

Kunstig intelligens og naturlige feilgrep:

Hva et biovåpen kan lære oss om å møte klimaendringene

CIENS Frokostwebinar 23.03.2023

Kyrre Kausrud
Veterinærinstituttet
Kyrre.kausrud@vetinst.no



Veterinærinstituttet

Norwegian Veterinary Institute

Mattrygghet

Matsikkerhet

Menneske

Dyr

Én Helse

Beredskap

Zoonoser

Økosystem

Klima

Økologi



Veterinærinstituttet
Norwegian Veterinary Institute

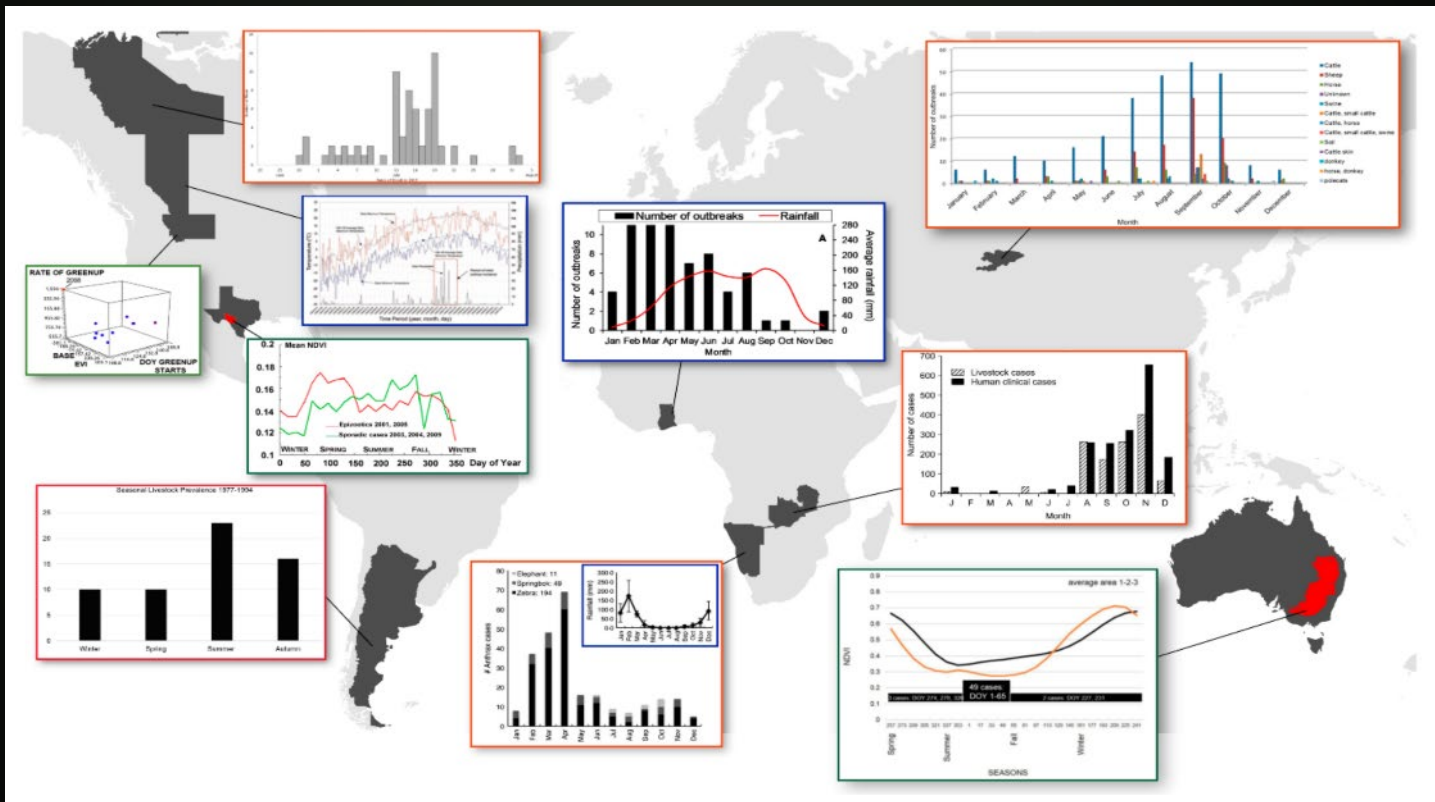
Et biovåpen som bor i konvolutter

- En uke etter 9/11 sendte noen brev med anthraxspulver til et utvalg myndighetspersoner i USA.
- 17 mennesker ble smittet, 5 døde, de fleste i posthåndtering
- Den skyldige var antakelig en forsker i USAs biovåpenprogram.
- FHI undersøker vanligvis 10-30 konvolutter for anthrax per år.





Frykt koster: den lar enhver stoppe post, rettsgang og offentlige bygg for prisen av melis
Den egentlige faren ved anthrax er imidlertid skade på mennesker med dårlig mattrygghet, husdyr, levebrød og sårbare arter.





