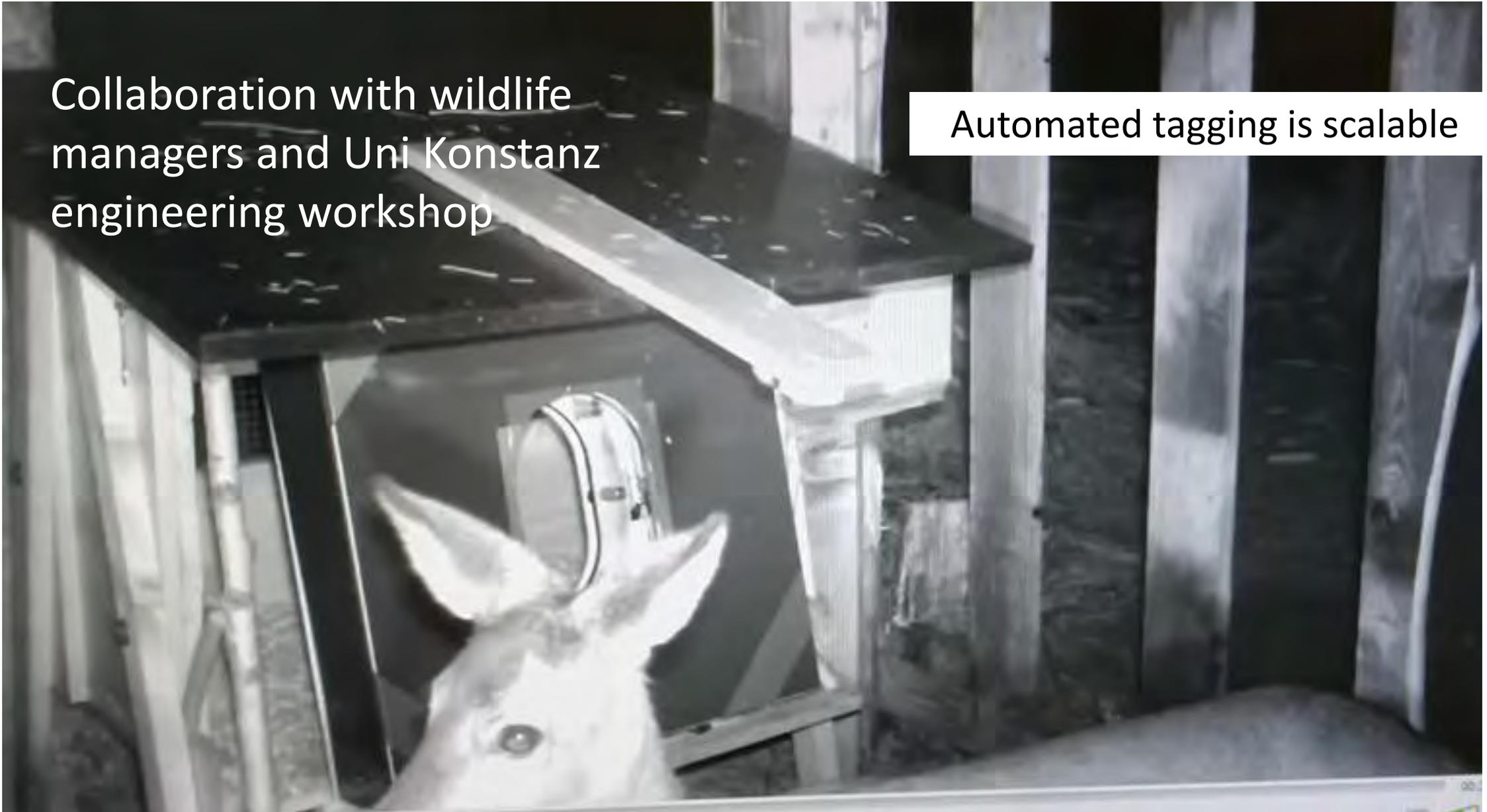






Collaboration with wildlife
managers and Uni Konstanz
engineering workshop

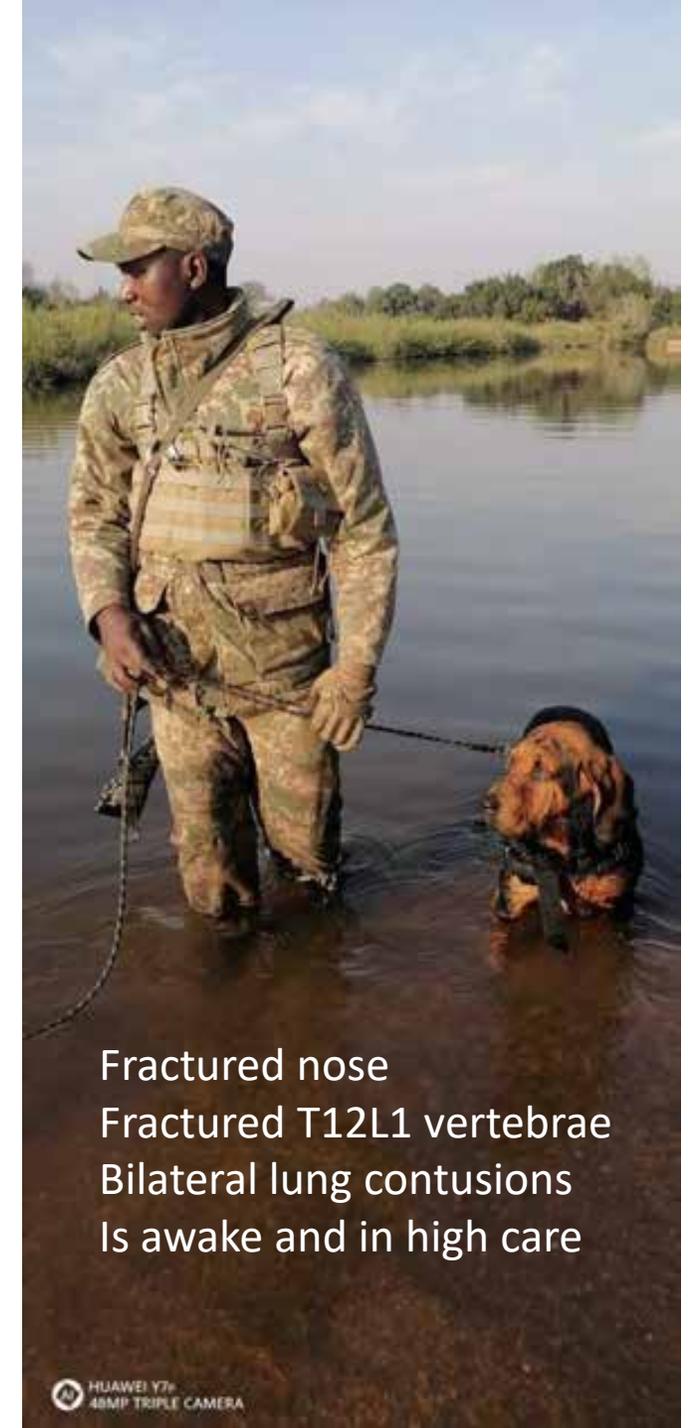
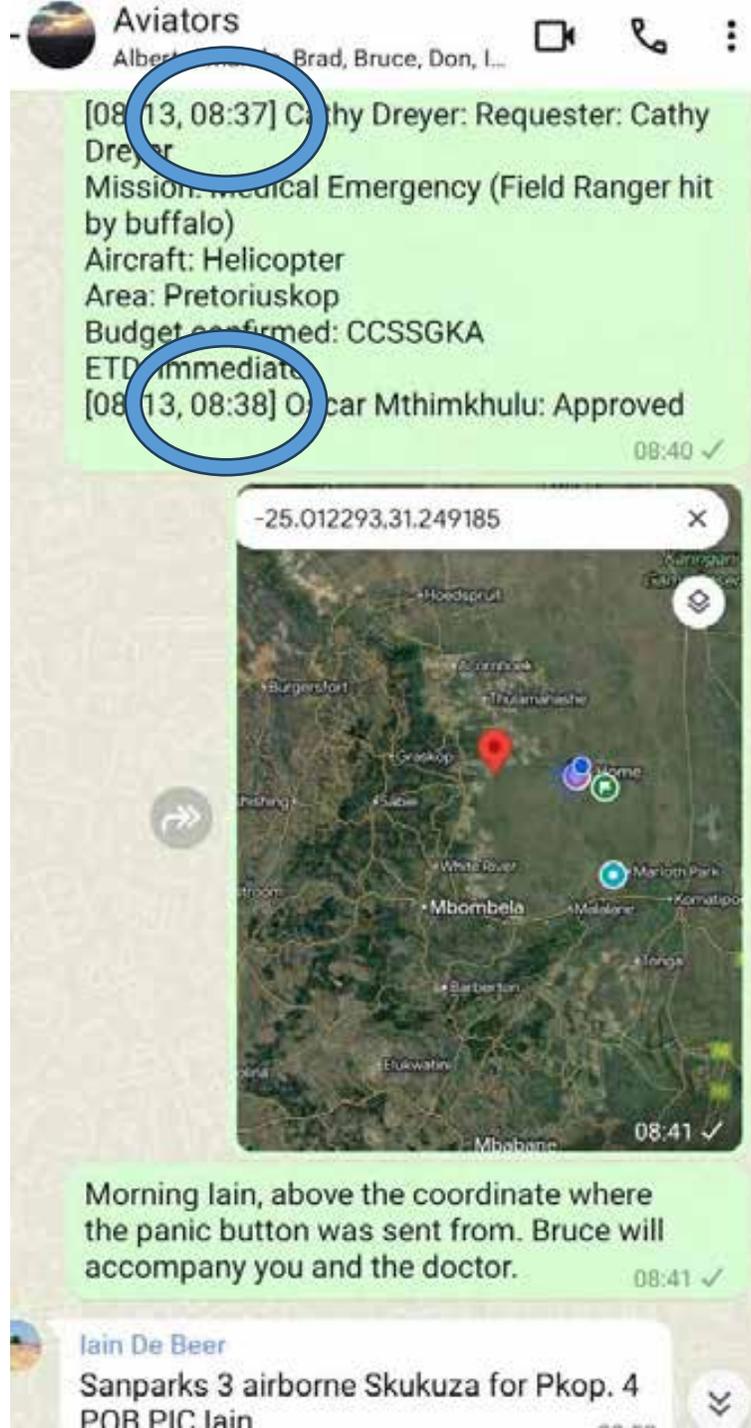
Automated tagging is scalable





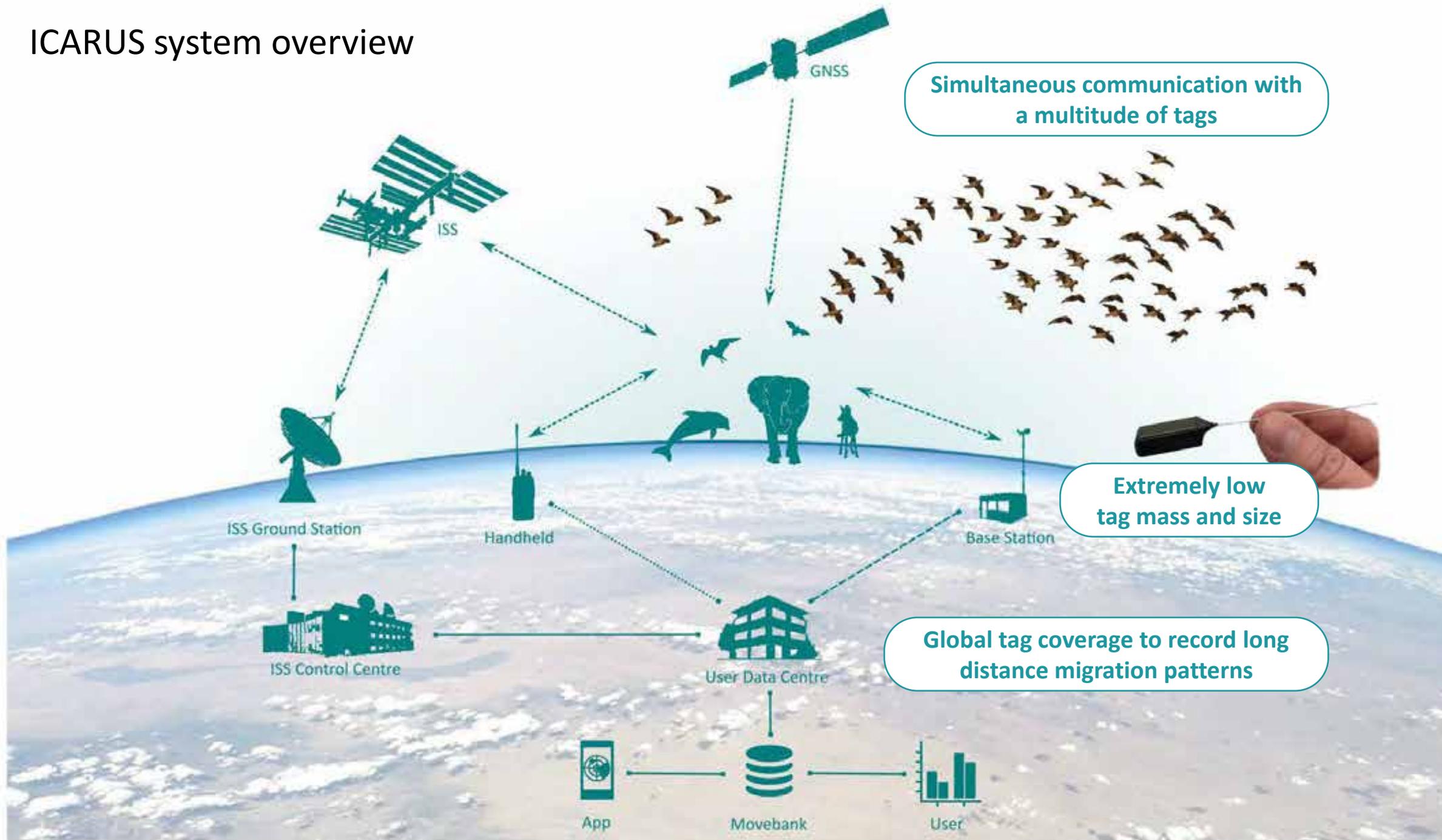
V 01409.M4V

Saving rangers builds trust



Fractured nose
Fractured T12L1 vertebrae
Bilateral lung contusions
Is awake and in high care