Sibir 2016

Bilder: Yuri Selyaninov

Hueffer et.al (2022): Anthrax in the North.
Arctic One Health: Springer

**Kunstig intelligens og
statistiske modeller
trenes på det de har
tilgjengelig**



Bilder: Hannah Shønhaug



Veterinærinstituttet
Norwegian Veterinary Institute



**Kunstig intelligens og
statistiske modeller
trenes på det de har
tilgjengelig**



Midjourney images

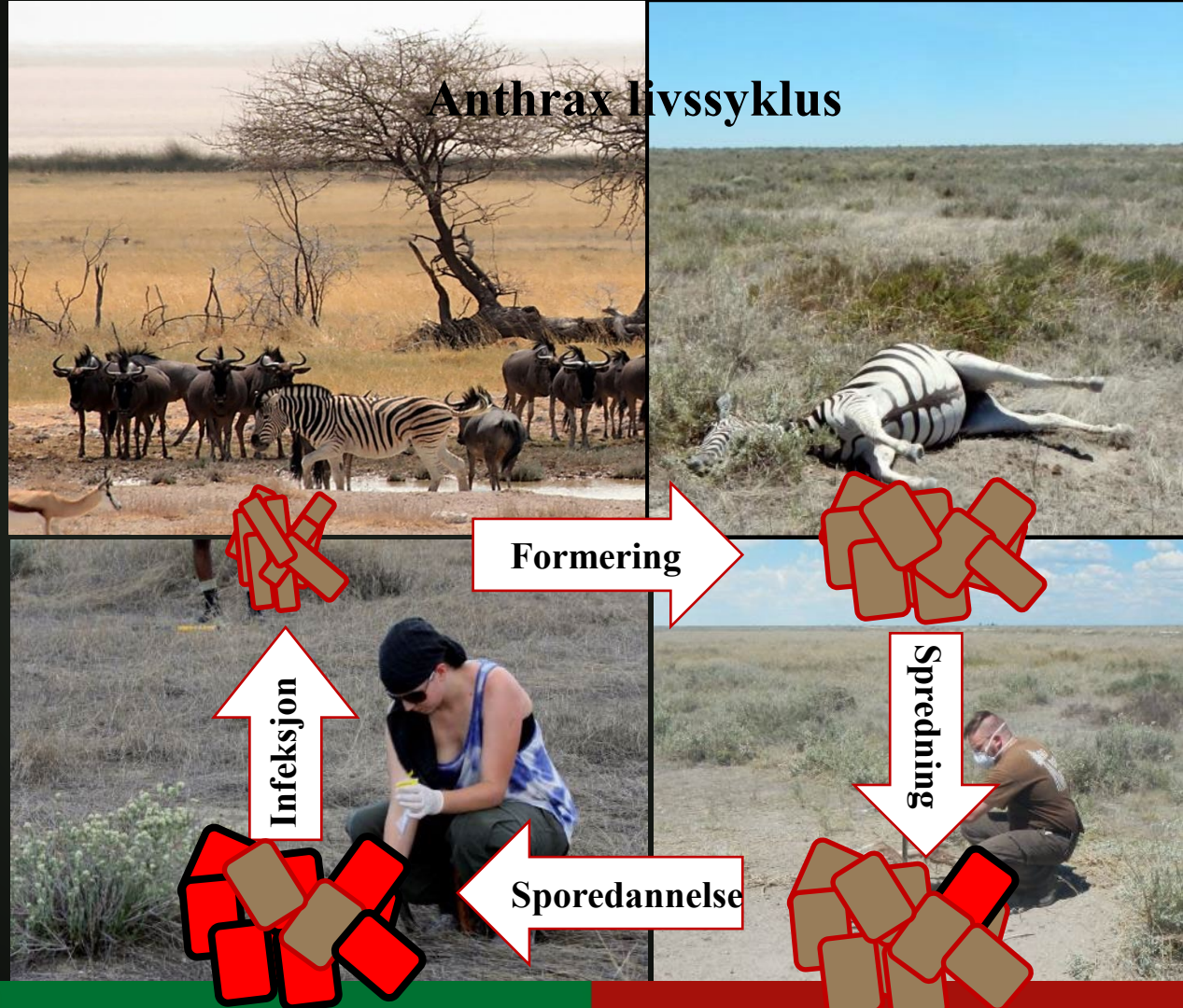


Veterinærinstituttet
Norwegian Veterinary Institute

Etosha, Namibia



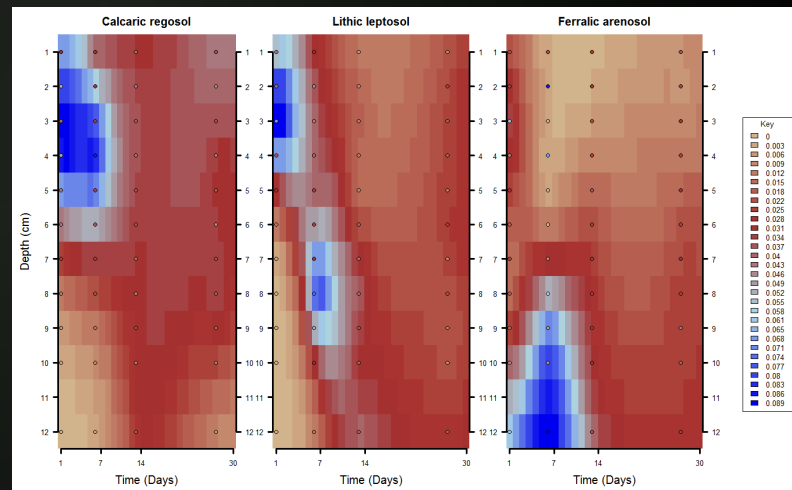
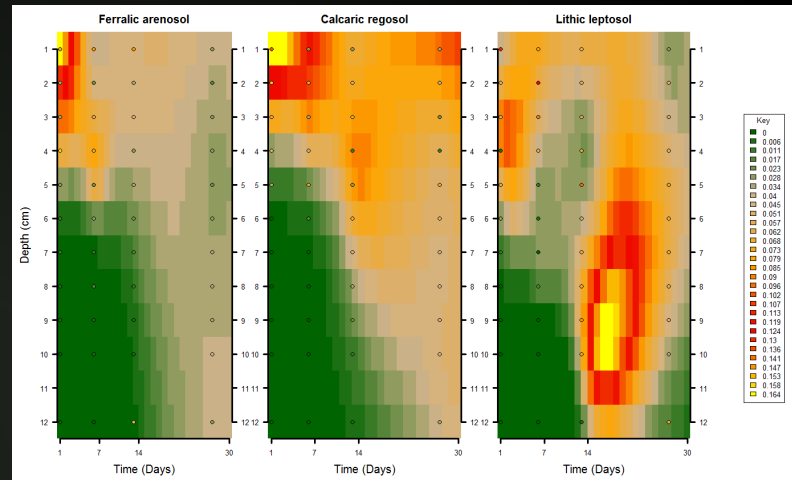
Hva kan vi lære av å
studere anthrax i
Namibia?

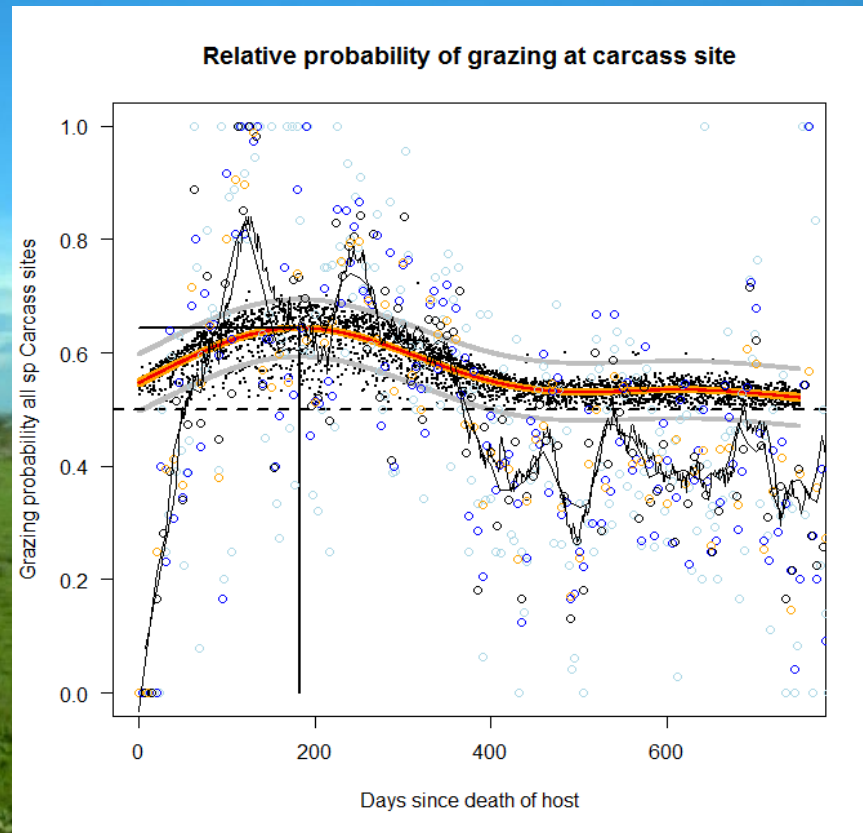


BA sporebevegelser i jord under naturlig klimapåvirkning

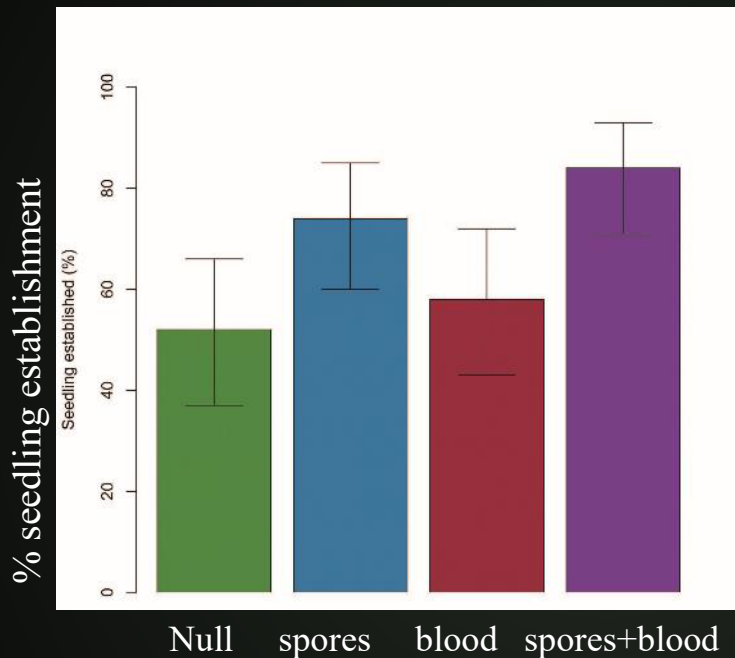


Sporetransport er
avhengig av
partikkelstørrelse
og jordkjemi





B. anthracis samspill med gress



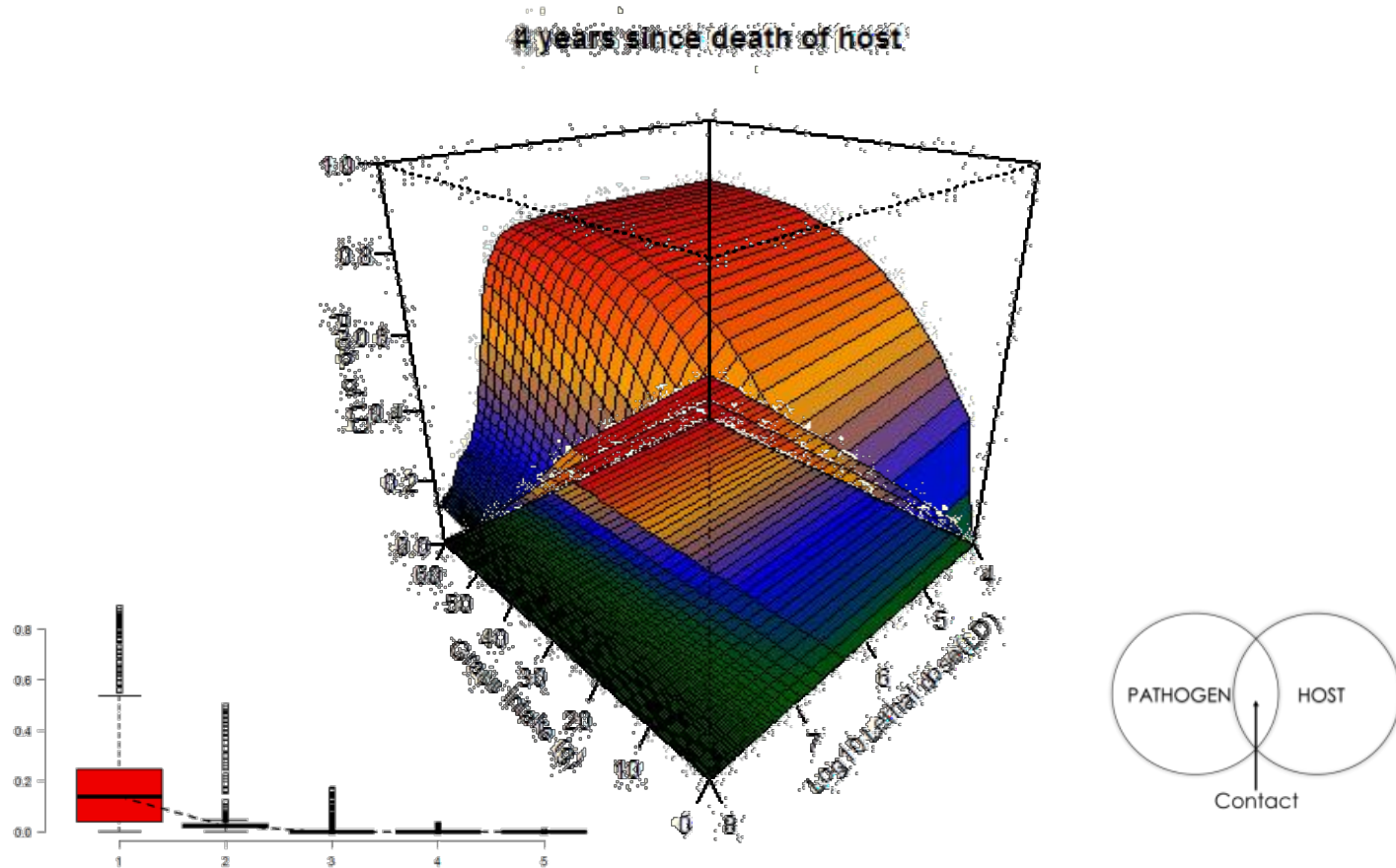
Å tilsette BA sporer fremmer gressspiring
(Ganz et al.)