ICARUS system overview











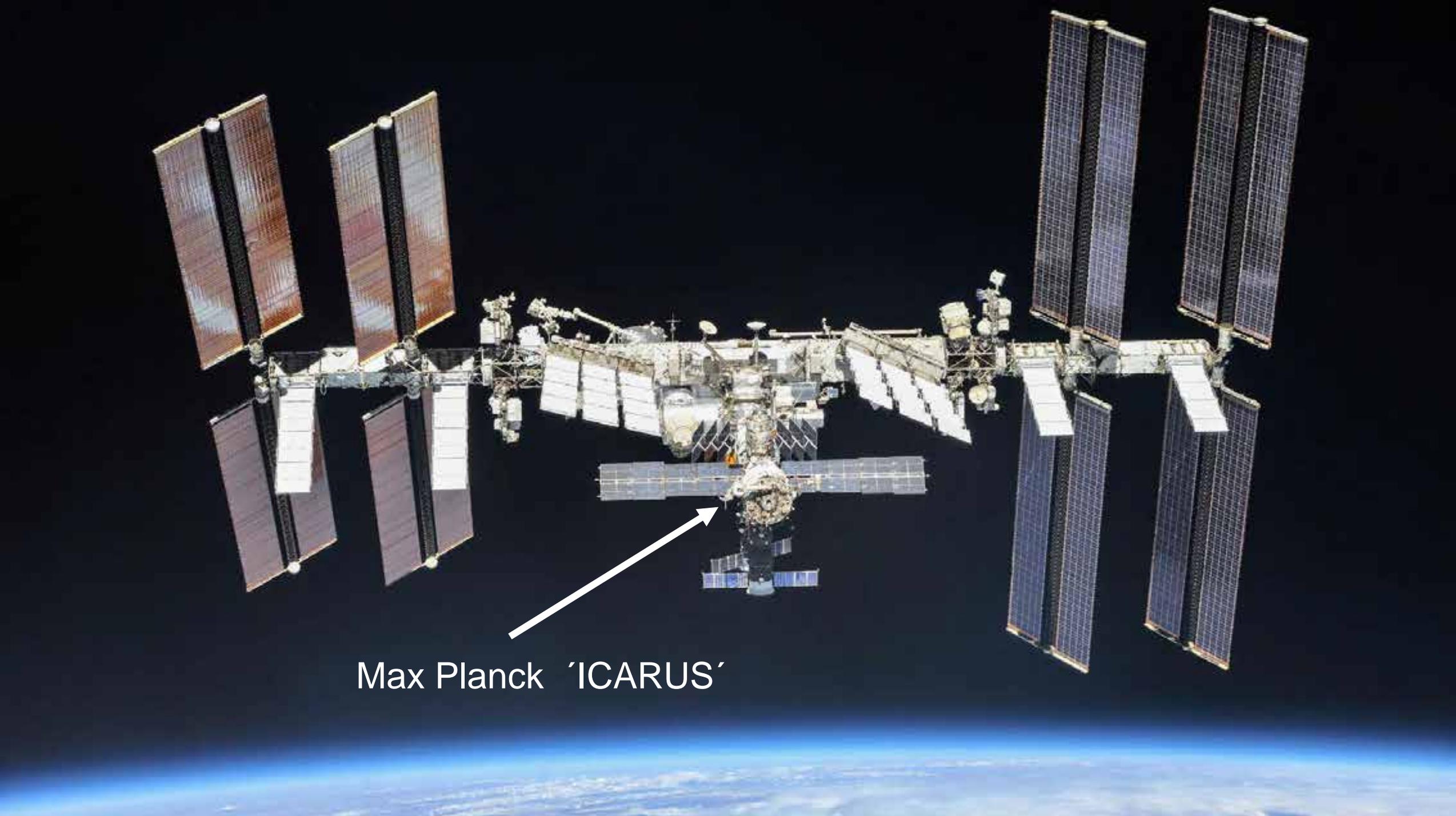








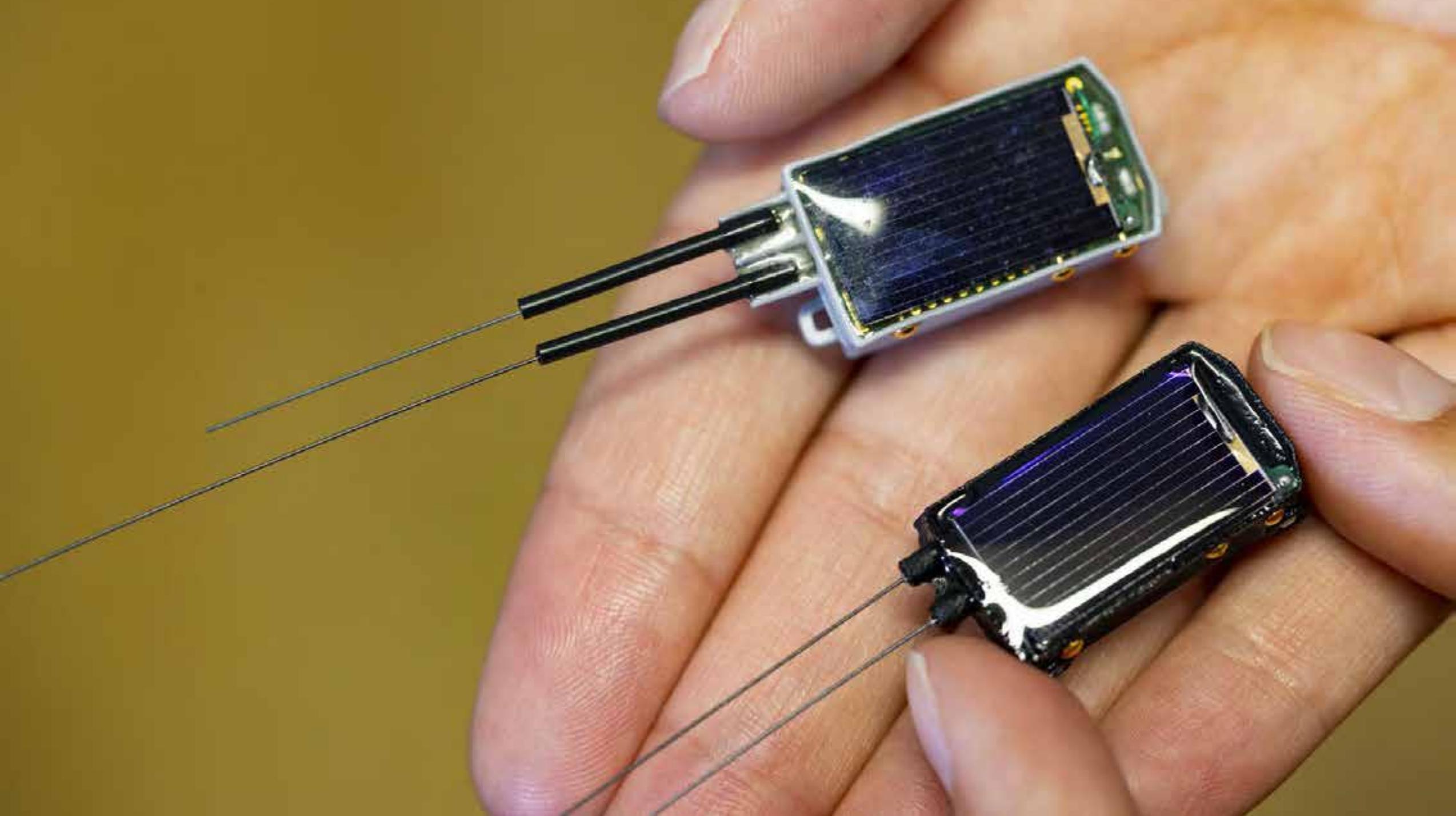




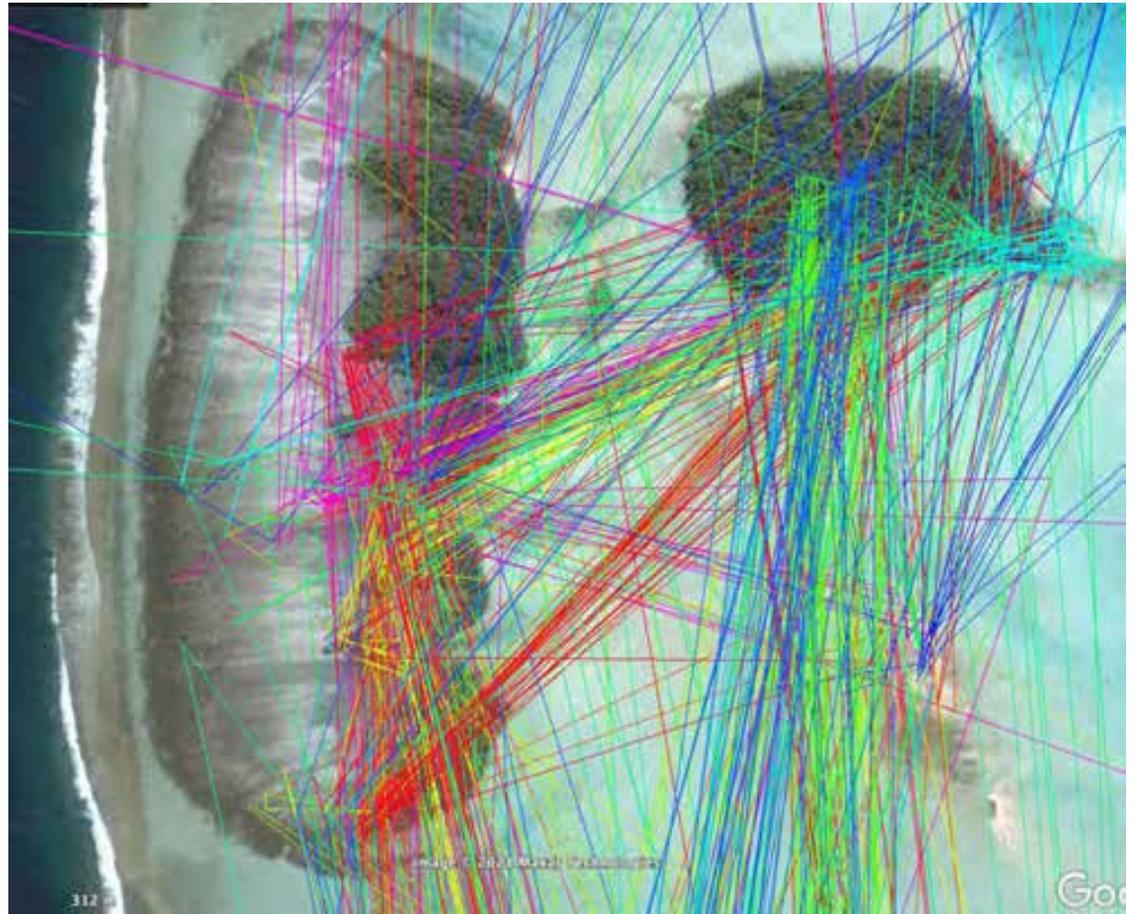
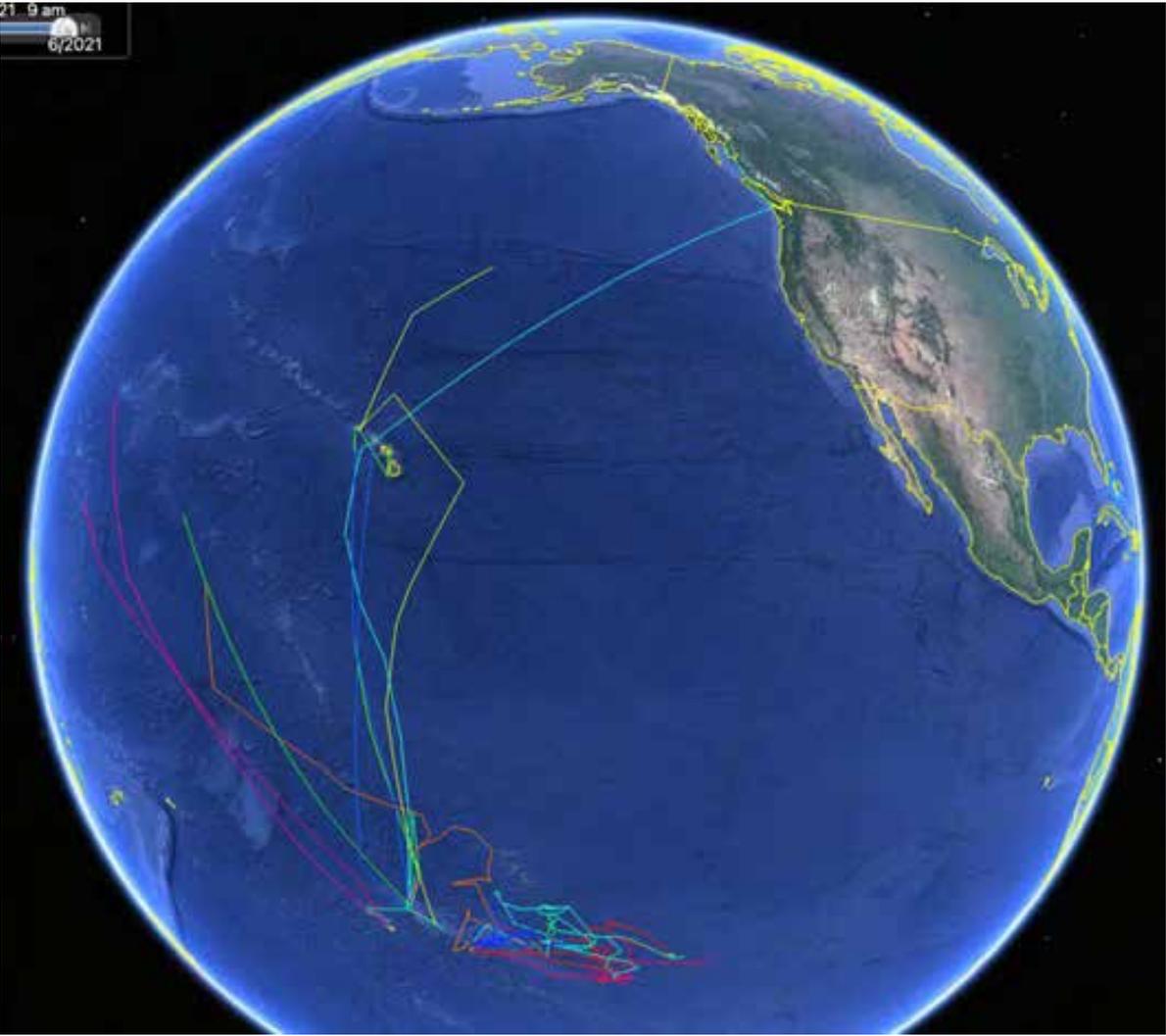
Max Planck 'ICARUS'

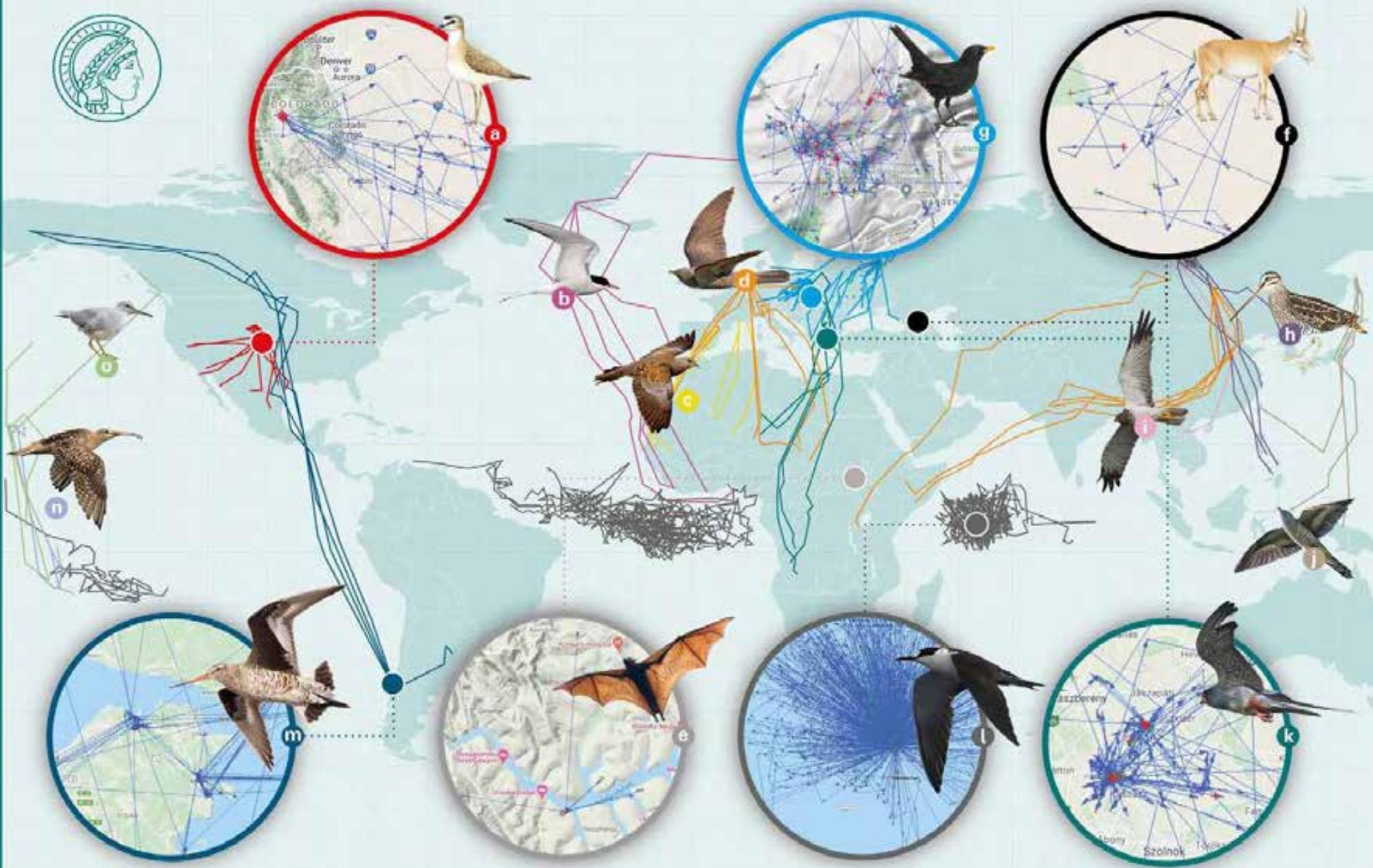


ISS



Can seabirds in the Pacific indicate the beginning of a taifun?

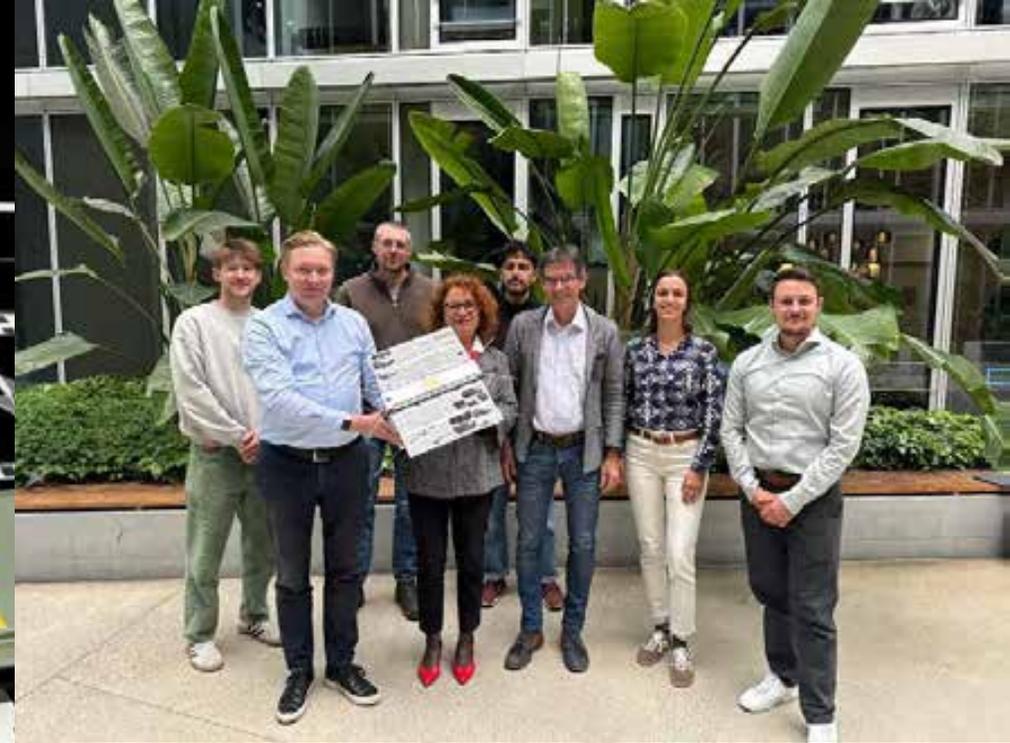
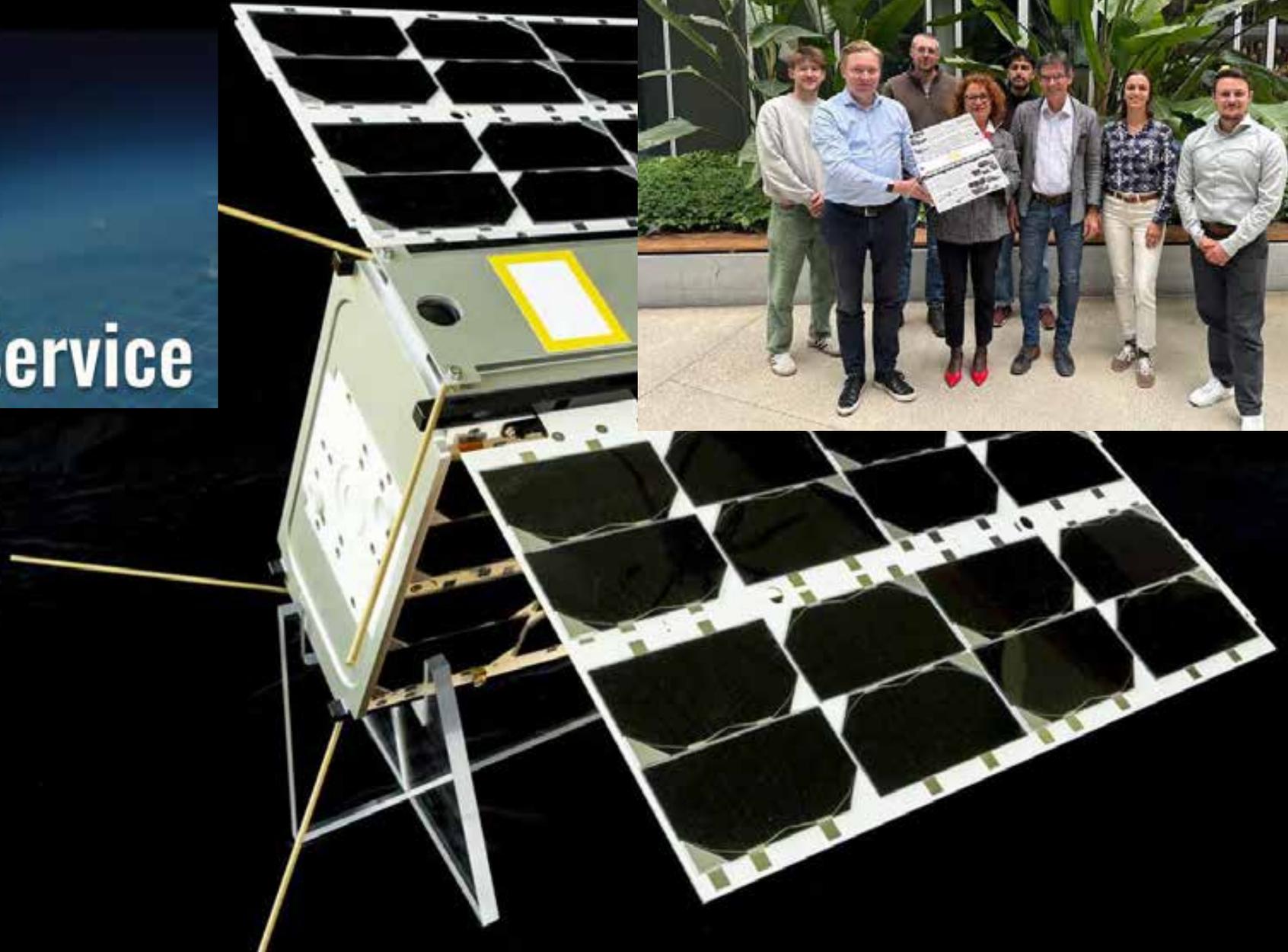


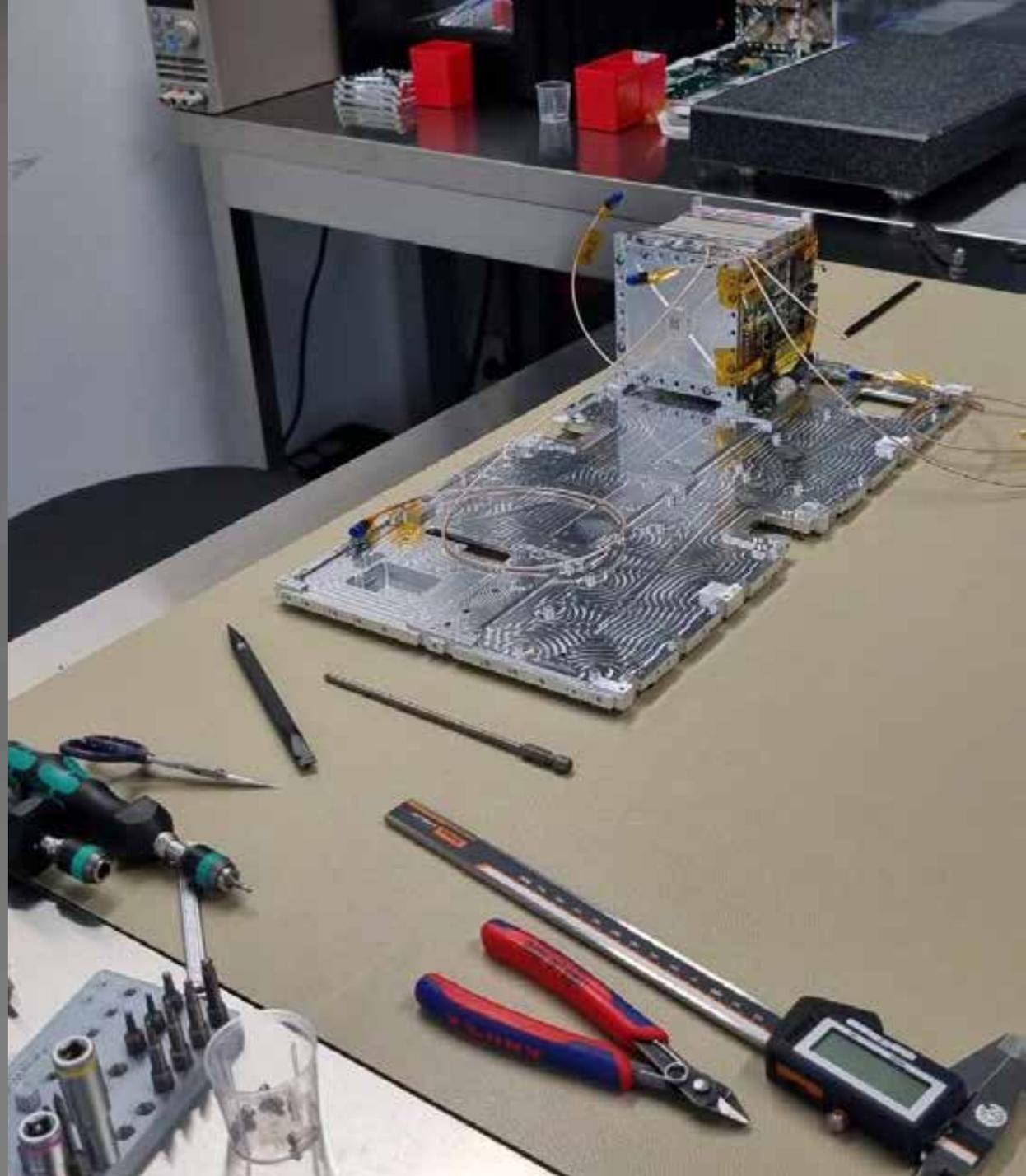




TALOS

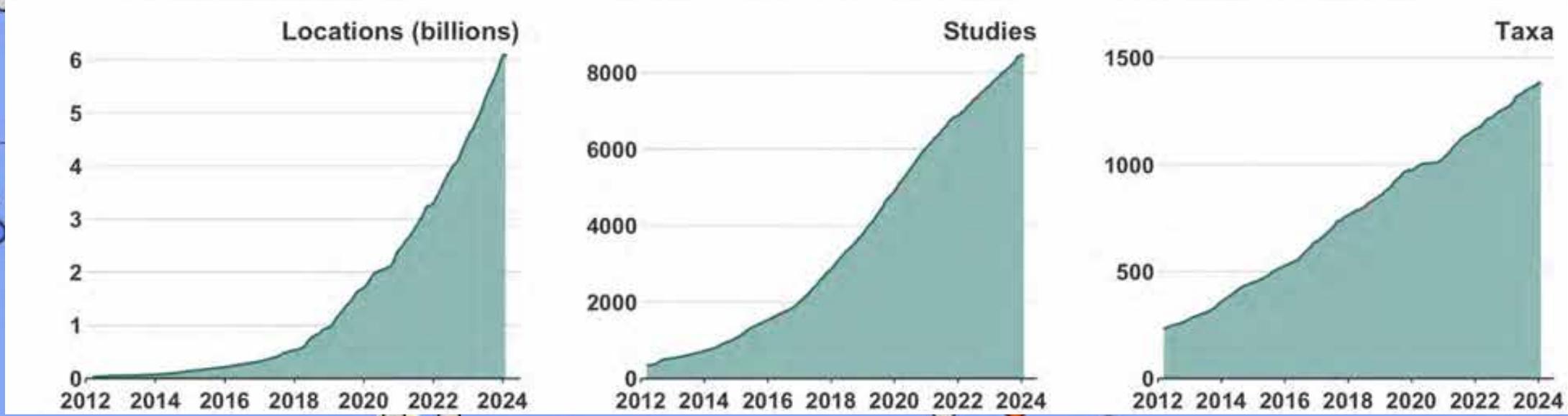
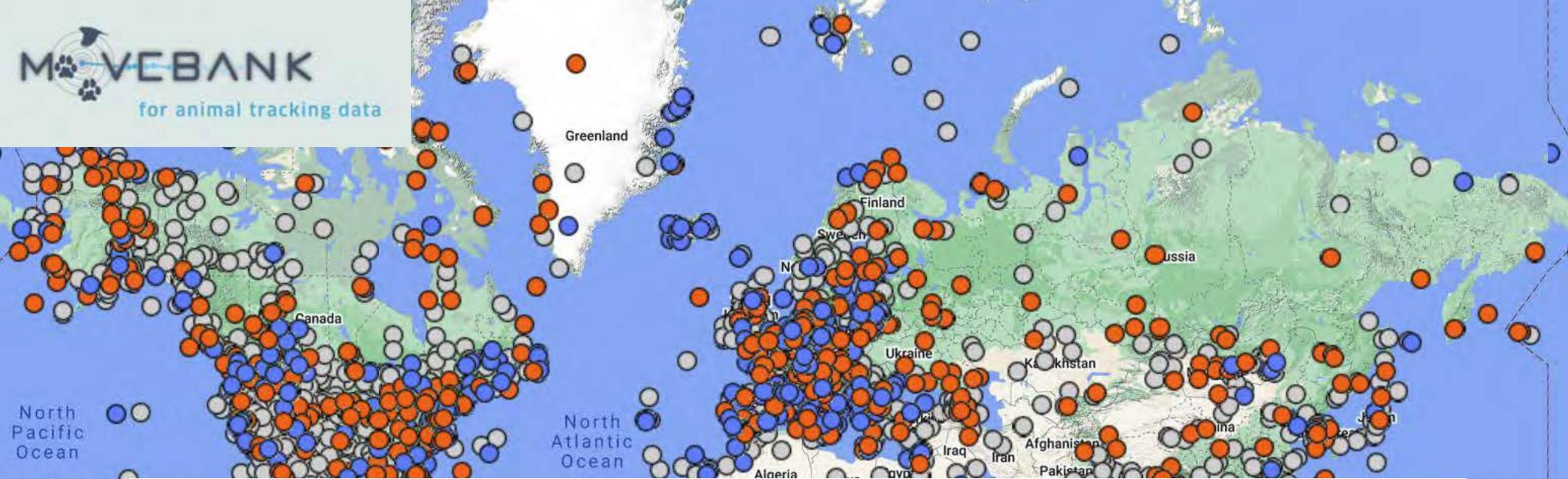
Global Tracking Solutions-as-a-Service