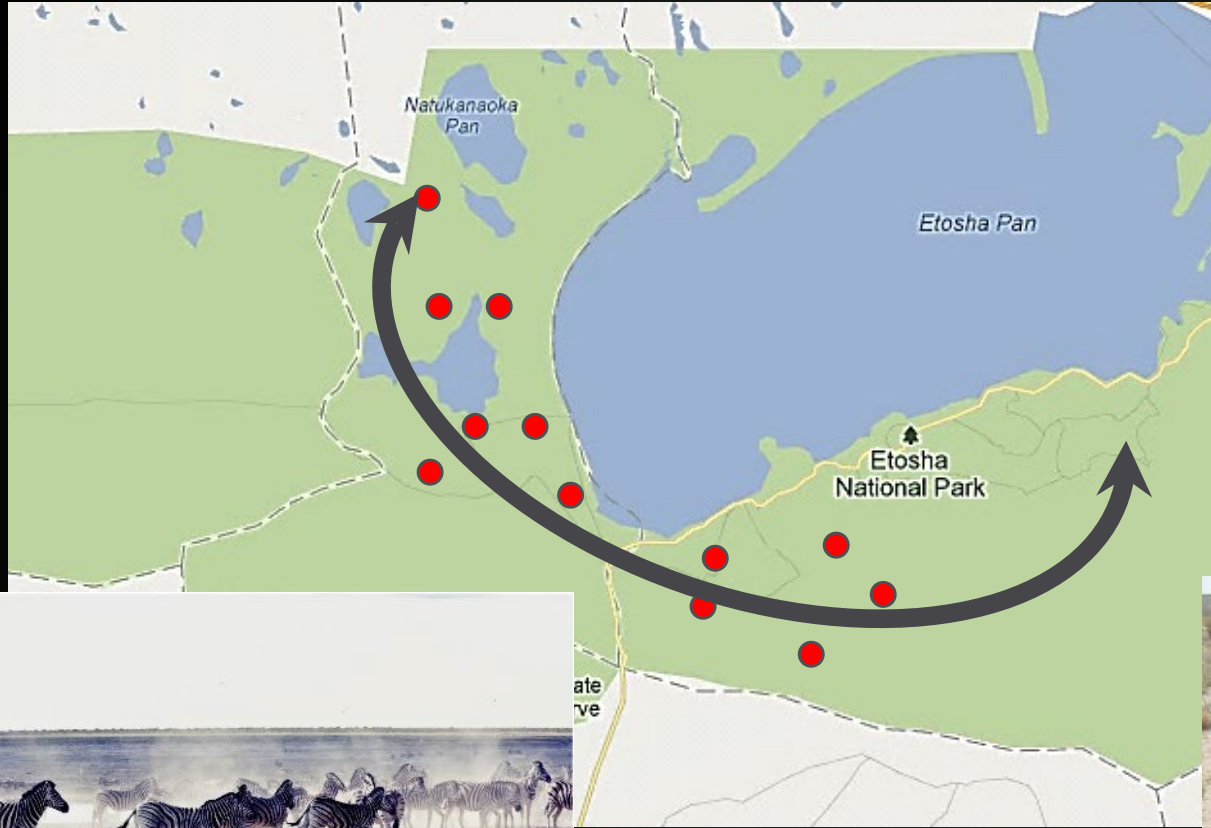
Feltarbeidet er variert...



Sannsynligheten for å gresse en dødelig dose

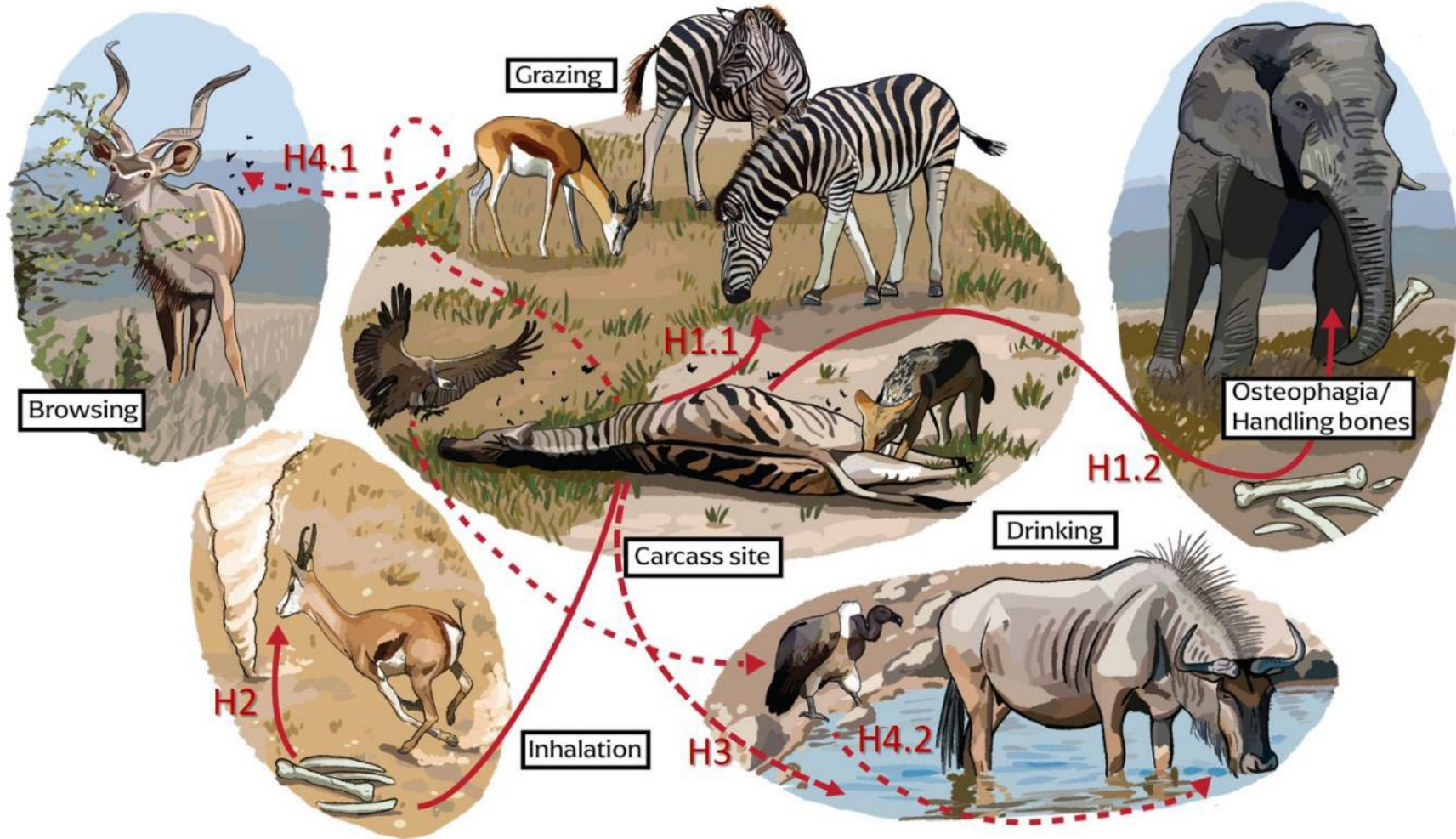


Kontrollerer anthrax og klima antallet sebra og elefant?



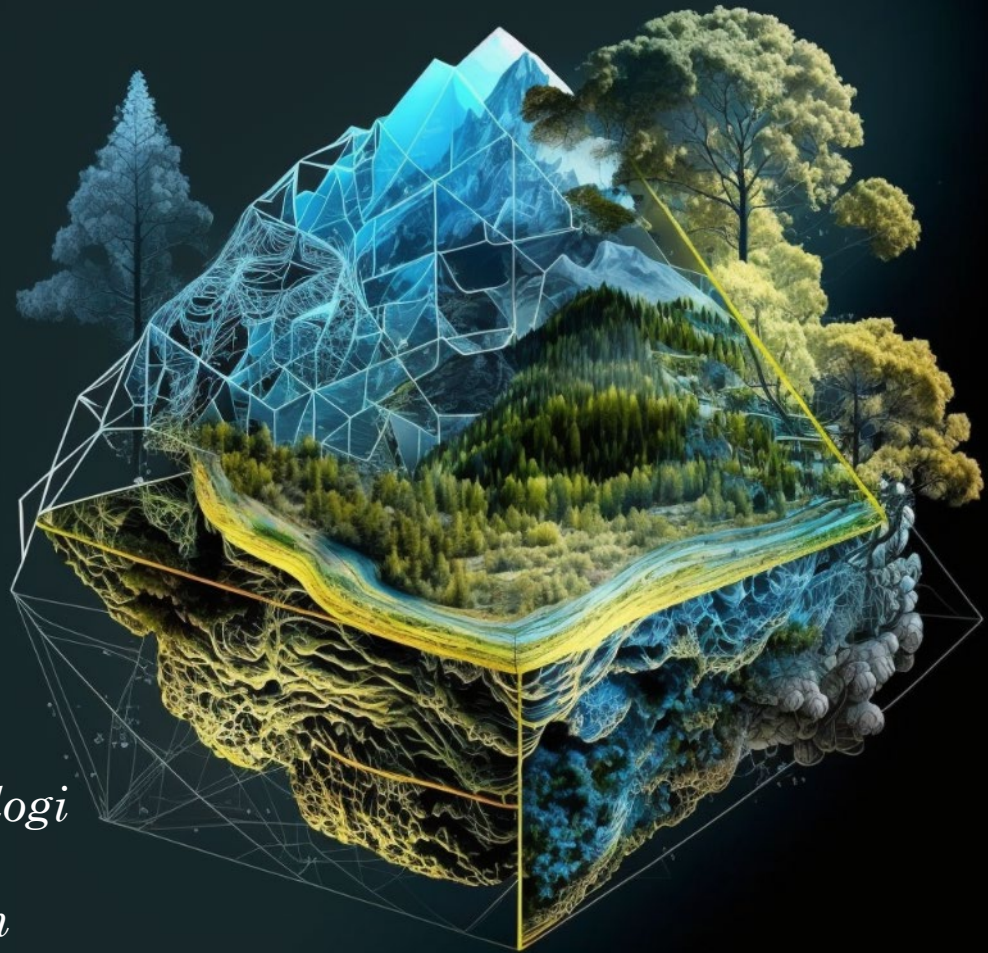
See Huang et al. 2022 &
Dolfi et al. in prep, m.fl...





Komplekse systemer
representeres
matematisk fra teori og
data

Teoretisk innsikt gir
praktisk nytte –og
omvendt

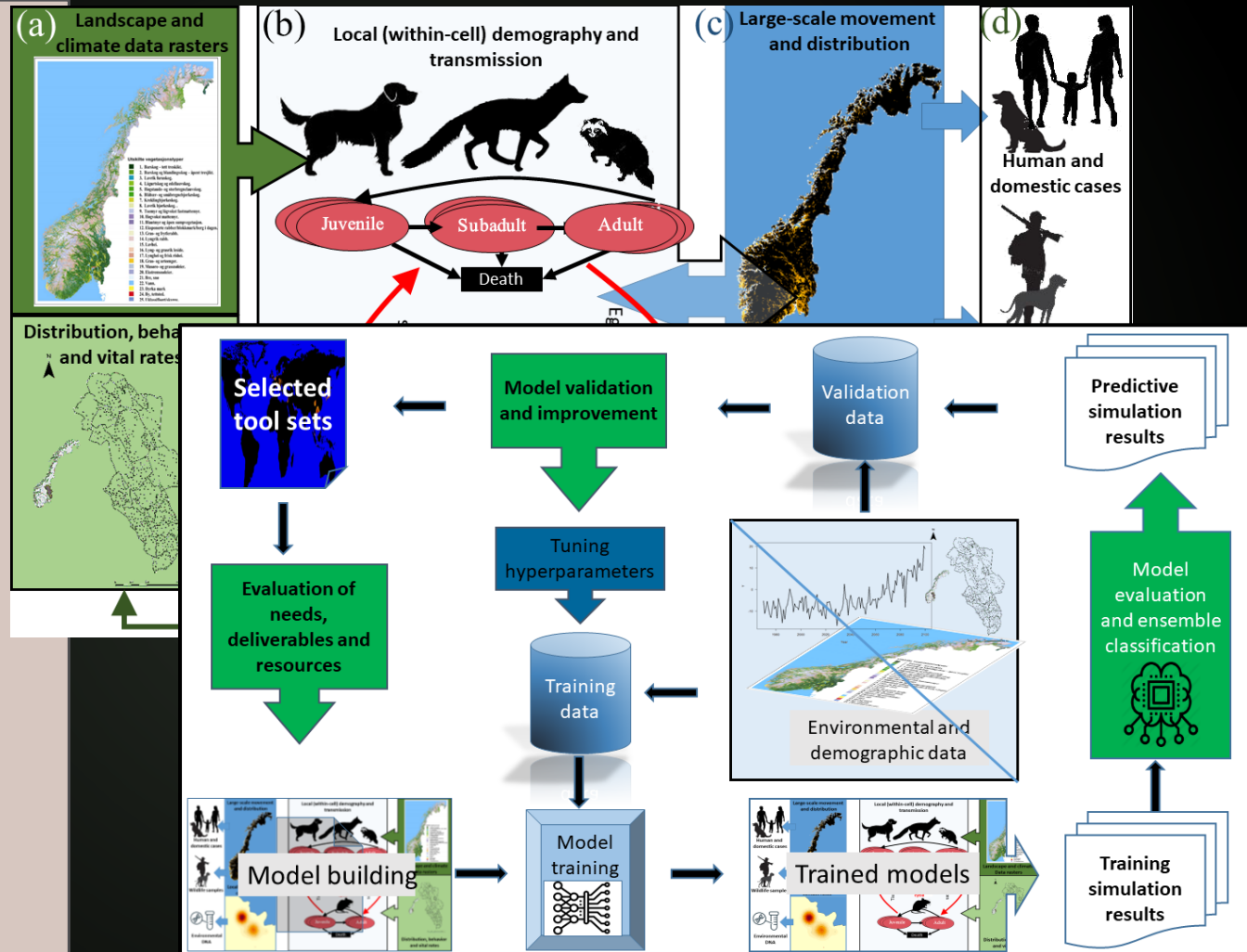


Epidemiologi
-Risiko
-Evolusjon
-Menneskelig påvirkning



Systemforståelse
Modellverktøy
Verifisere
Gjenta!

Empiriske data og/eller
eksperimenter





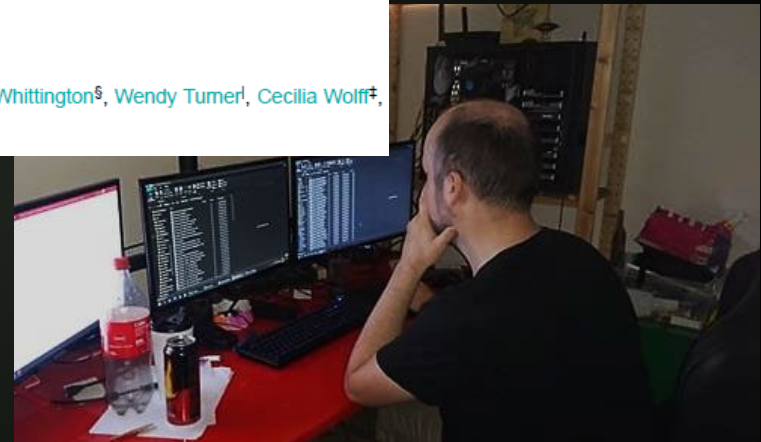
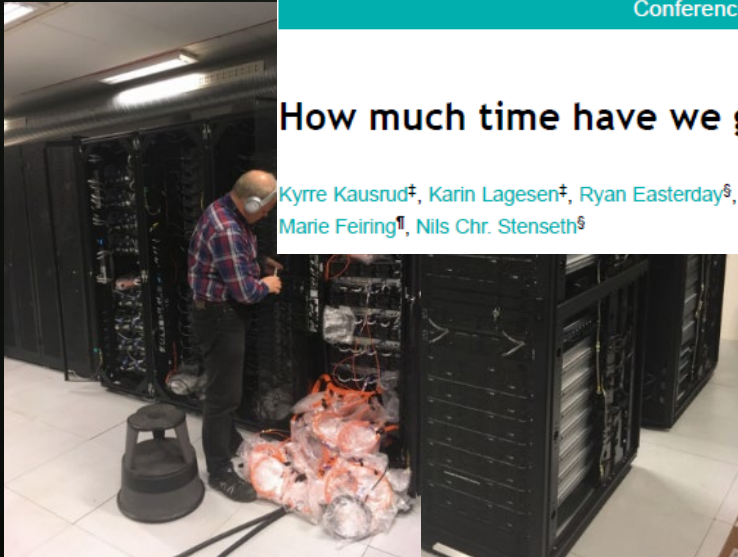
ARPHA Conference Abstracts 4: e68934
doi: [10.3897/aca.4.e68934](https://doi.org/10.3897/aca.4.e68934)