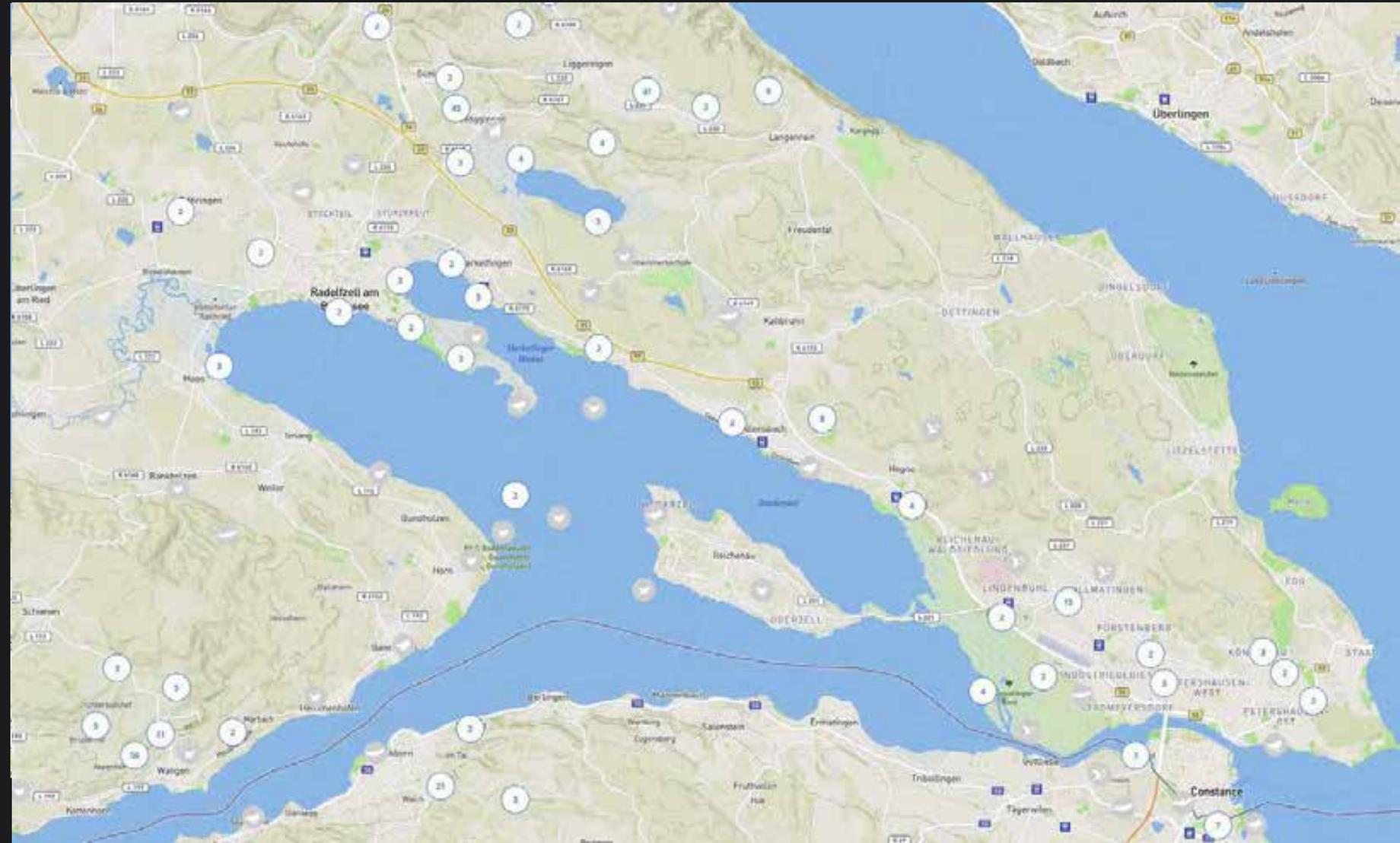
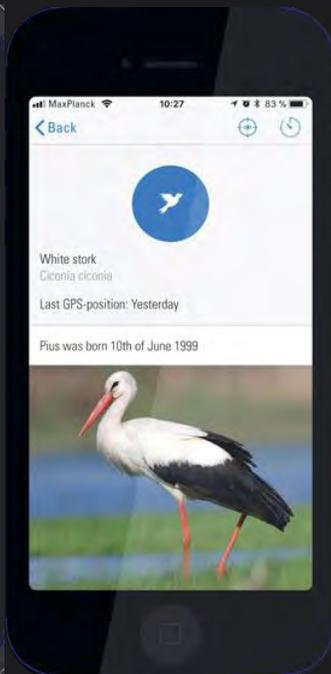
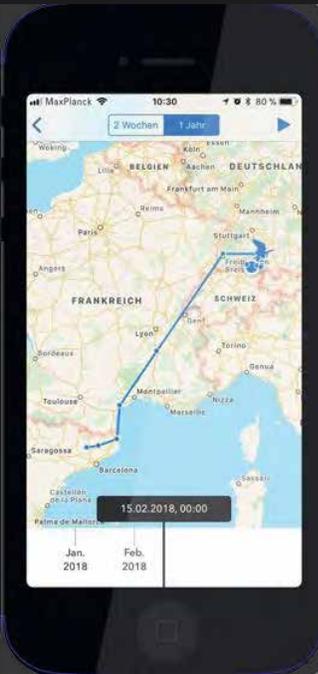




New Zealand



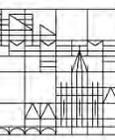
Animal Tracker App: Everybody can be an observer/guardian



17272 animals
243 species
>530.000 cell phones



Why we need information from animals globally?



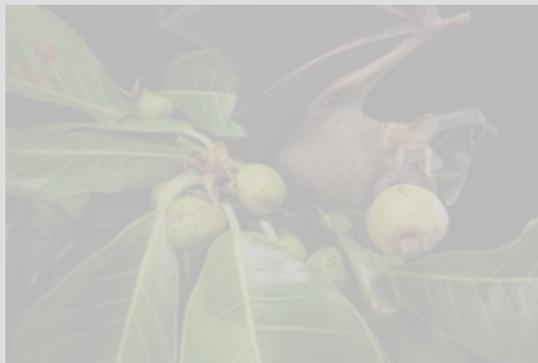
Prediction of catastrophes



Food safety



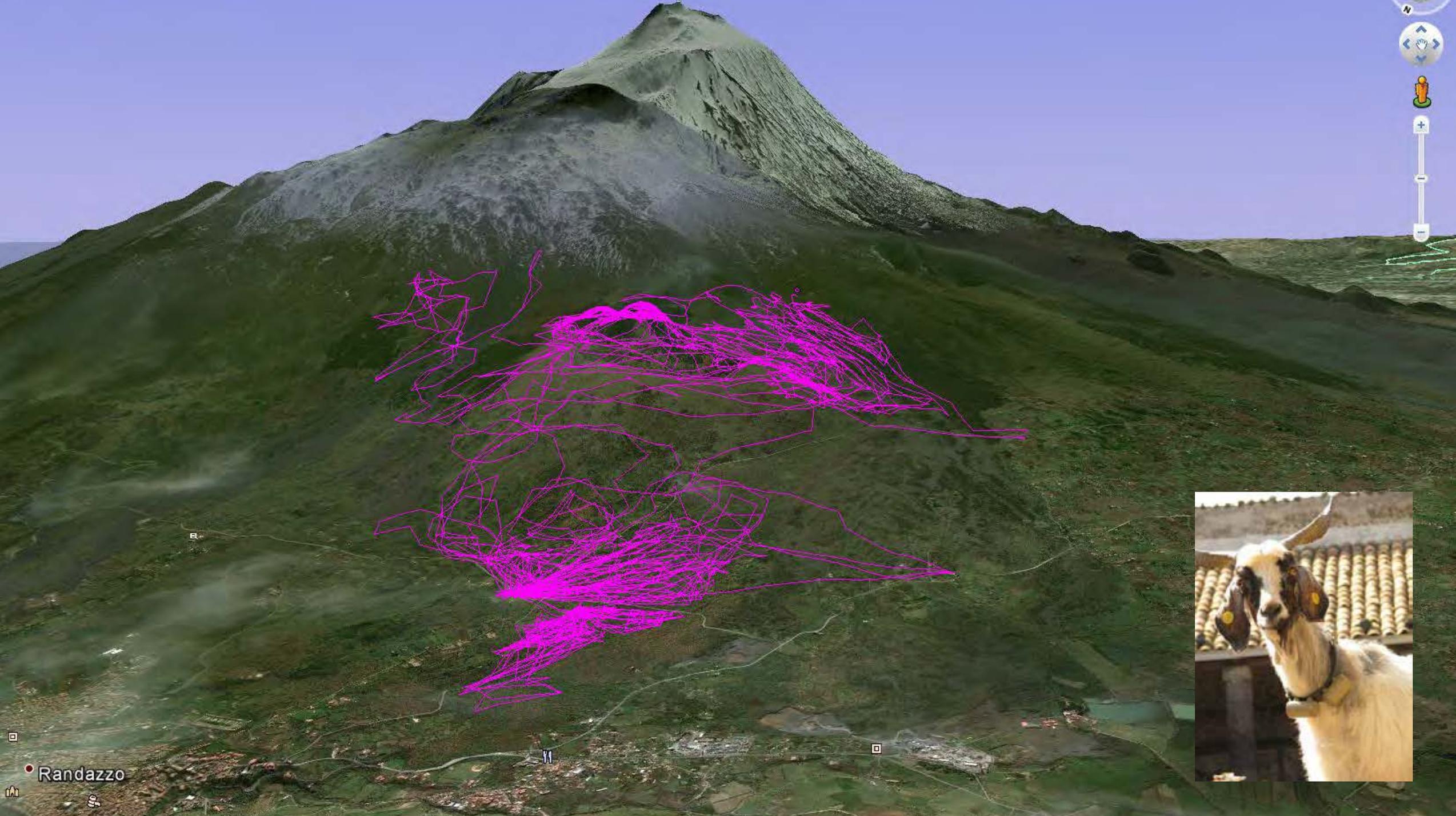
Ecosystem services Pollination - Reforestation



Health and well being

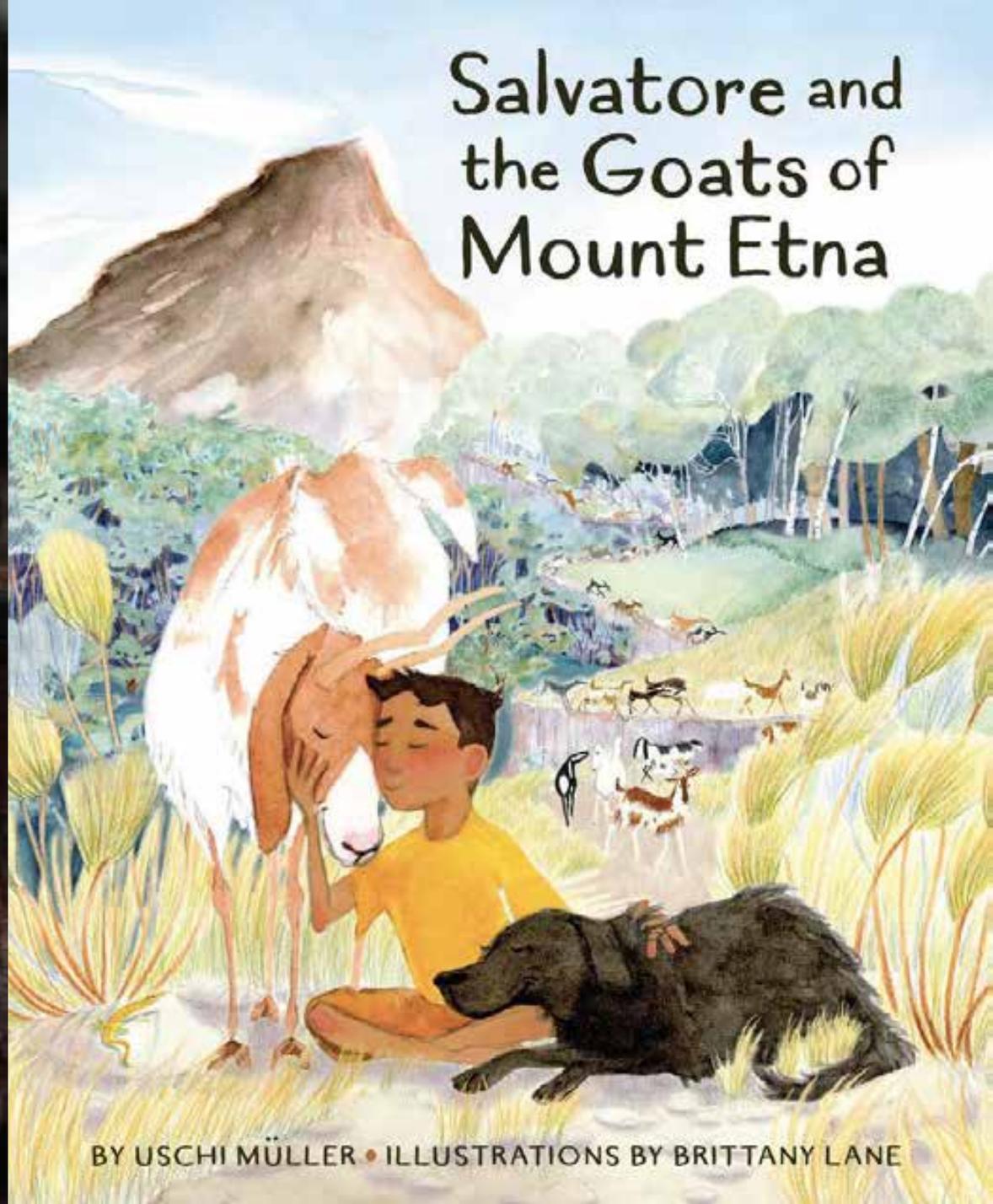








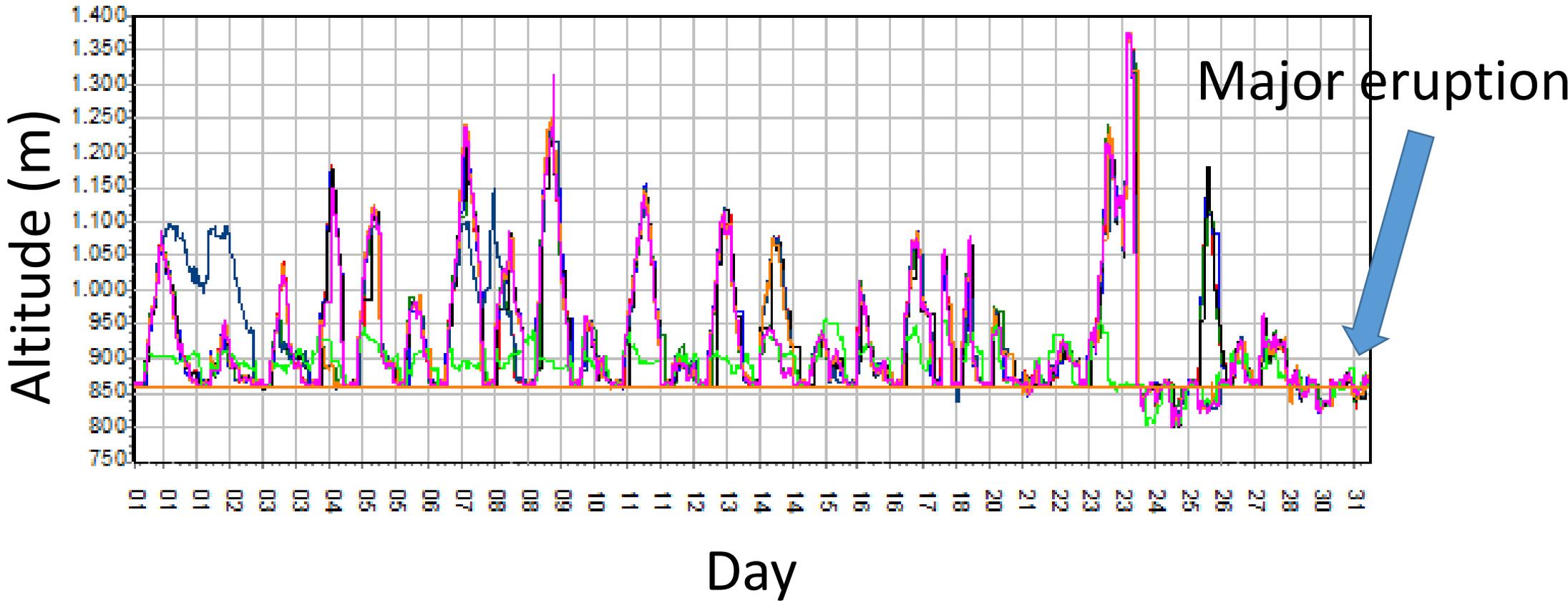
... "In goats we trust"



Salvatore and the Goats of Mount Etna

BY USCHI MÜLLER • ILLUSTRATIONS BY BRITTANY LANE

Goats change their altitudinal movement profile ahead of major eruptions

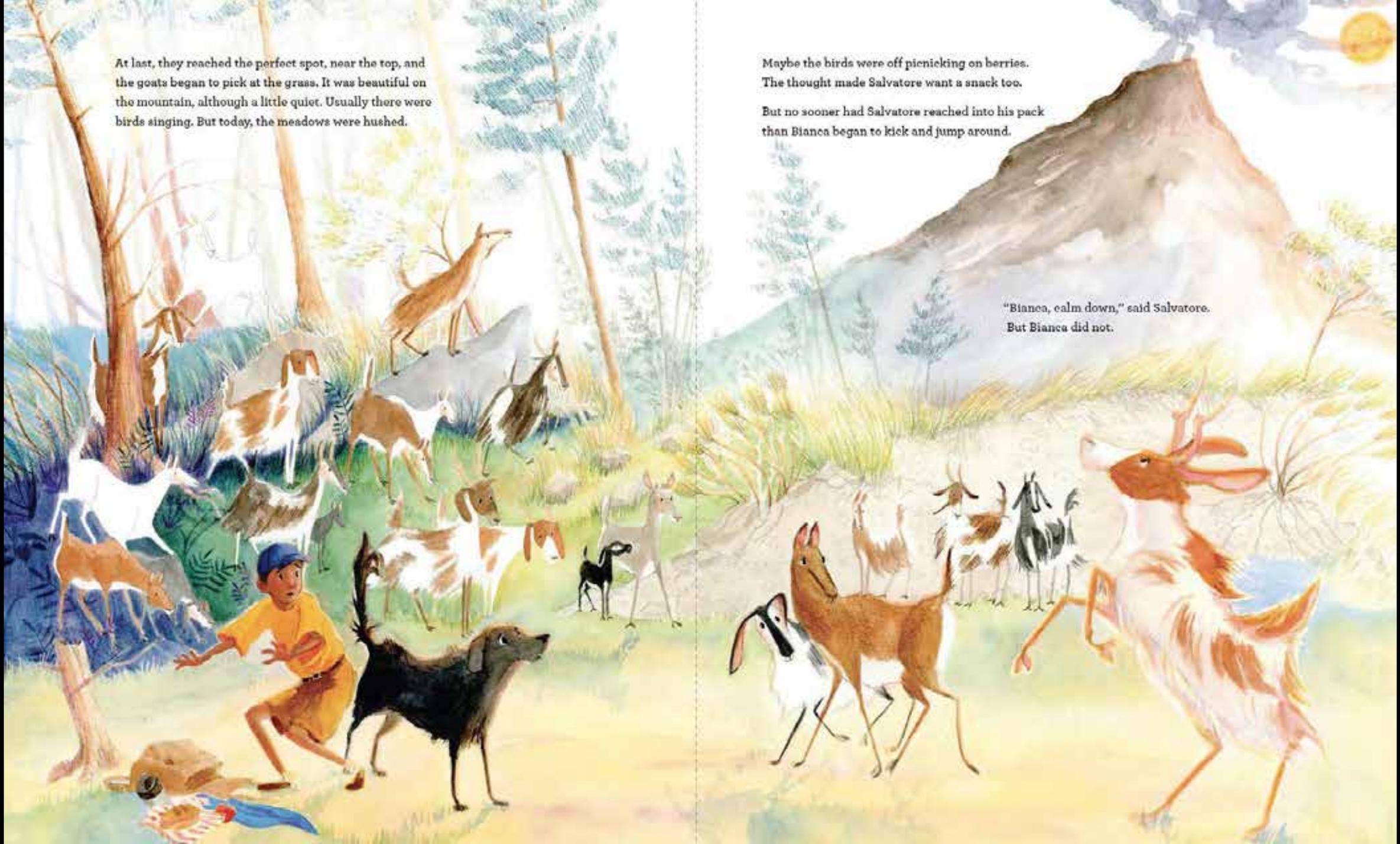


At last, they reached the perfect spot, near the top, and the goats began to pick at the grass. It was beautiful on the mountain, although a little quiet. Usually there were birds singing. But today, the meadows were hushed.