OPEN  ACCESS

Conference Abstract

How much time have we got?

Kyrre Kausrud[‡], Karin Lagesen[‡], Ryan Easterday[§], Jason Whittington[§], Wendy Turner[‡], Cecilia Wolff[‡], Marie Feiring[¶], Nils Chr. Stenseth[§]



Namibia vs. Sibir

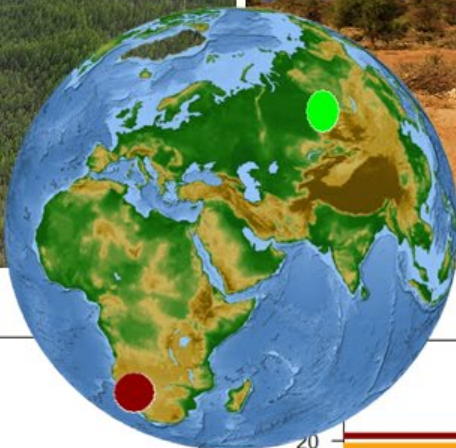
Veldig forskjellig, veldig likt...



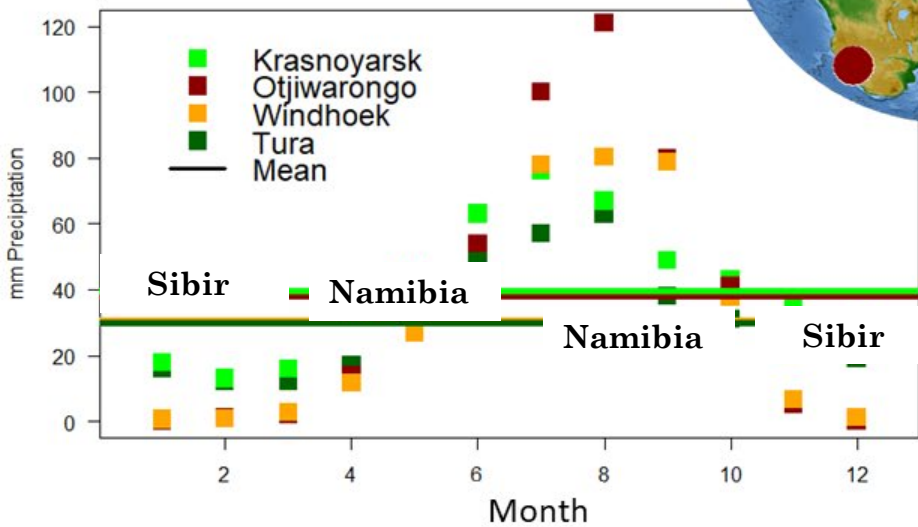
Siberian boreal forest



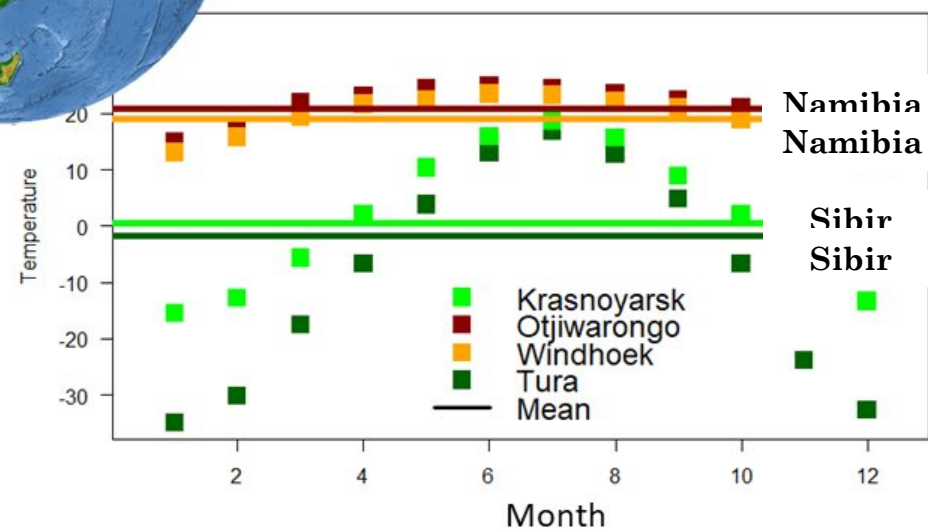
Namibian scrubland



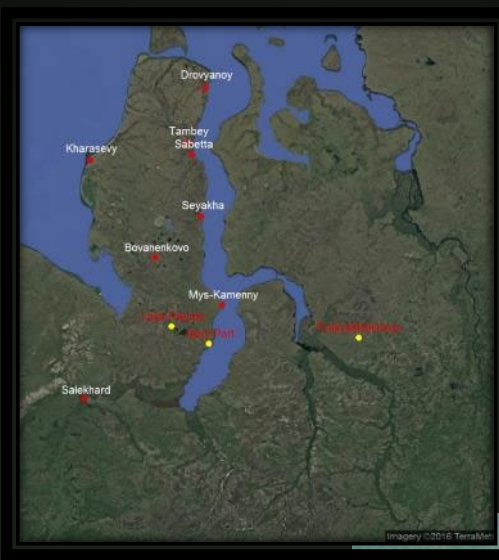
Precipitation (mm)



Temperature (C)