Maybe the birds were off picnicking on berries. The thought made Salvatore want a snack too.

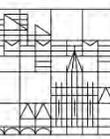
But no sooner had Salvatore reached into his pack than Bianca began to kick and jump around.

"Bianca, calm down," said Salvatore. But Bianca did not.





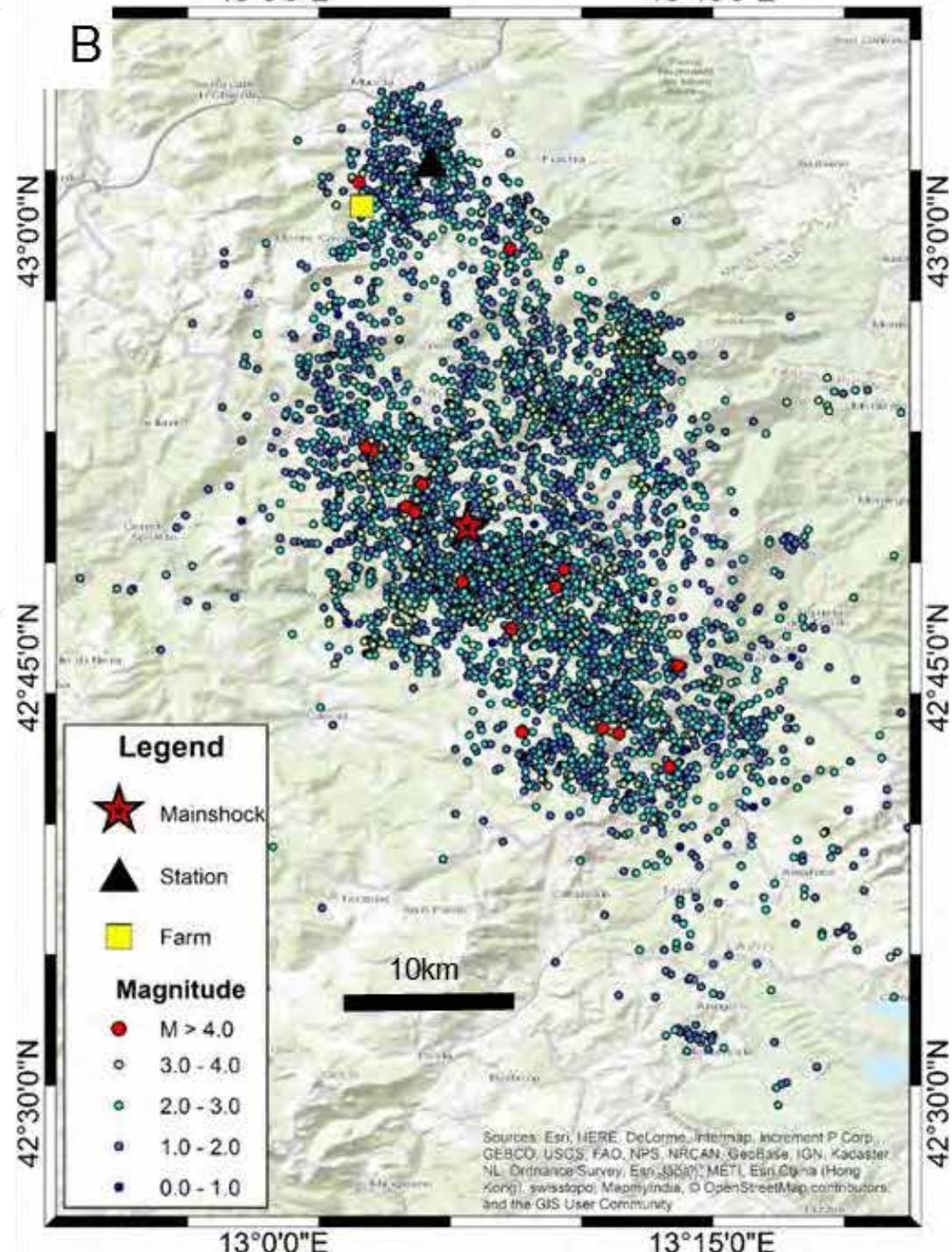
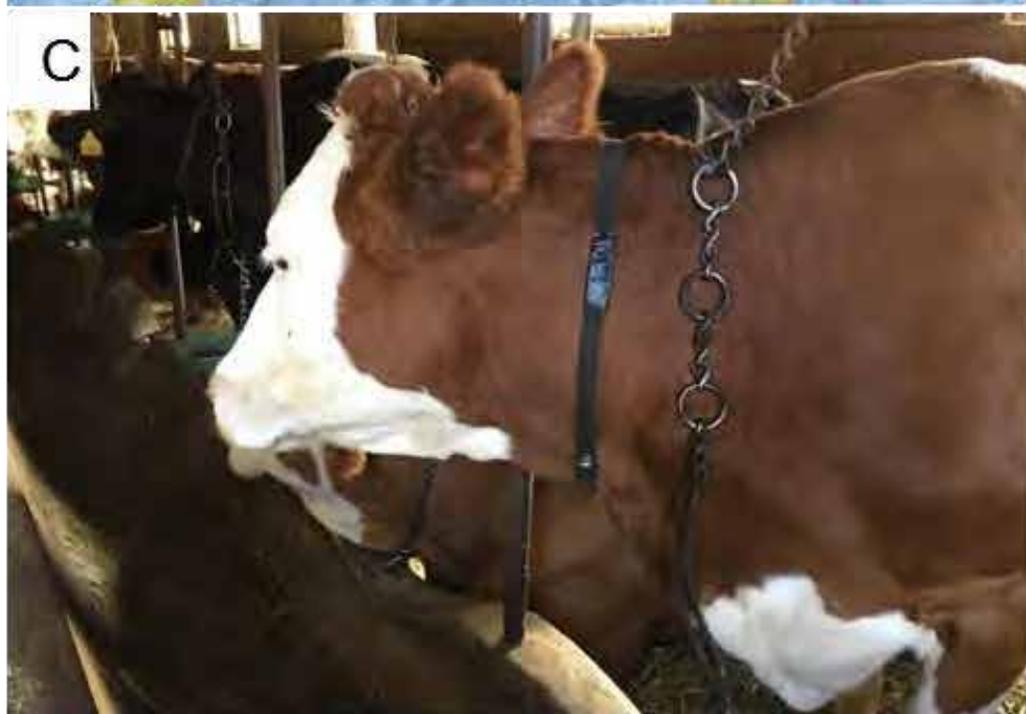
Fish 'cause' earthquakes





Apennine, Italy





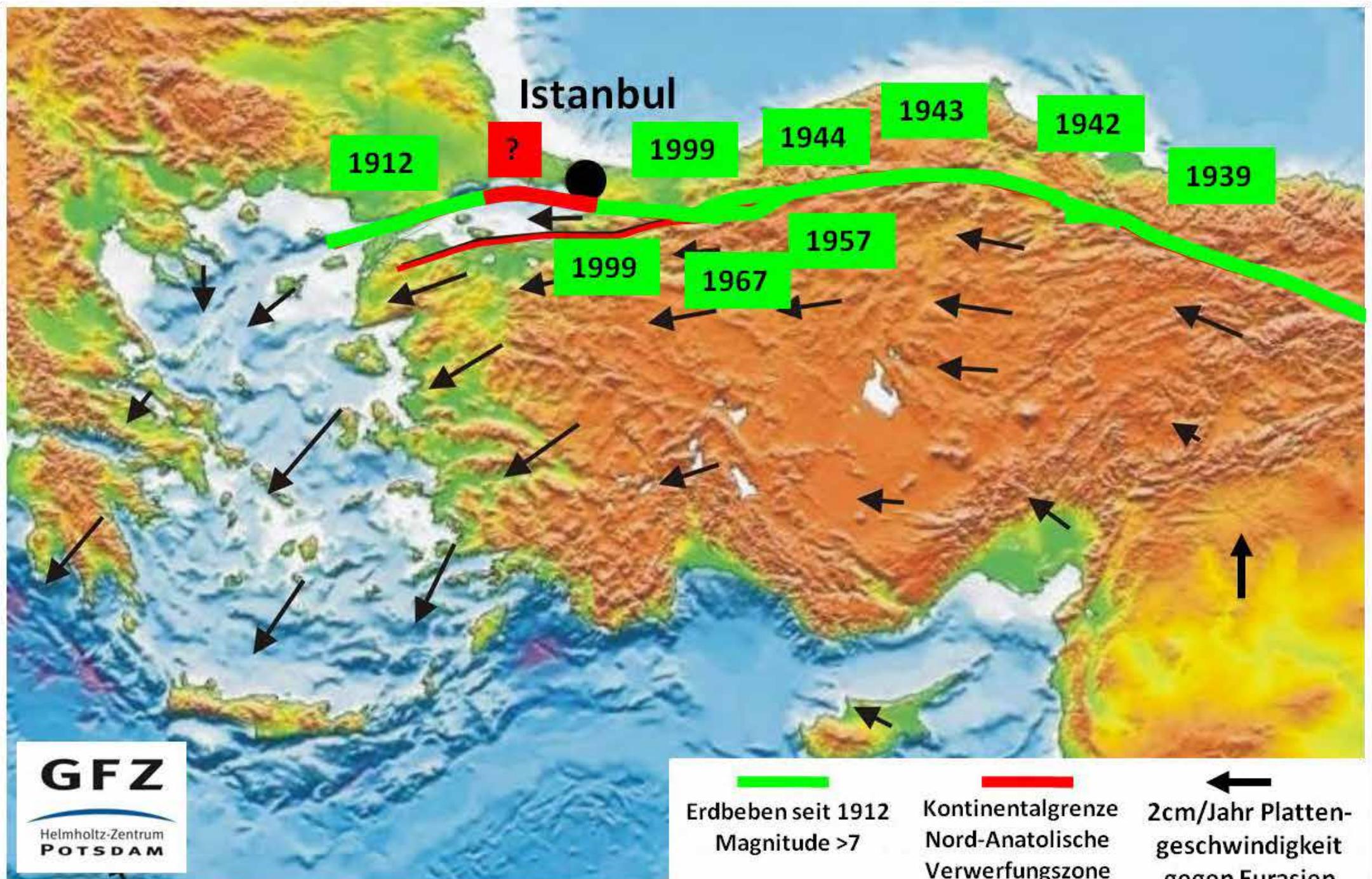






Before the Earthquake hit !

Recorder



Can (some) cats or dogs predict an earthquake?

> 1 Mio Tracker



Max Planck Institute Uses Tractive Trackers to Gain New Insights into the Health and Behavior of Pets

Tractive and the Max Planck Institute for Animal Behavior are launching a joint research project to use activity data collected by more than 1 million active Tractive GPS trackers to investigate deviations in pet behavior before natural disasters.

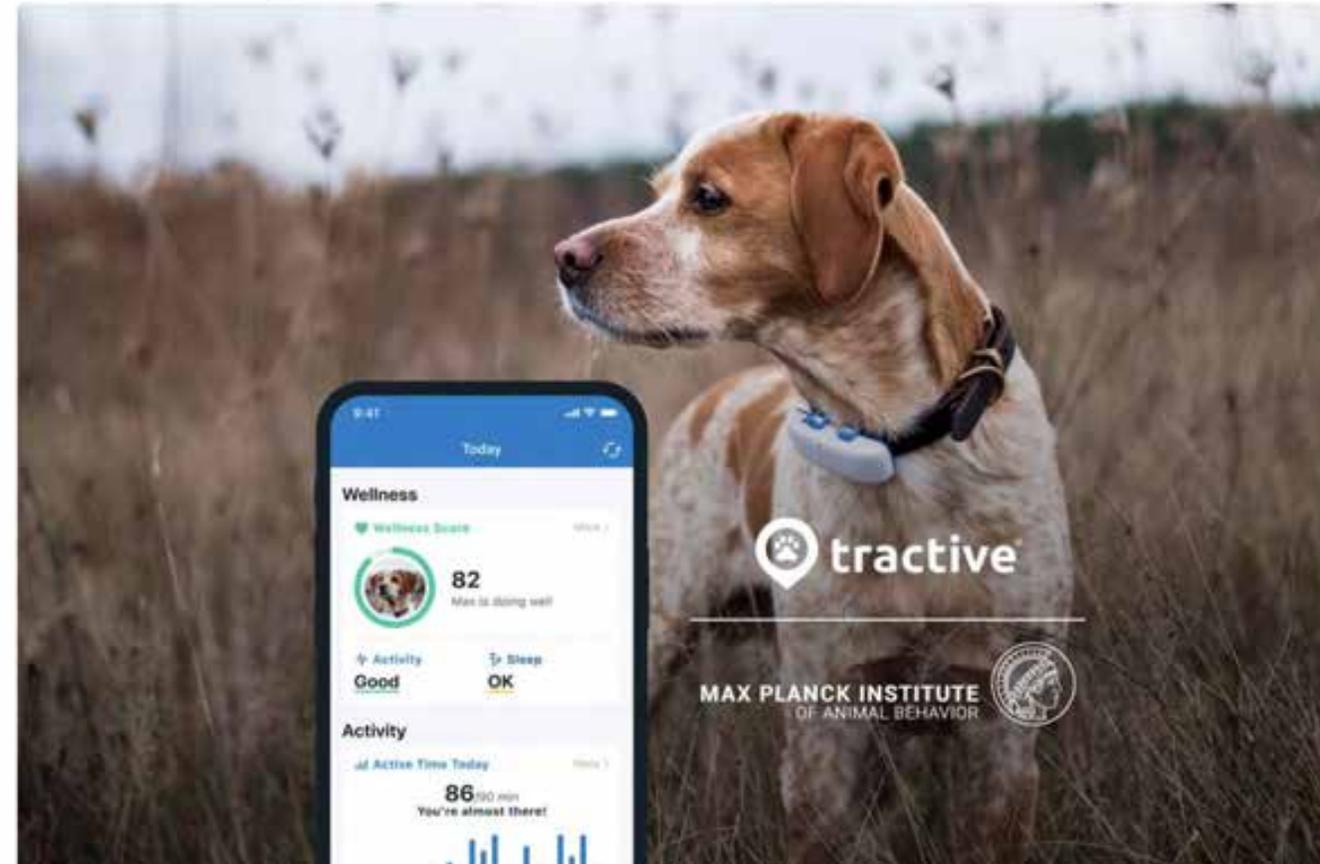
Max Planck Institute of Animal Behavior > Media & Outreach > News > Pets studied to develop disaster forecasting

Pets studied to develop disaster forecasting

MPI-AB joins forces with GPS pet tracking company - Tractive - to explore how dogs and cats can detect natural disasters before they happen.

MARCH 27, 2023

The Max Planck Institute of Animal Behavior (MPI-AB) is collaborating with Tractive, a global provider of wellness tracking solutions for dogs and cats, to use real-time animal activity data from almost a million trackers in the field. The collaboration will give rise to new insights into the health and behavior of pets and even help to determine if pet behavior could act as a pre-warning system for natural disasters, such as earthquakes.



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Media Officer

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4500 cats and dogs in Munich

Map Activity

City

Munich, Konstanz

Center: (47,699, 9,182)
Zoom: 13

Show Urbanity

Presentation

Elevation Shift

Color Shift

Reset to Start

Timeframe

Use Timestamp

Use Range

Timestamp:

2024-03-11 00:00:00

2024-03-11 20:10:00

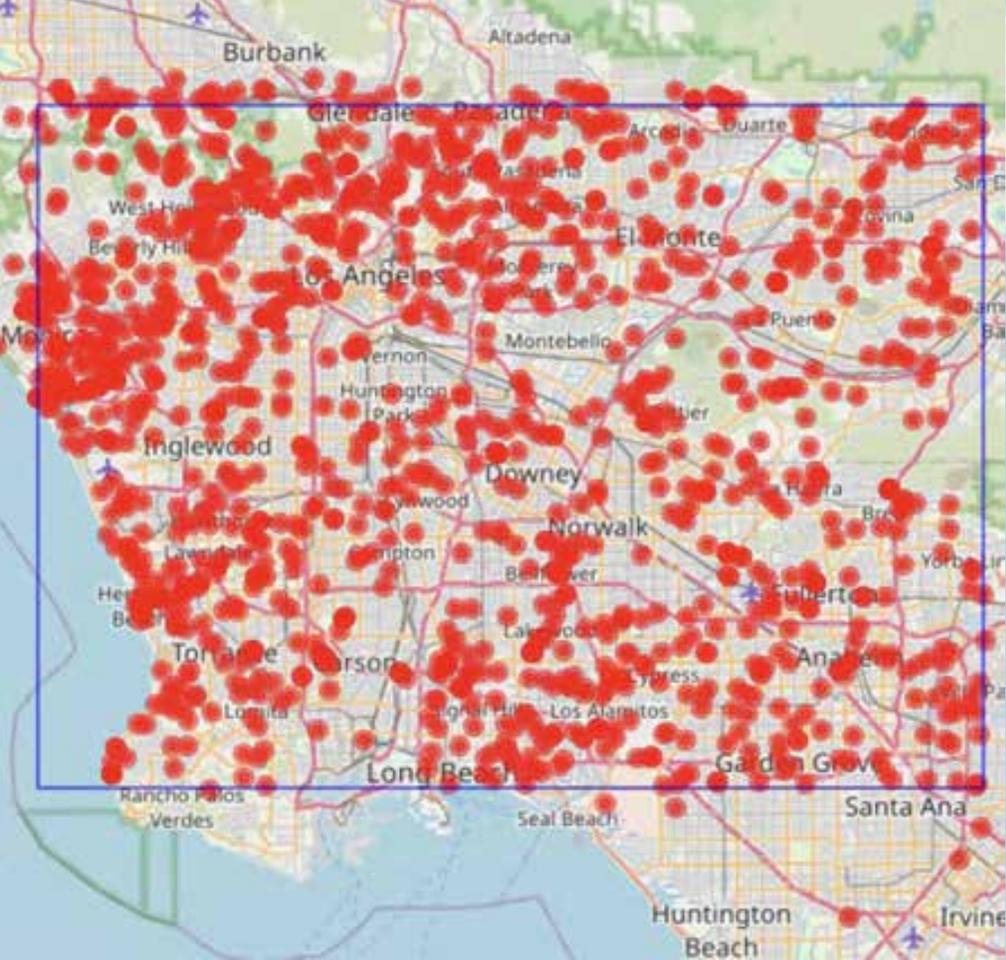
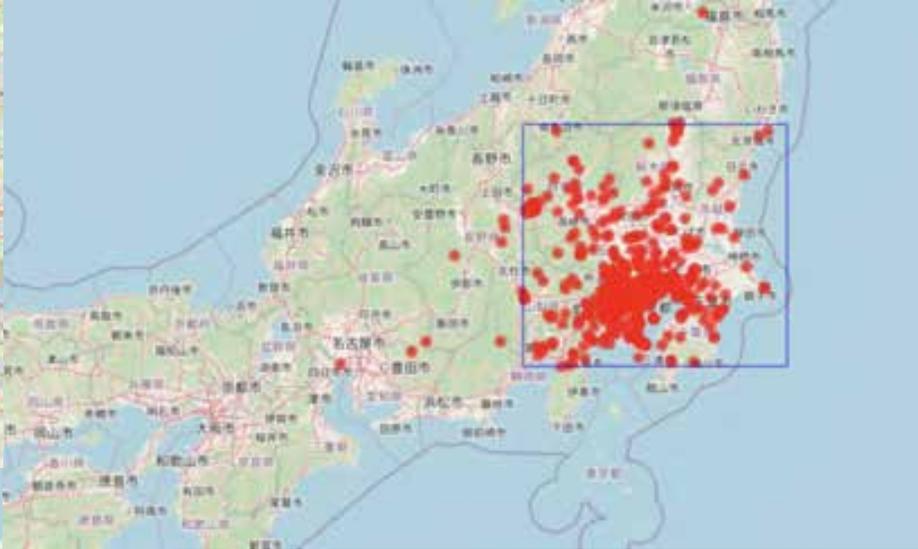
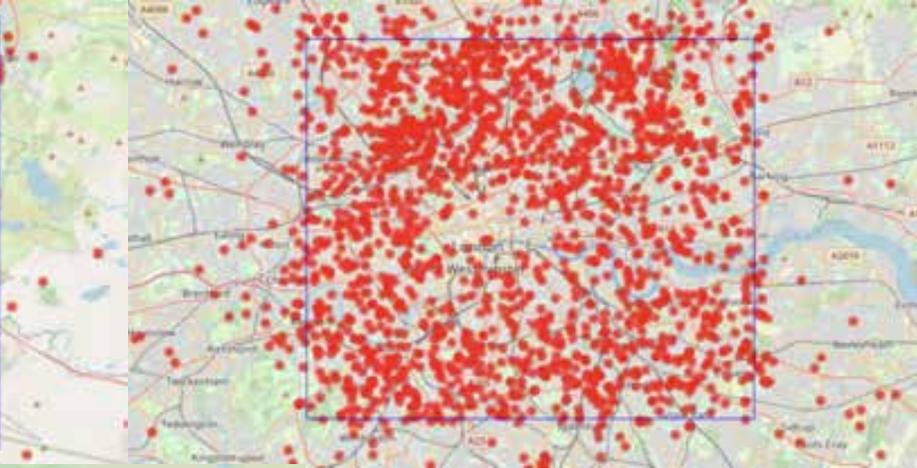
Map style:

Light

2024-03-11 20:10:00

> 1 Mio Tracker



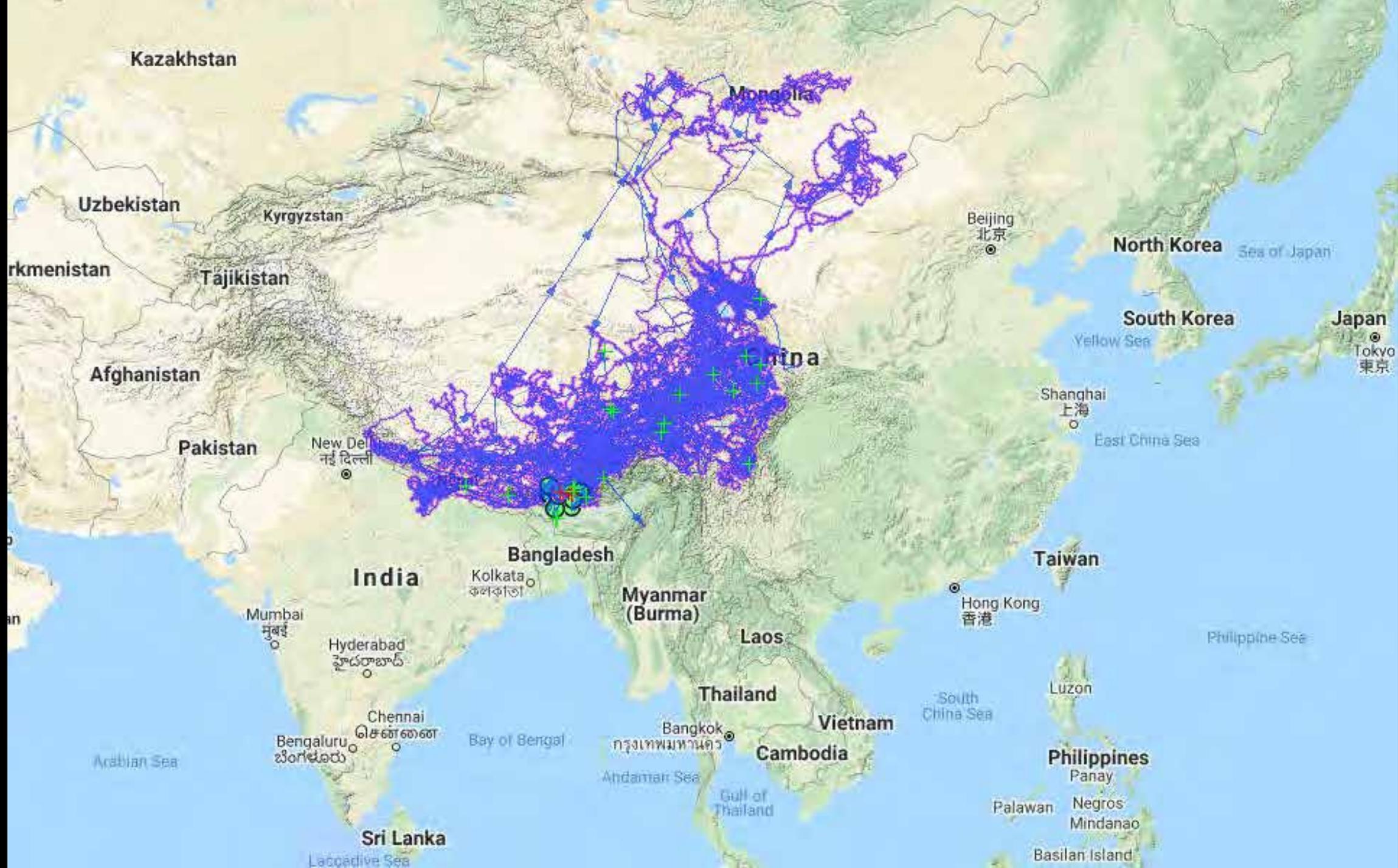


Mt. Everest Camp (NY Times)



Griffon in Bhutan







Wind speed and direction
Turbulence
Temperature
Humidity



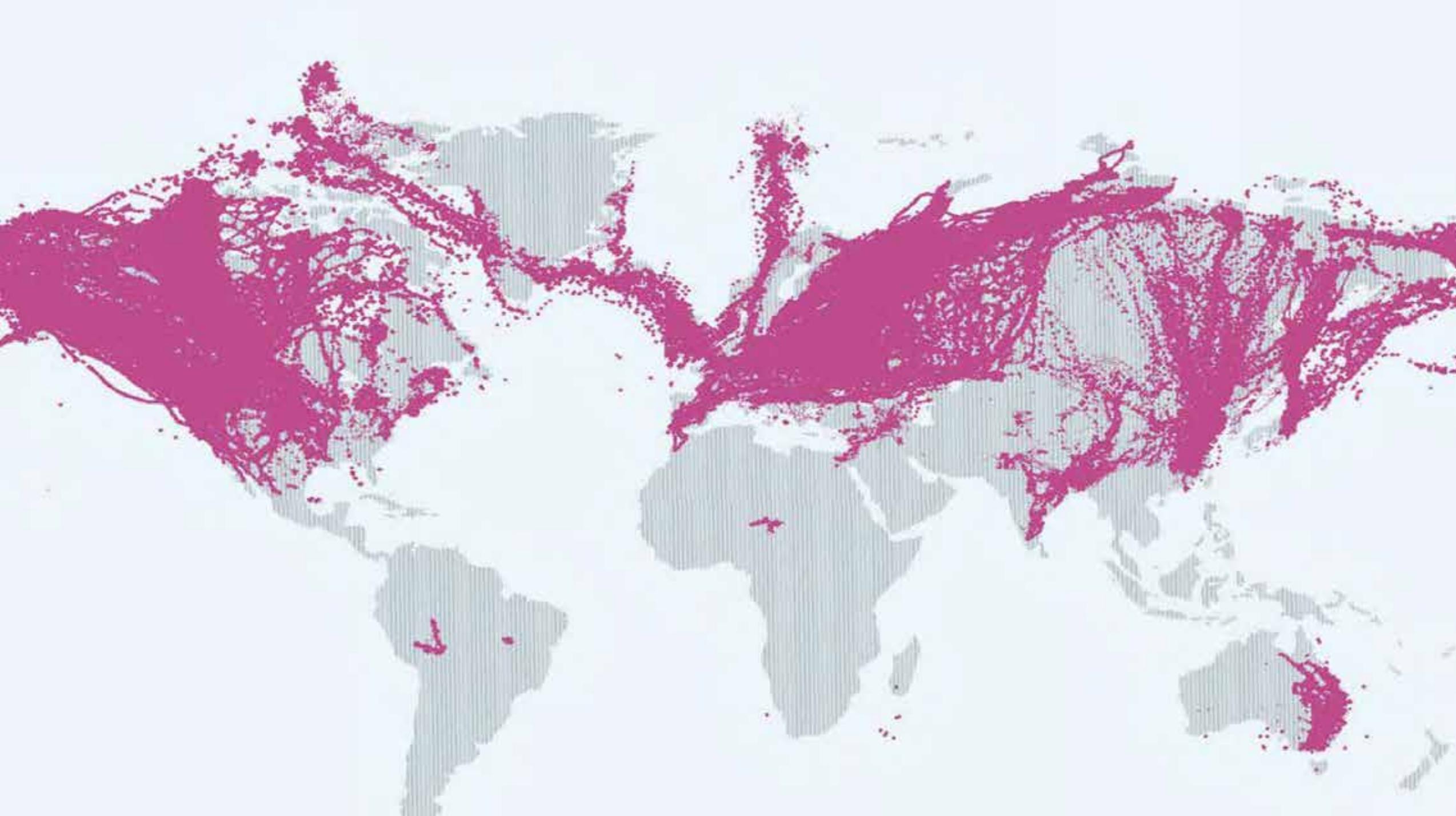


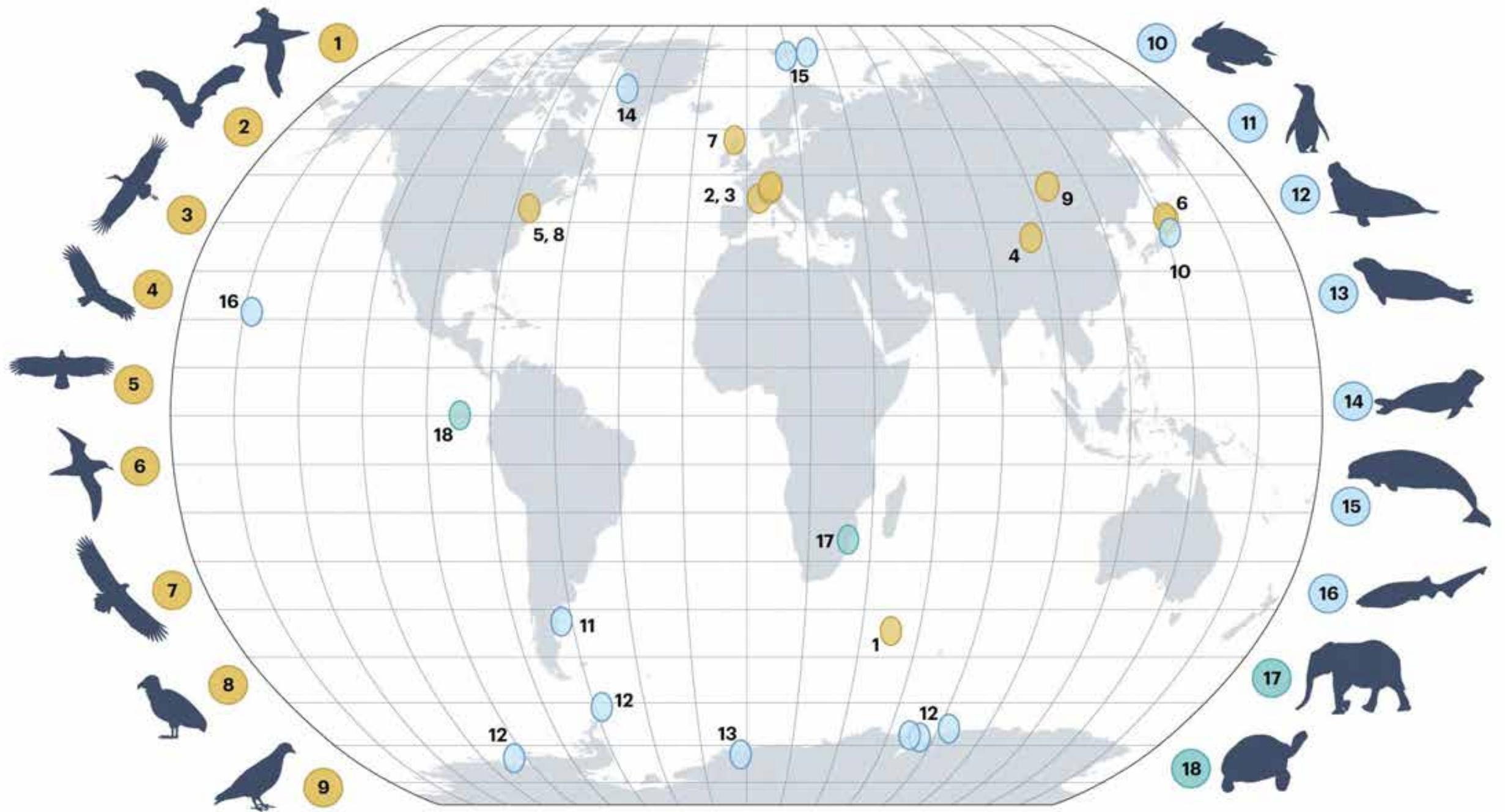


toniroth.com



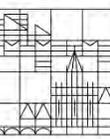
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Gesamtlaufzeit	Verstrichene Dauer	Durchschnittsgeschwindigkeit	Entfernung	GPS
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Why we need information from animals globally?



Prediction of catastrophes



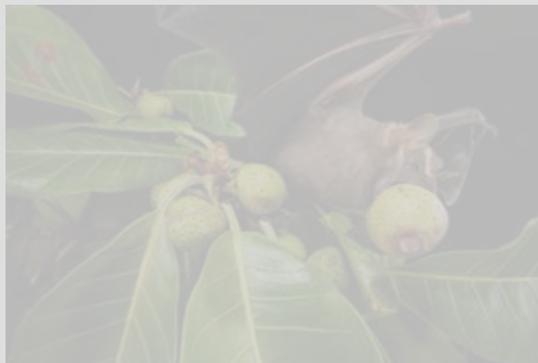
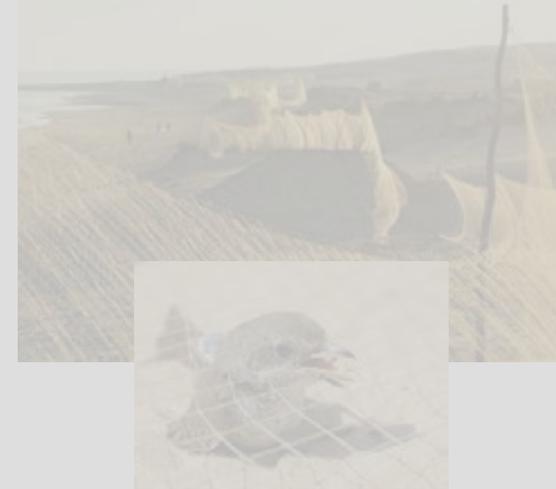
Food safety



Ecosystem services
Pollination - Reforestation

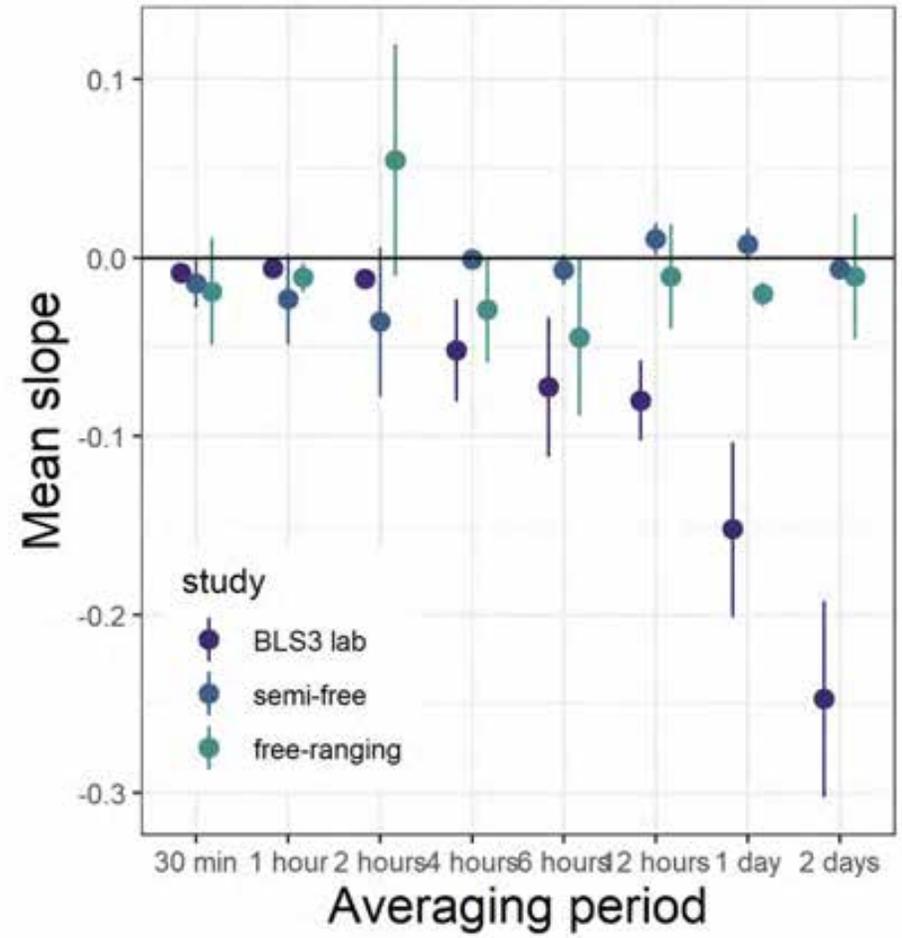
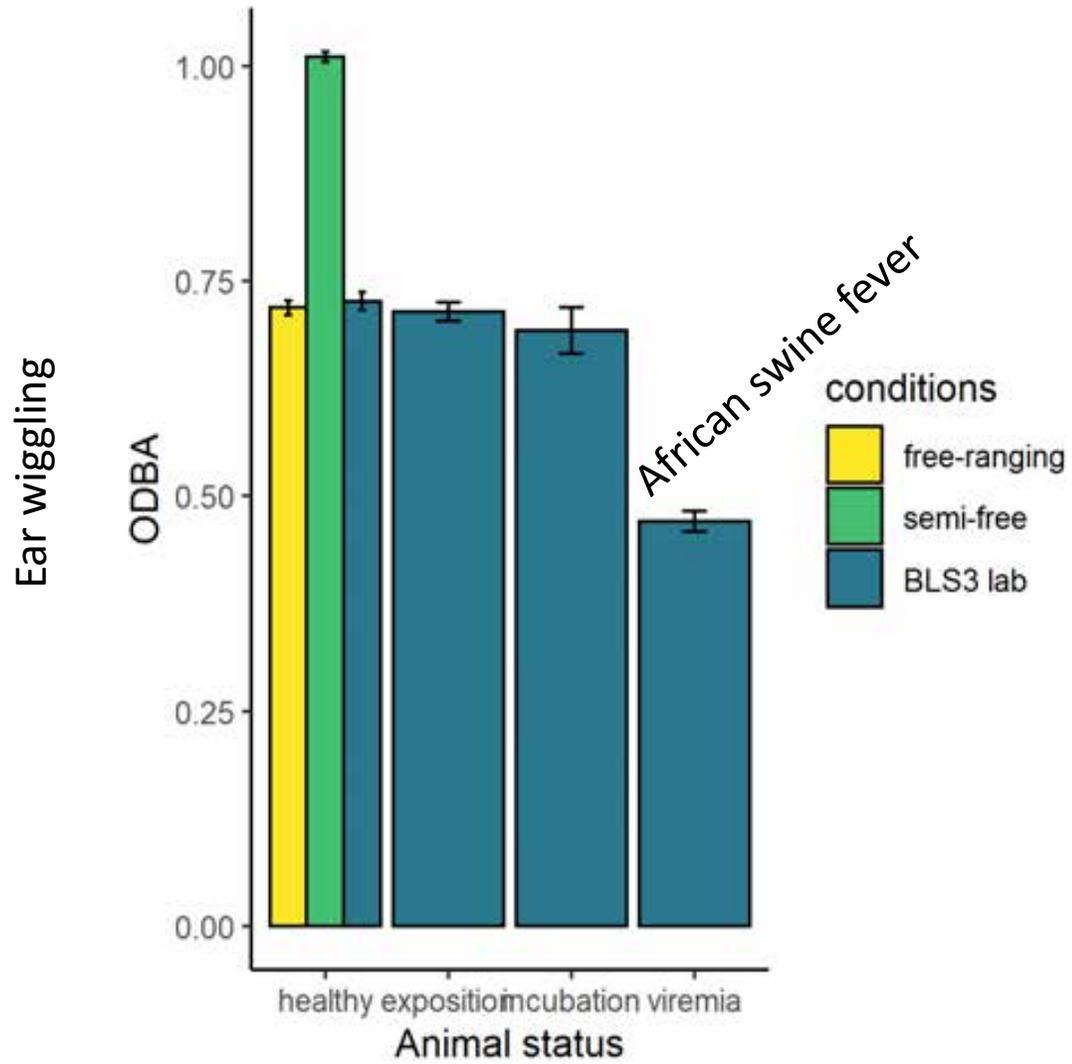


Health and well being

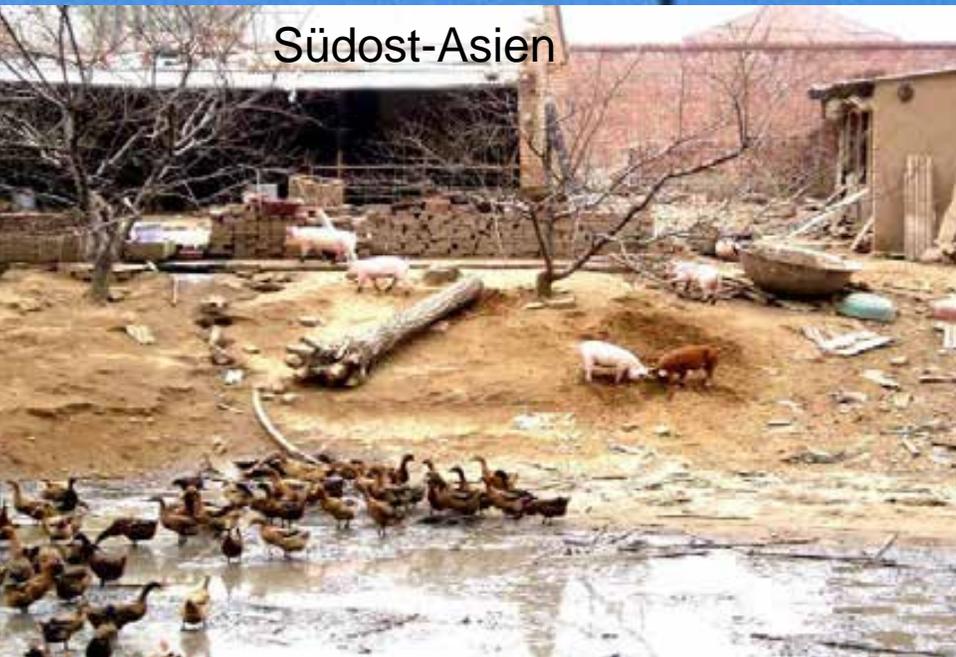
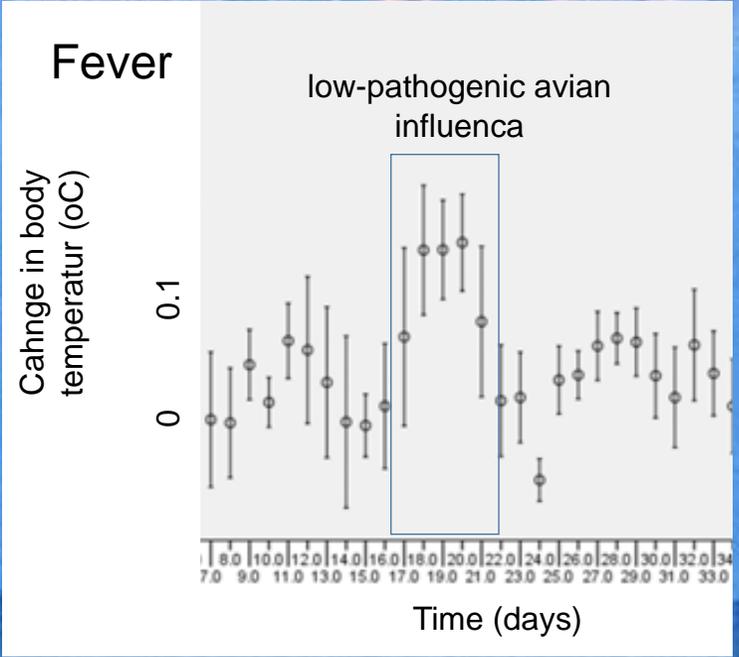
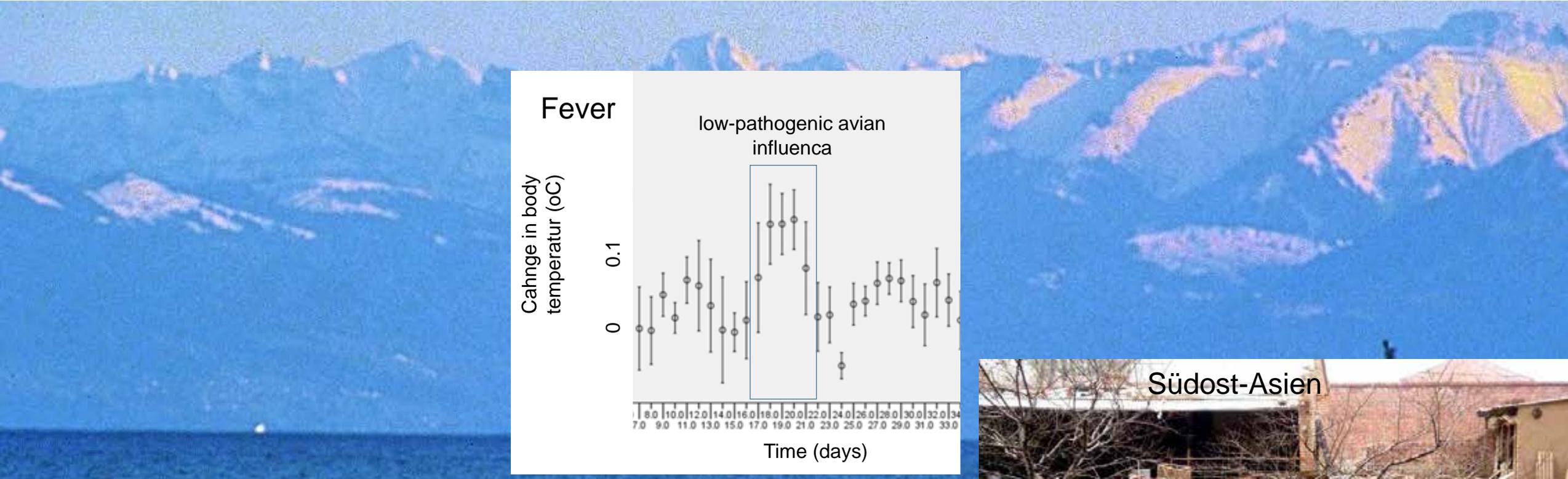


Detection of African swine fever in real time (3h) via 'ear wiggeling' (3D-acceleration)









An aerial photograph of a vast agricultural landscape in Chachoengsao Province, Thailand. The foreground is dominated by a large body of water, likely a reservoir or a flooded field, with a bright reflection of the sun. The water is surrounded by dark, rectangular plots of land, possibly rice fields. In the middle ground, a road runs horizontally across the frame. The background shows a hazy, distant horizon under a clear sky. The text "Chachoengsao Province" and "Thailand" is overlaid in white, sans-serif font in the center of the image.

Chachoengsao Province

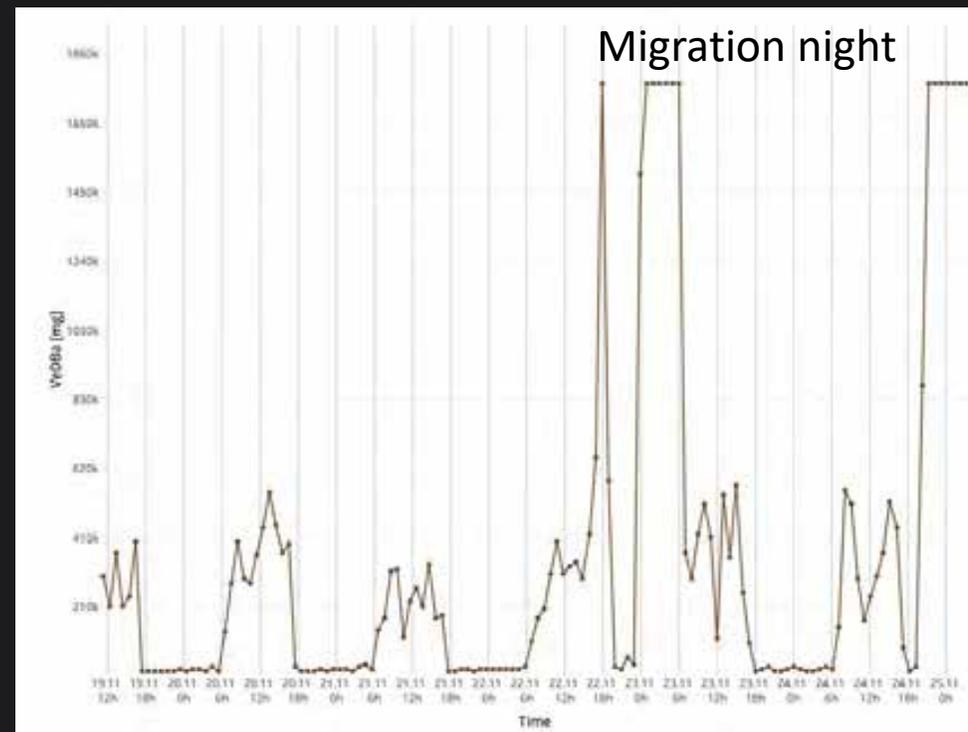
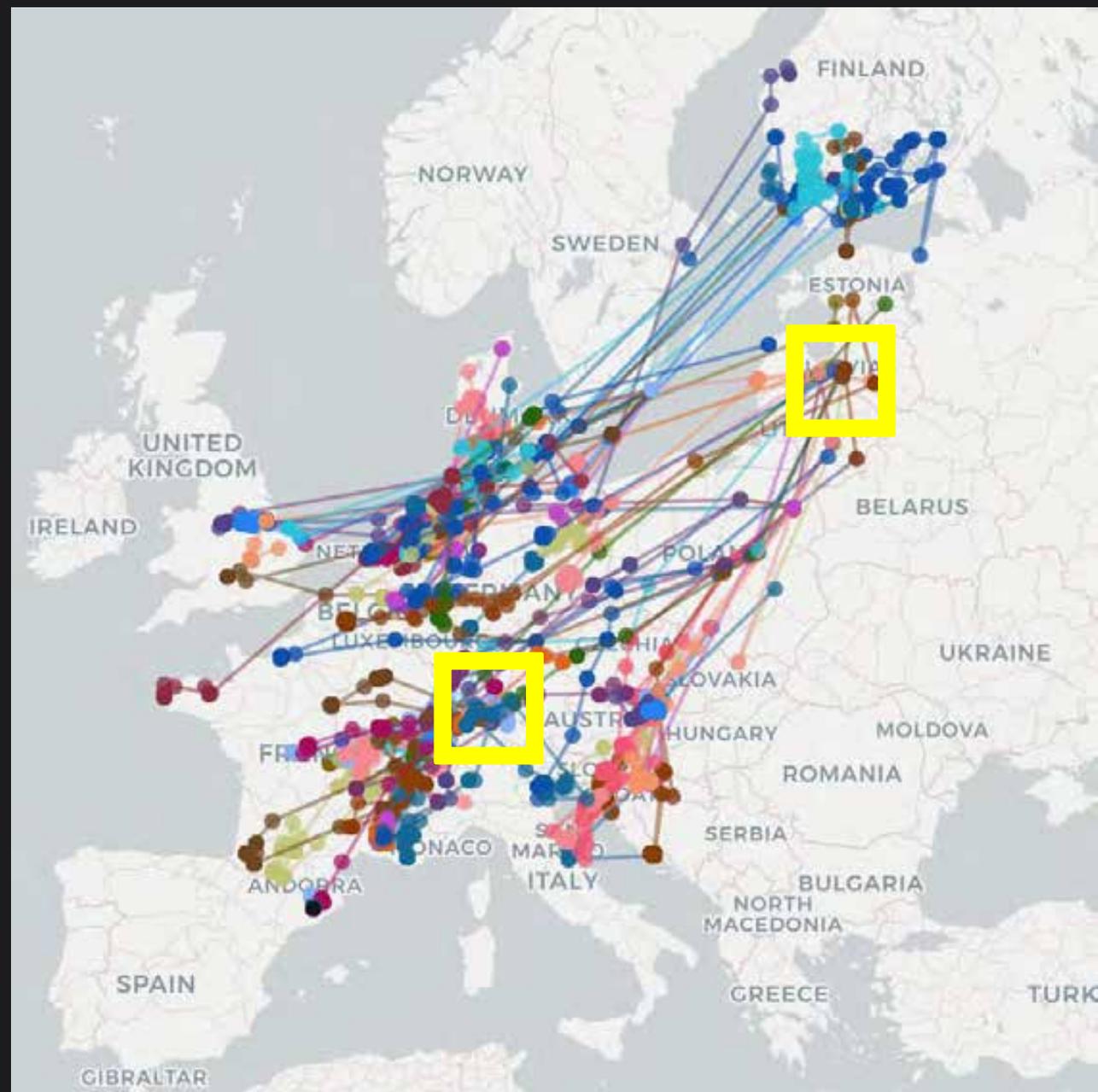
Thailand

Encephalitis via tick bites





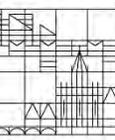




incubation



Why we need information from animals globally?



Prediction of catastrophes



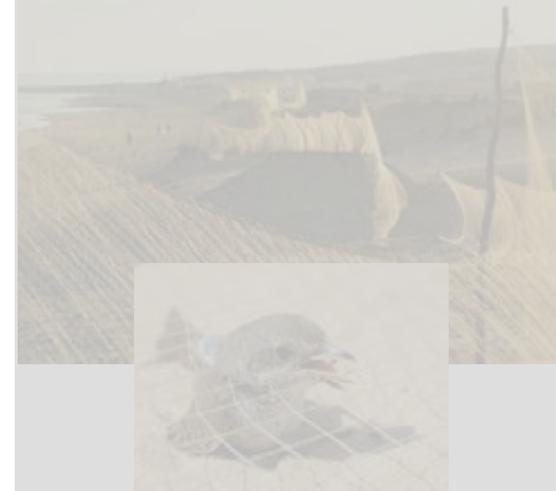
Food safety



Ecosystem services
Pollination - Reforestation



Health and well being

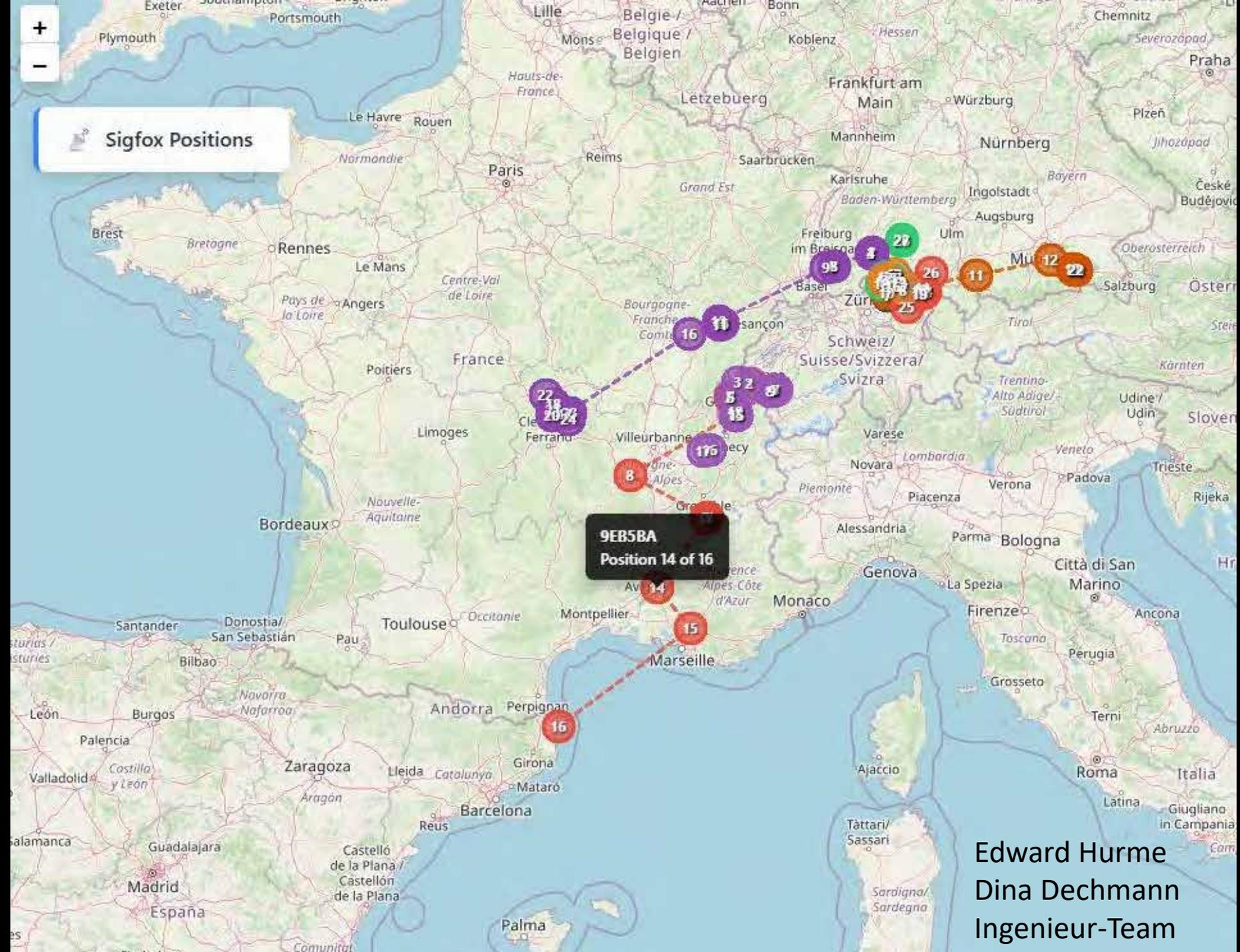








 **Sigfox Positions**



9EB5BA
Position 14 of 16

Edward Hurme
Dina Dechmann
Ingenieur-Team

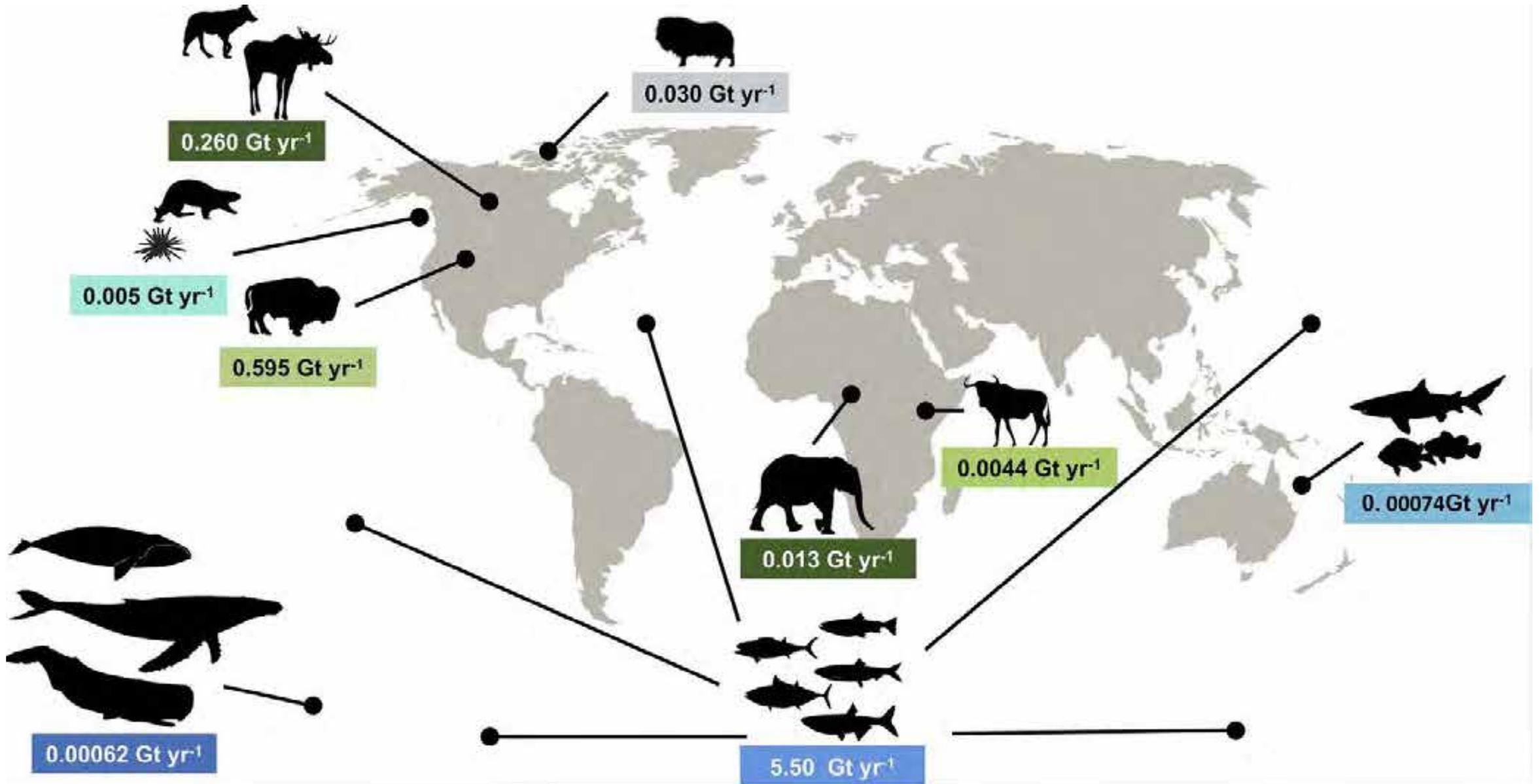




08. Juli



Global CO₂ savings - Nature-based solutions: Animals conserve 6 gigatons of carbon



A woman in a blue plaid shirt and two children, a boy in a red shirt and a girl in a red dress, are sitting in a lush green forest. They are holding a small sapling with large green leaves. The woman is smiling, while the children look on with neutral expressions. The background is filled with trees and foliage, suggesting a natural, outdoor setting.

Bäume pflanzen als Mittel gegen den Klimawandel?

So finden Spender sinnvolle Baumpflanzprojekte

Seed-dispersing animals as gardeners of the forests





Why we need information from animals globally?