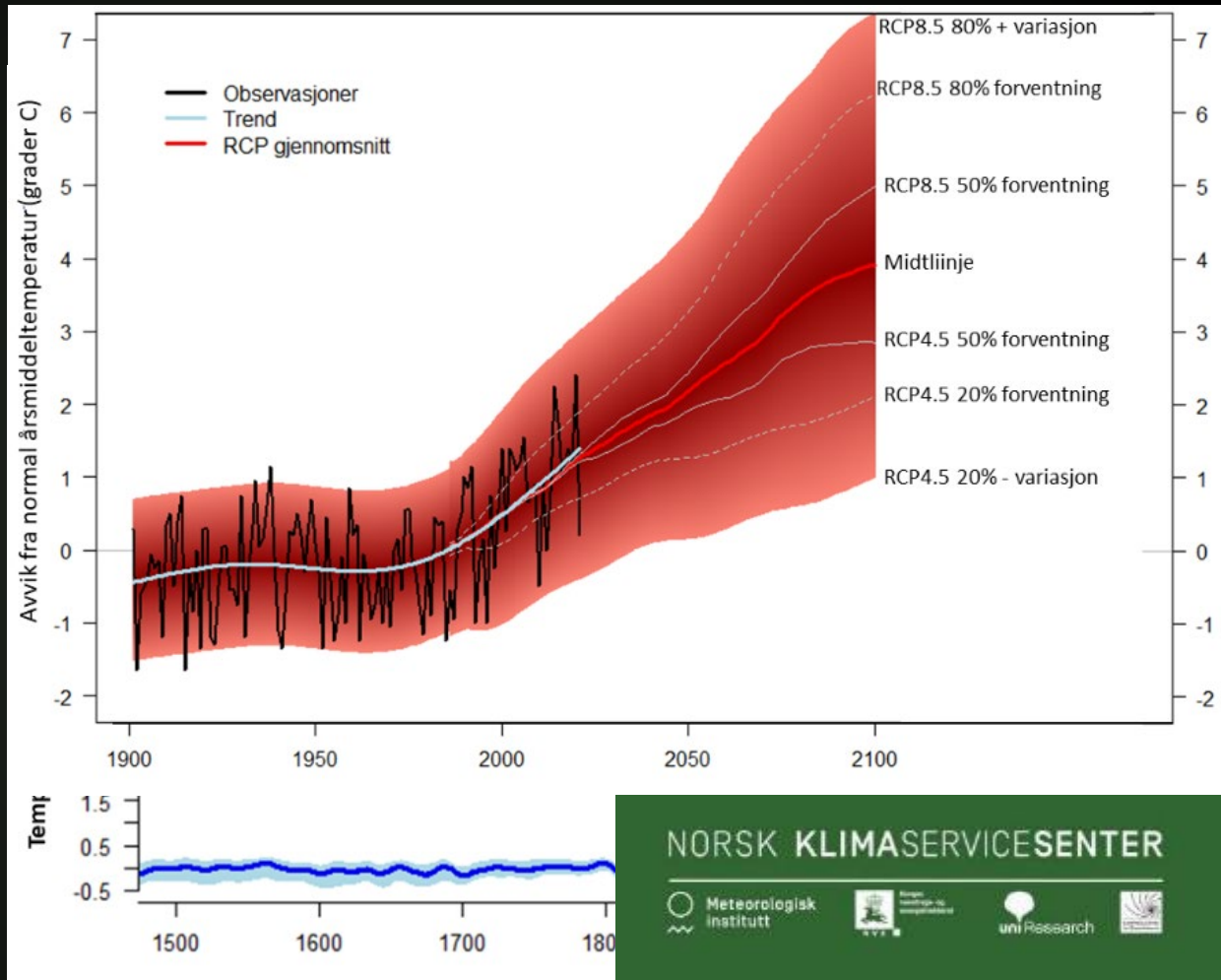
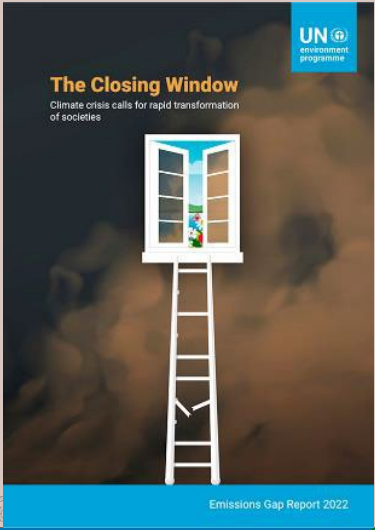


Mammuter,
metan og virus: Ikke
bare anthrax som tiner
frem fra permafrosten



Vi er nå utenfor referanseområdet

Utenfor den klima og miljøtilstanden vi kjenner



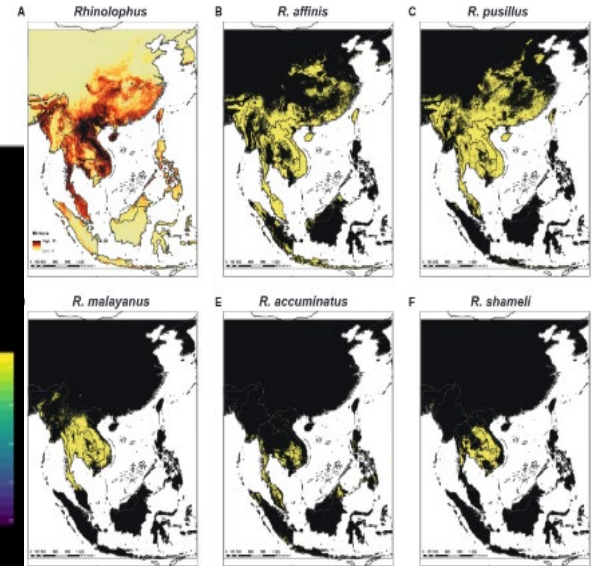
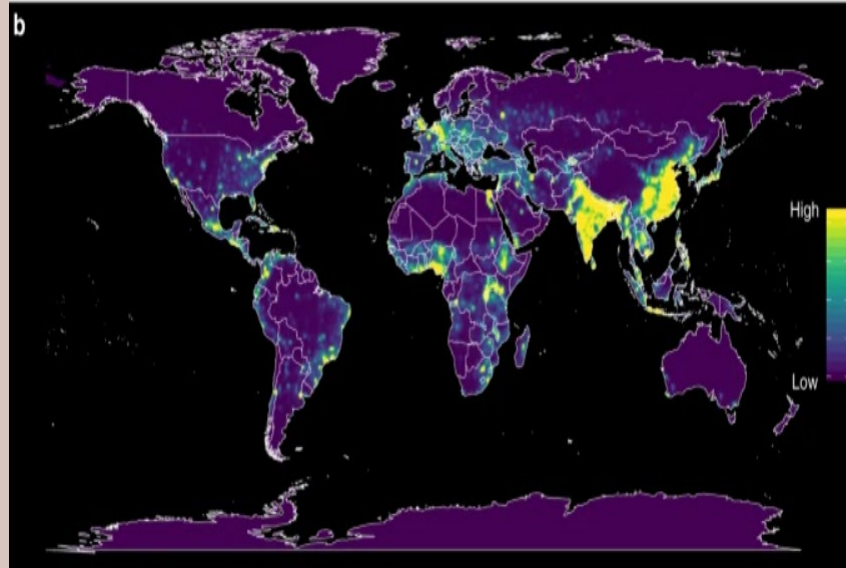
NORSK KLIMASERVICESENTER

Meteorologisk Institutt   

uni Research

Klimaendringer og sosiale forhold driver nye og fremvoksende sykdommer –de fleste er zoonoser (som Covid-19, anthrax, og fugleinfluensa)

Global hotspots and correlates of emerging zoonotic diseases

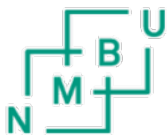


Zhou et al., 2021, Cell 184.
<https://doi.org/10.1016/j.cell.2021.06.008>

Allen et al., 2017, Nature Comm.
<https://www.nature.com/articles/s41467-017-00923-8>



A project for understanding zoonotic spillover pathways for pandemic prevention and preparedness



Norwegian University
of Life Sciences



UNIVERSITÄTS
KLINIKUM
HEIDELBERG



Chula
Chulalongkorn University



Veterinærinstituttet
Norwegian Veterinary Institute



UMEÅ
UNIVERSITY



KKU

มหาวิทยาลัยขอนแก่น
KHON KAEN UNIVERSITY



Leibniz-Institut für Zoo-
und Wildtierforschung
IM FORSCHUNGSVERBUND BERLIN E.V.