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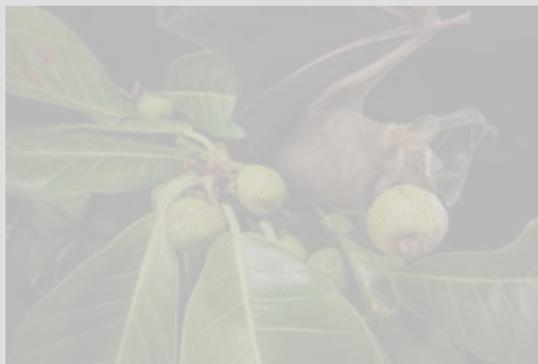
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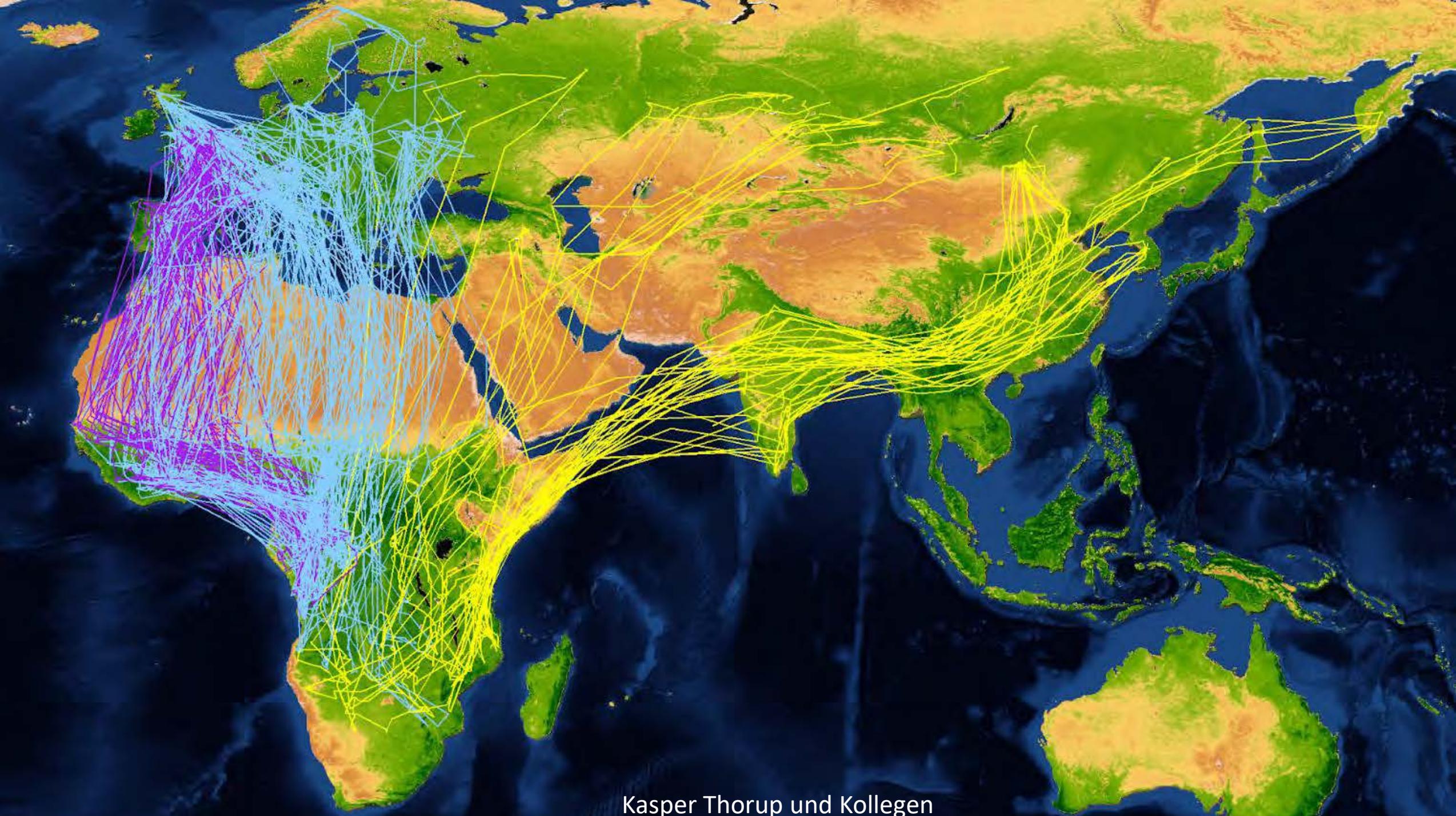


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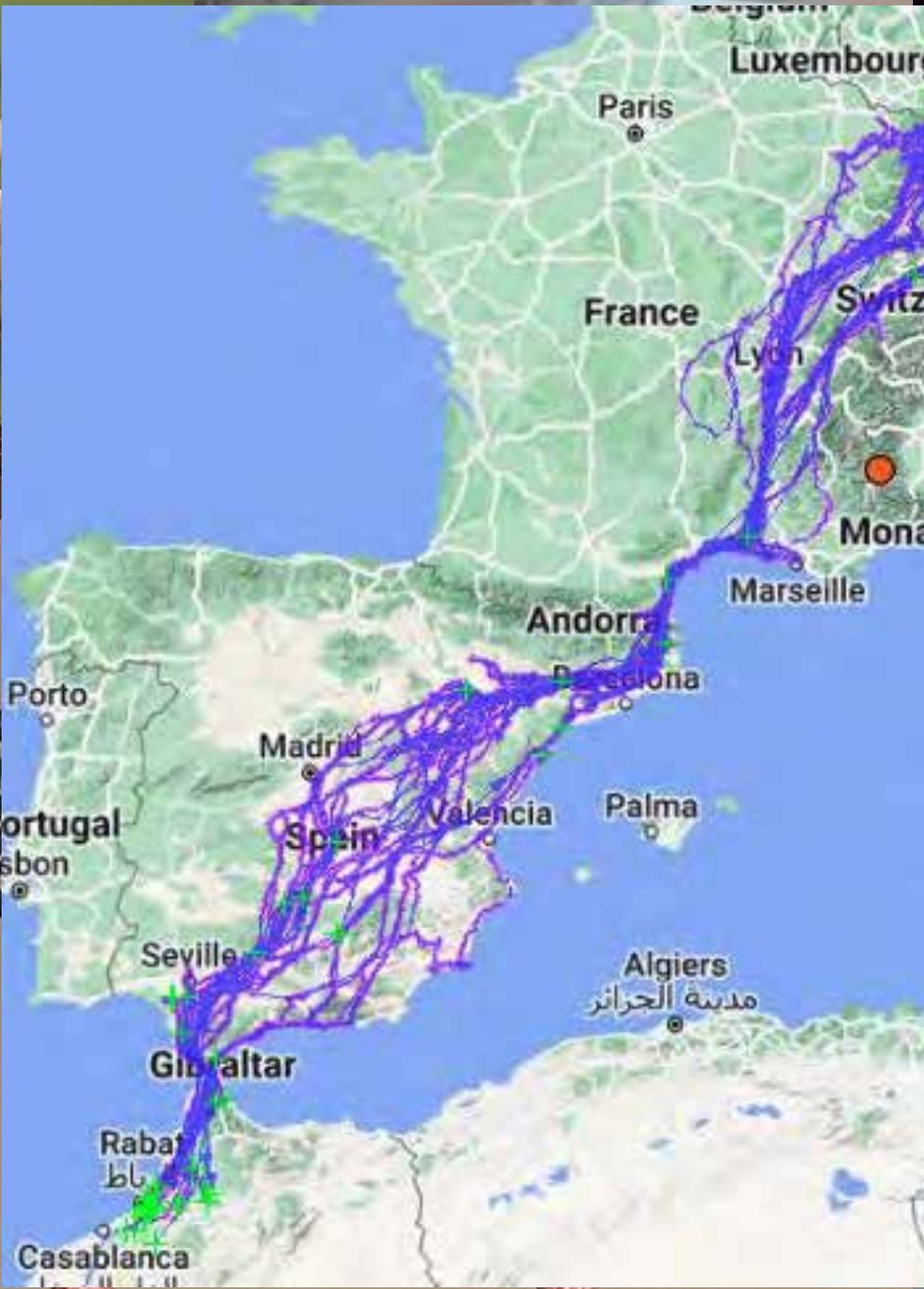


Cuckoo:
the best indicator of
intact nature

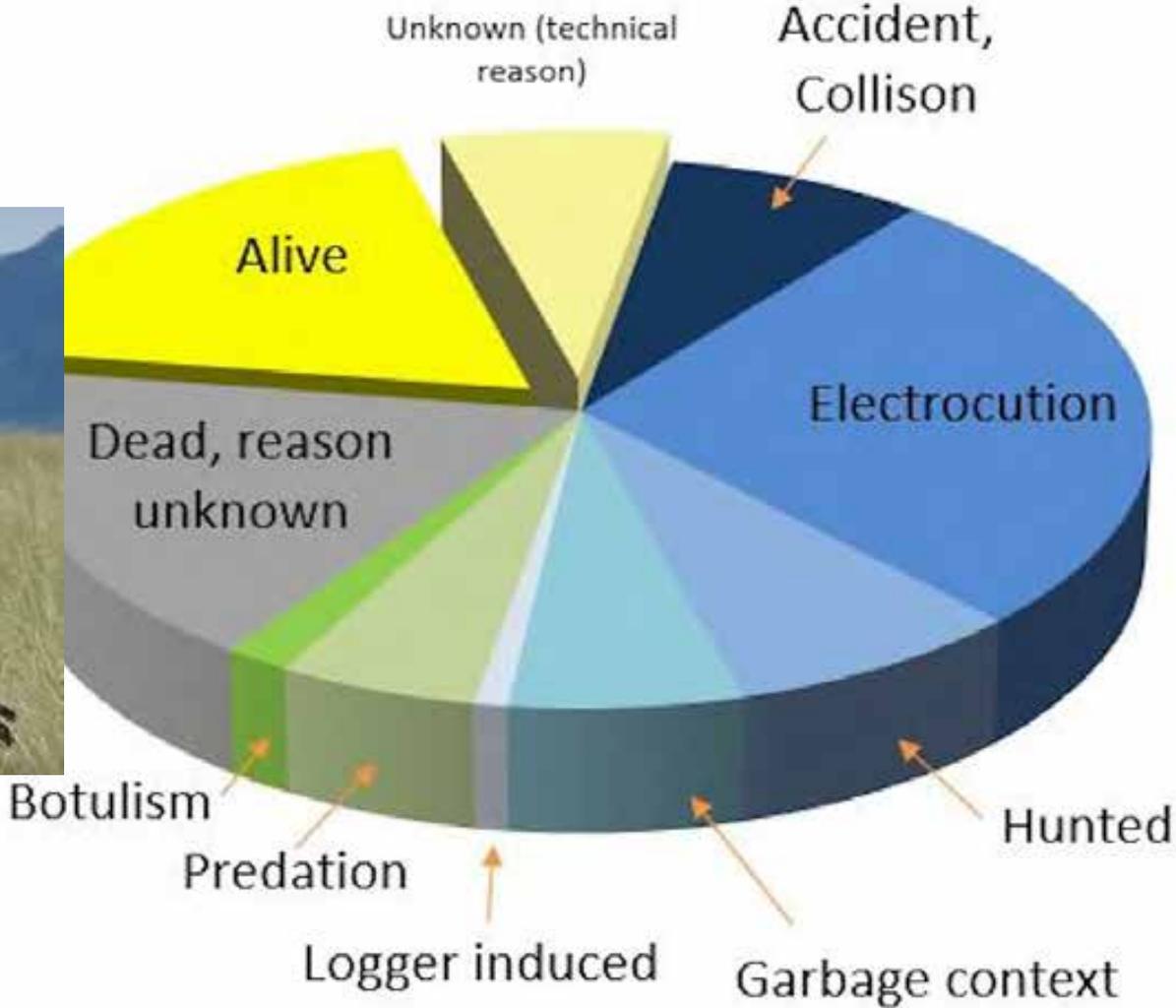




Kasper Thorup und Kollegen

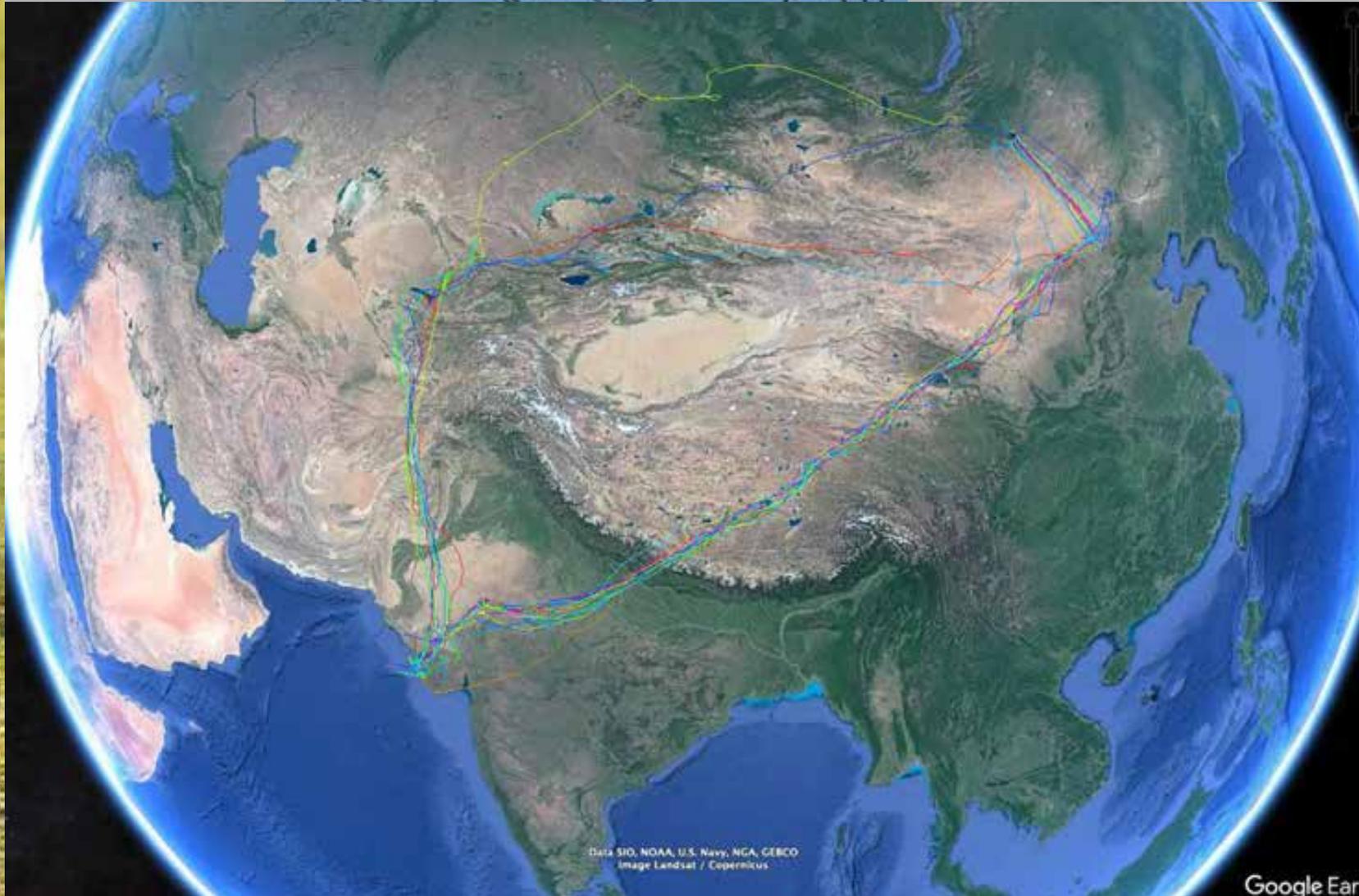


Causes of death



Demoselle cranes
Mongolia

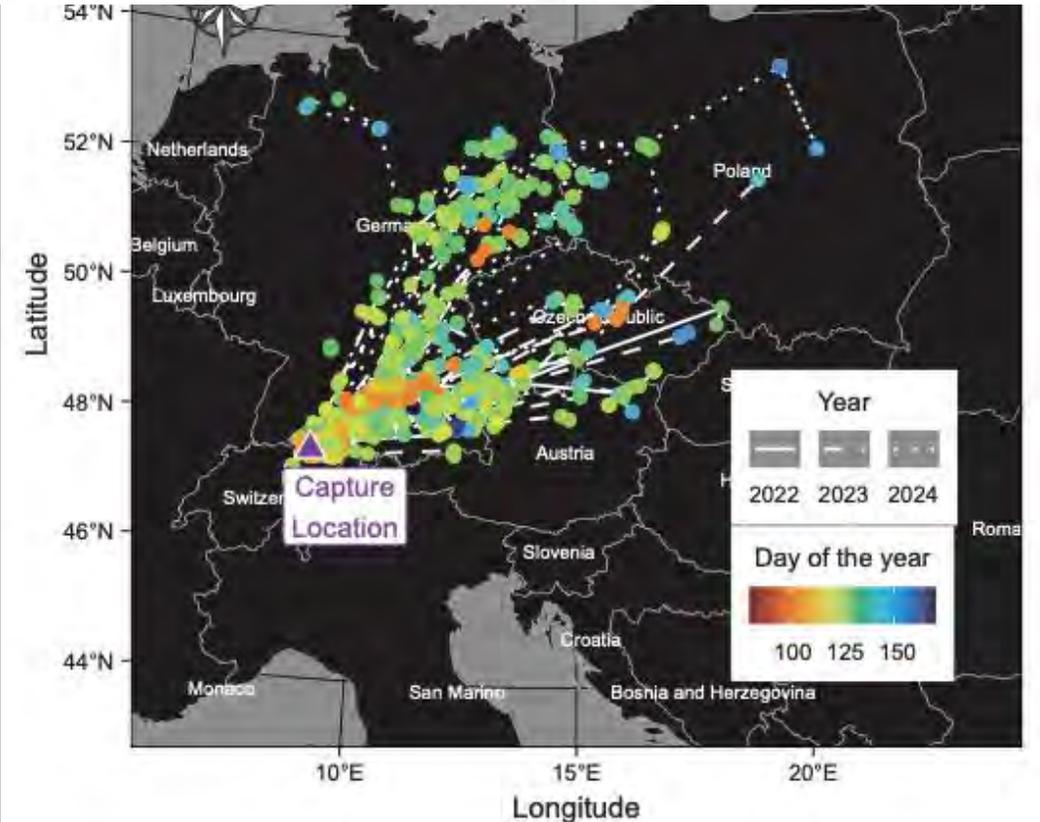
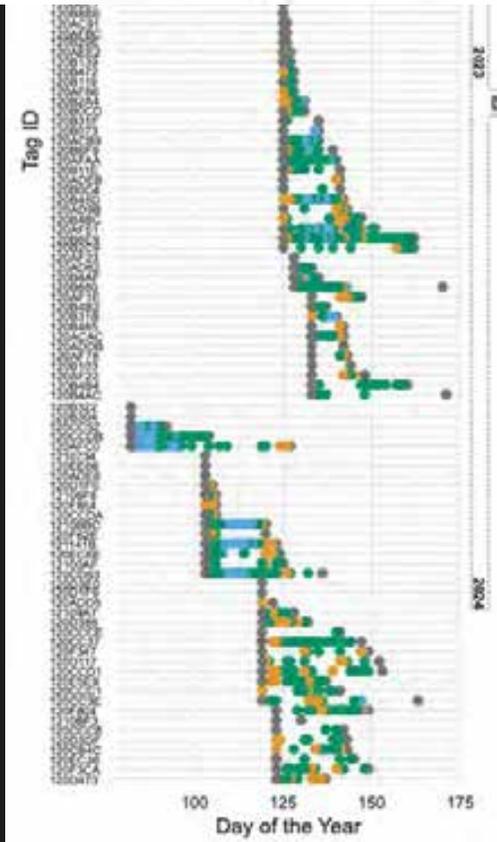
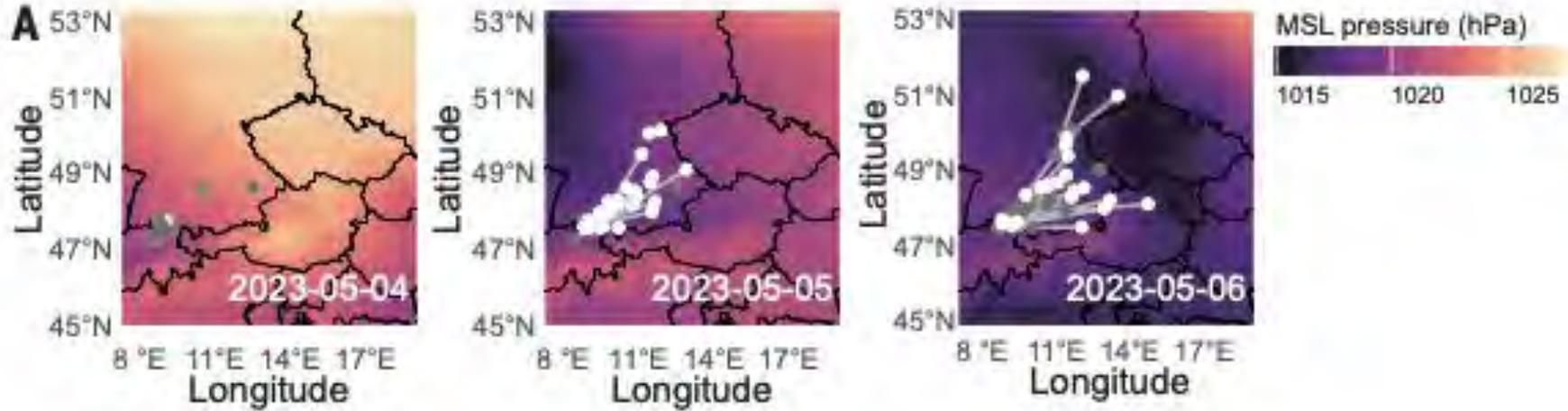






Bat tracking across Europe

New technology answers questions about the seasonal migration of bats



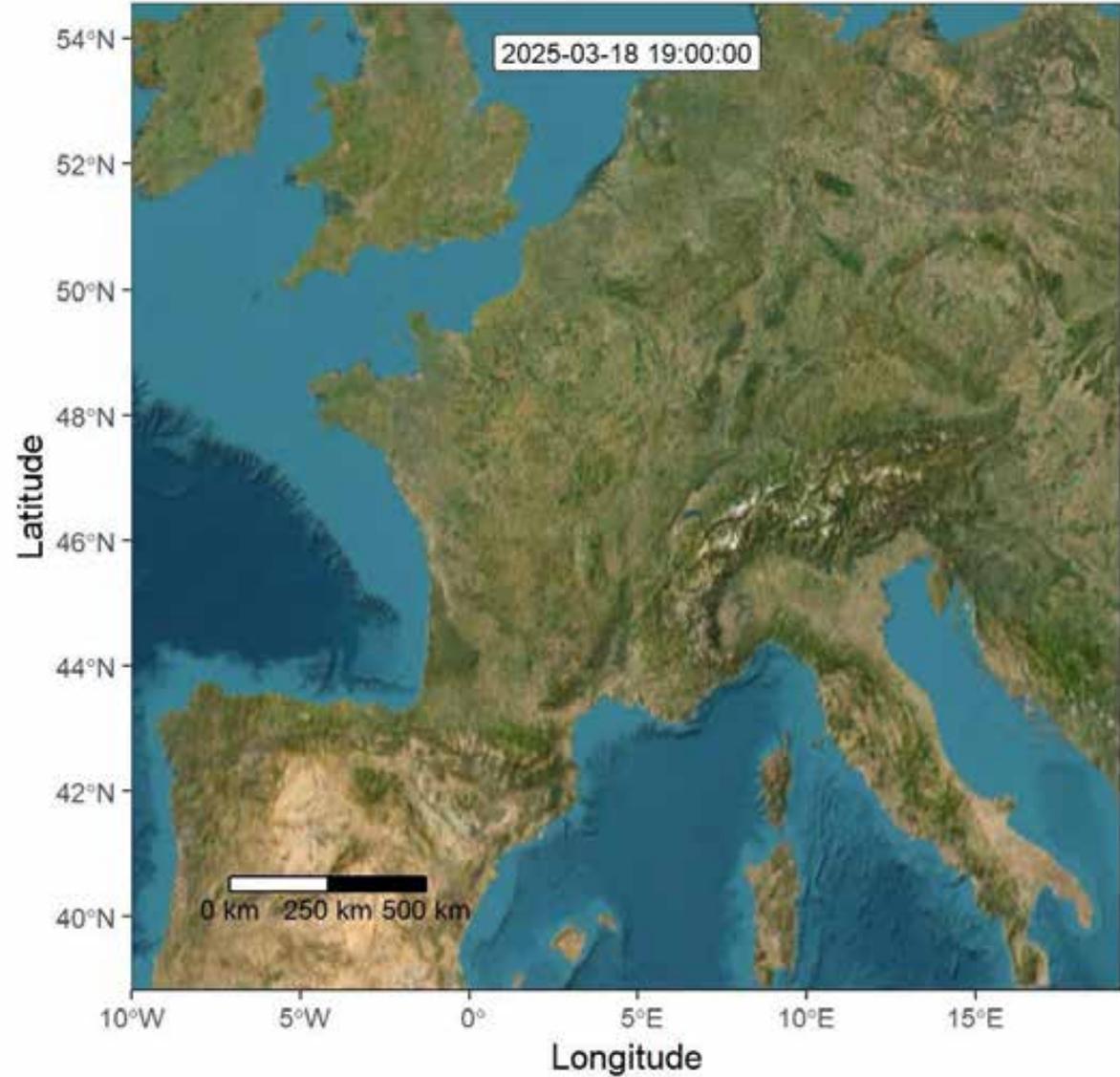
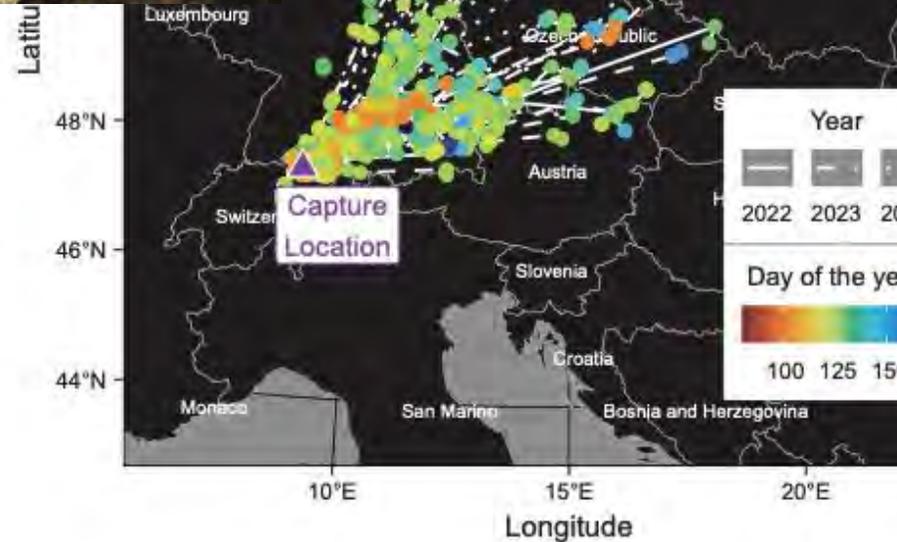
Bat tracking across Europe

New technology answers questions about the seasonal migration of bats

Daily VeDBA (g)



C







**Ihre Spende
hilft!**

JETZT SPENDEN

SAVING PRIVATE RHINO

'Benefits so clearly outweigh the risks': 120 rhino successfully translocated into Greater Kruger system



GKEPF vet Günter Nowak carefully guides a sedated rhino to a translocation crate. (Photo: Cathan Moore)



Transport crates ready to load rhino. (Photo: Michael Dexter)

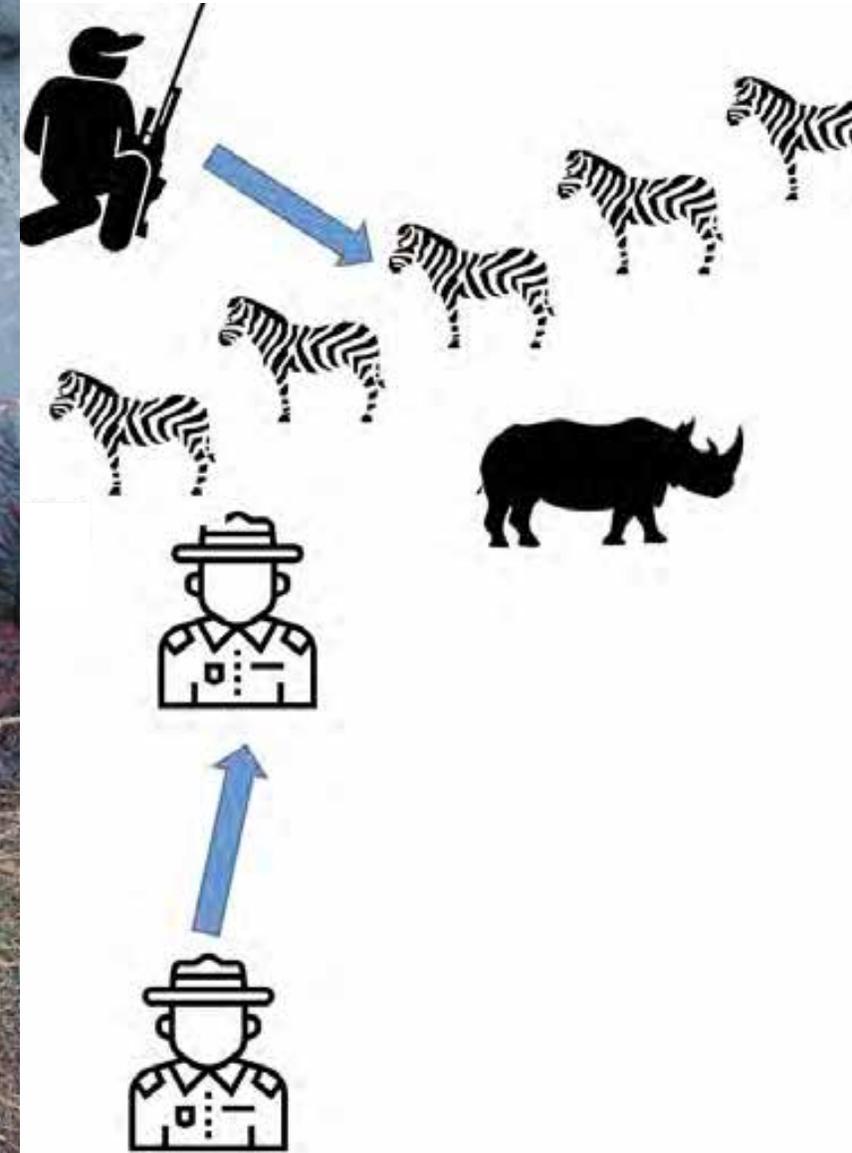


A rhino takes cautious steps out of its crate after arriving in the Greater Kruger system. (Photo: Cathan Moore)

Rhino safety



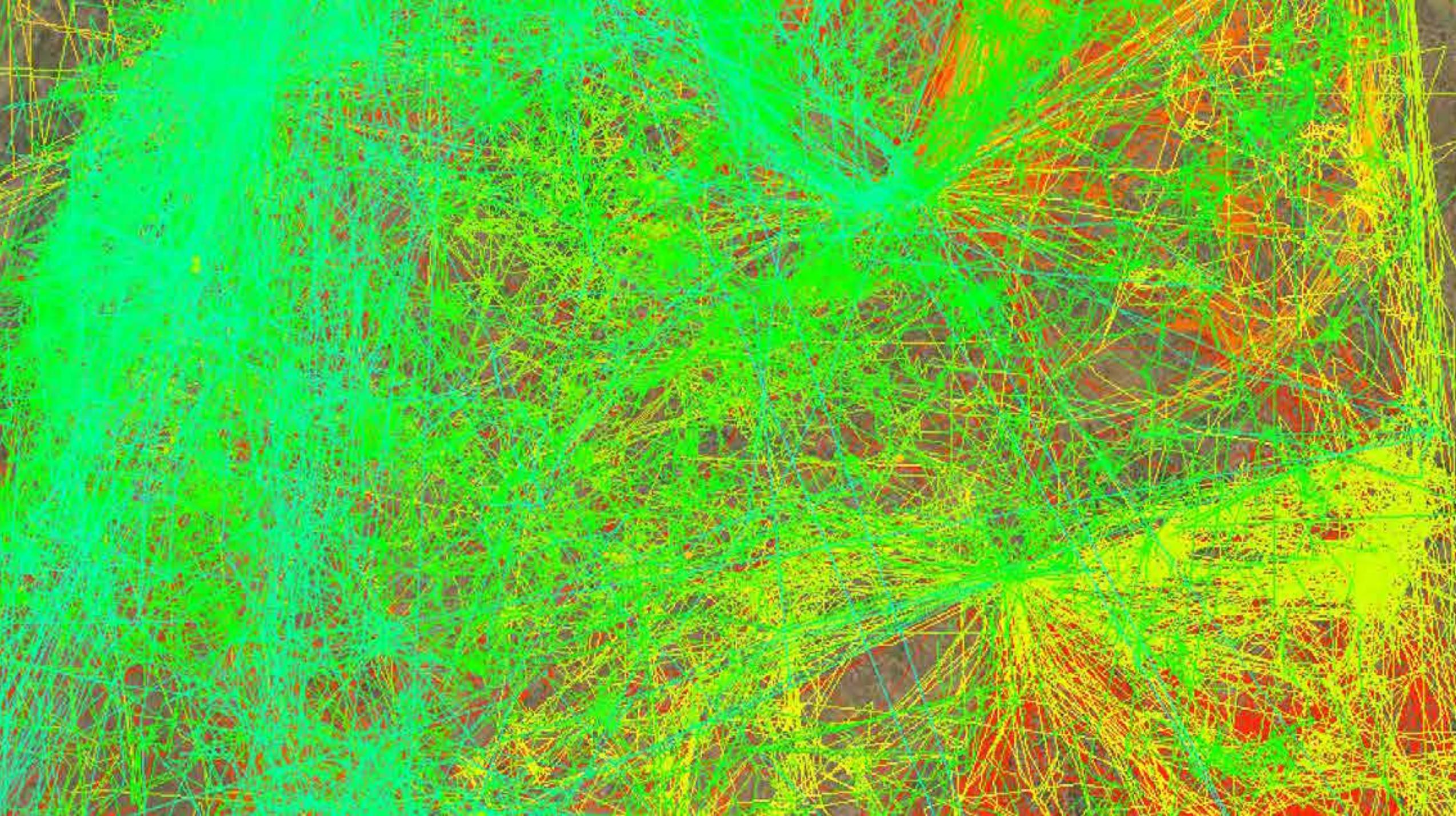
Animals warn of poachers











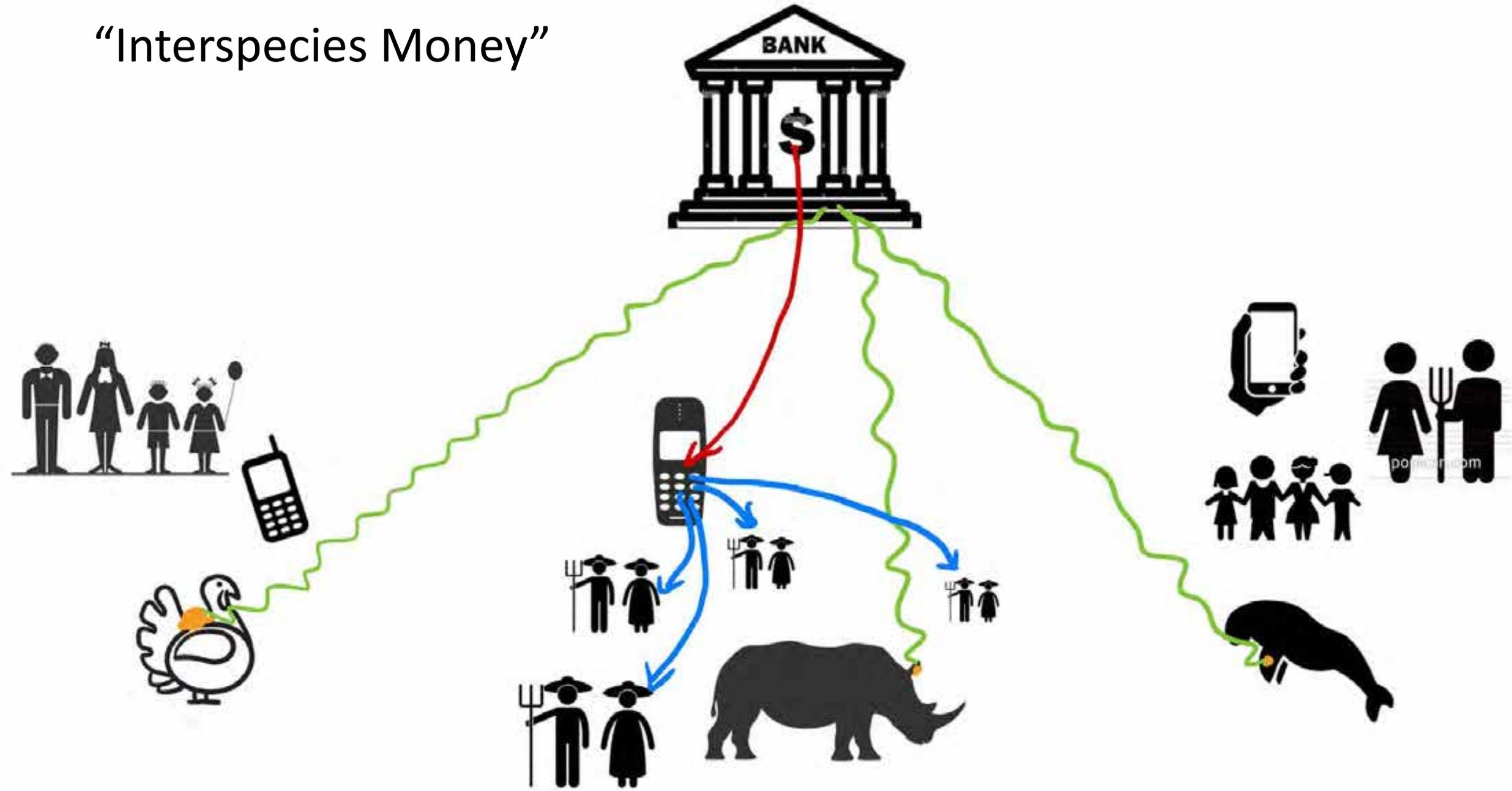


Zurich



Zurich

“Interspecies Money”



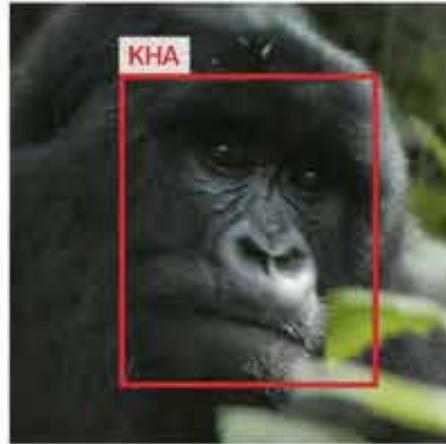
RWANDA, A TEHANU PILOT PROJECT

In a world first, we have enabled nonhumans to spend money based on their interests using their digital wallets connected to their digital identities.

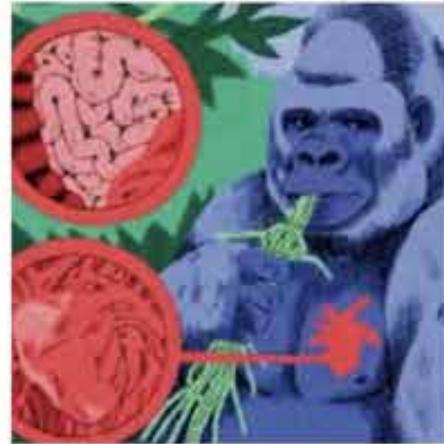
12 Millionen \$ from the government of Rwanda



Collect data



Know your species



Determine interests



Perform and verify services



Receive payment

AI on collar

Detects hunting behavior

Collar emits bird warning
call

-> Birds escape



„Cats can go outside“



20



TJUGO KRONOR



MARTIN WIKELSKI

Foreword by KEITH GADDIS
NASA, Biodiversity and Eco Forecasting Program

THE INTERNET OF ANIMALS

DISCOVERING
THE COLLECTIVE
INTELLIGENCE OF
LIFE ON EARTH

"A loving ode to science itself, told
with wit and wonder." THOR HANSON,
author of *Hurricane Seasons* and *Plastic Spill*

지구를 살릴 세계 최초
동물 네트워크 개발기

The Internet of Animals

마르틴 비켈스키 지음 박래선 옮김

동물 인터넷

Ⓜ

Discovering the Collective Intelligence of Life on Earth

Trends in
Ecology & Evolution

CellPress
OPEN ACCESS

Review

The Internet of Animals: what it is, what it
could be

Roland Kays^{1,2,3,4,*} and Martin Wikelski^{1,2,3,4,*}

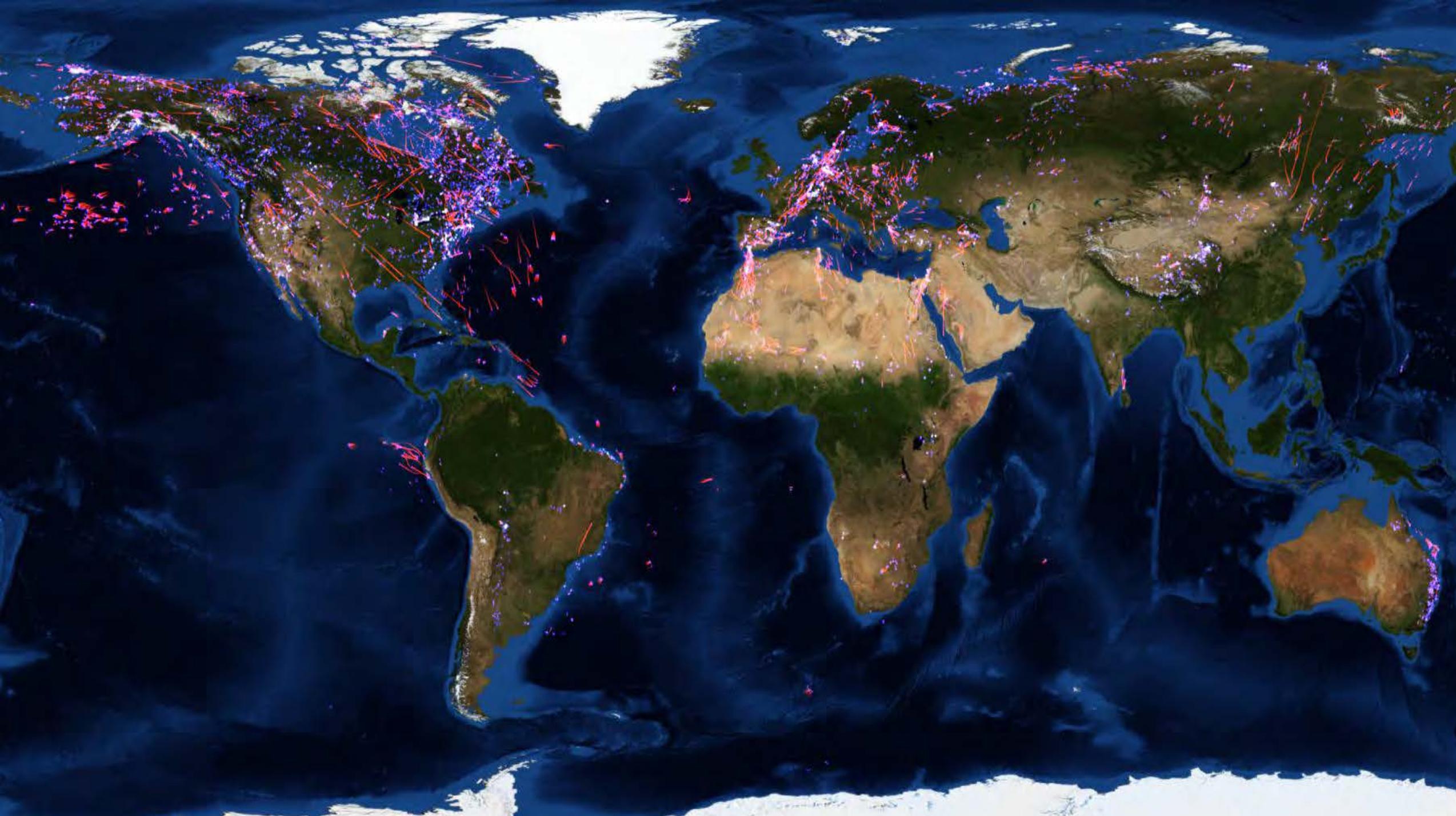
One of the biggest trends in ecology over the past decade has been the creation of standardized databases. Recently, this has included live data, formal linkages between disparate databases, and automated analytics, a synergy that we recognize as the Internet of Animals (IoA). Early IoA systems relate animal locations to remote-sensing data to predict species distributions and detect disease outbreaks, and use live data to inform management of endangered species. However, realizing the future potential of the IoA concept will require solving challenges of taxonomy, data security, and data sharing. By linking data sets, integrating live data, and automating workflows, the IoA has the potential to enable discoveries and predictions relevant to human societies and the conservation of animals.

FOCUS

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venue for understanding and managing
the Earth through digital knowledge
and innovation.

The journal has encouraged global
collaboration between readers. The
authors are encouraged to share their
insights in a public arena.

The journal's goal is to provide
insights into the world with a focus on
data understanding in the real world.



January 1