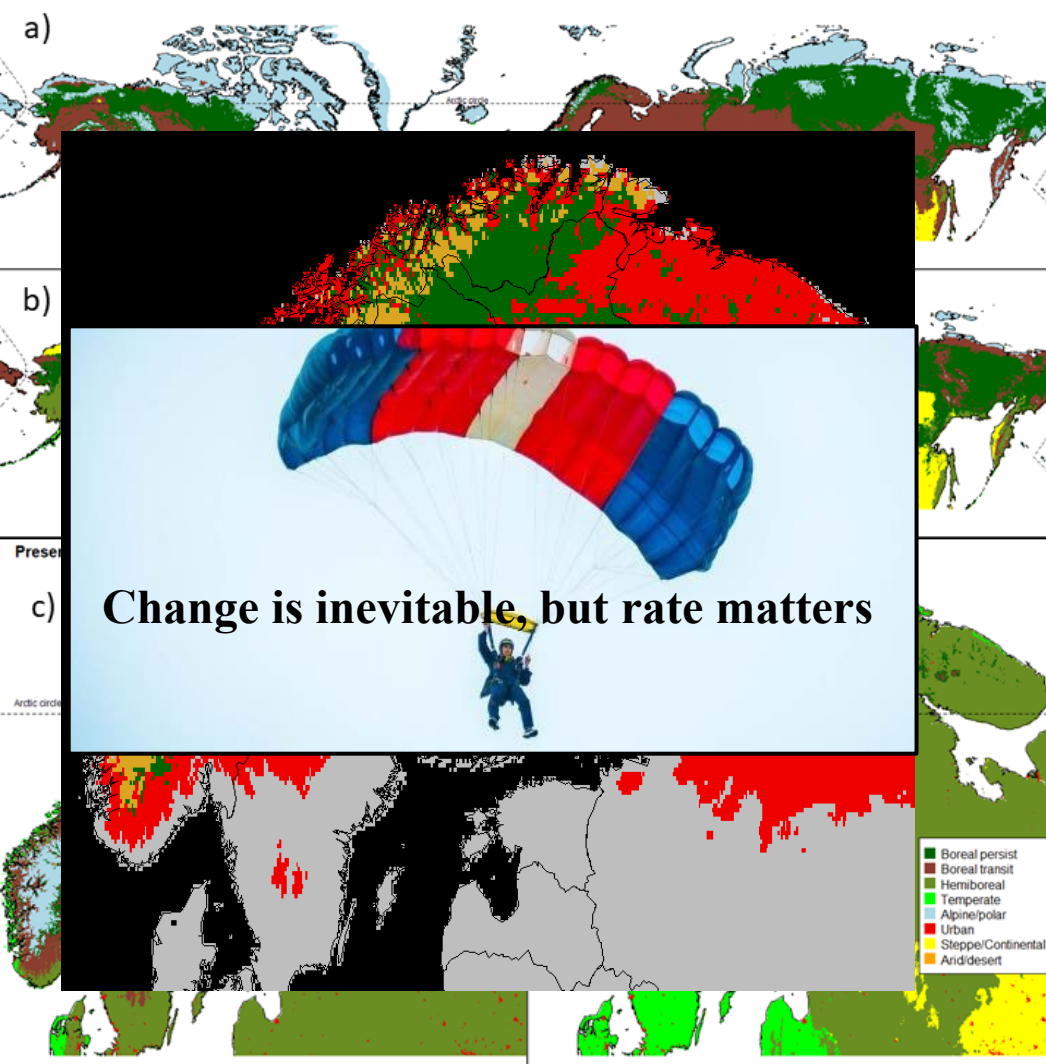
SUPA⁷¹
Action for Future



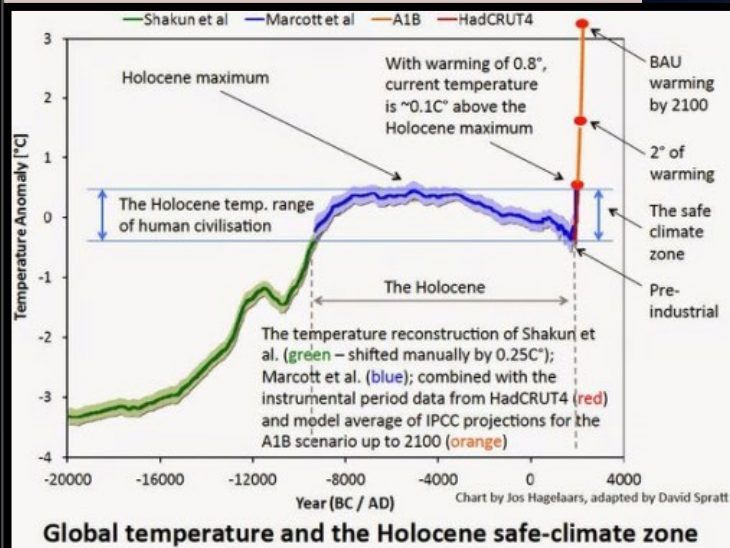
Queen Mary
University of London



Mahidol University
Wisdom of the Land



Mønstre fra i går
er ikke sikre,
så korrelasjon er ikke nok



Maskinlæringmetoder og mekanistiske modeller,
-ingen modell er bedre enn dataene den trenes på



Acknowledgements

Namibian Ministry of Environment & Tourism, Etosha Ecological Institute, and CEES (UiO):

Werner Kilian, Shayne & Birgit Kötting, Gabriel Shatumbu, Wilferd Versfeld, Marthin Kasaona, Richard Aingura, Petrina Ndumbu, Erastus Ithana, Ndapanda Kanime, Nils Stenseth

Data collection:

Klaudia Amutenya, Sarah Bischoff, Zepee Havarua, Katie Dean, Ronald Ho, Freedom Jatamunua, Martina Küsters, Salena Thong, Nina Pries, Hannah Schønhaug

Core team at UNAM, UiO, UCal, EEI and ARCRA:

Wendy Turner

Kyrre Kausrud

Ryan Easterday

John Mfuné

Zoe Mbarandongo

Modesta Evard

Karoline Valseth

Holly Ganz

Yathin Krishnappa

Hannah Schønhaug

Claudine Cloete

Thomas Haverkamp

Yen-Hua Huang

And others at the:

Etosha Ecological Institute

University of Namibia

University of Oslo,

University of Hohenheim

University of Florida

University of California

University of Salisbury

Including:

Peter C. B. Turnbull

Wolfgang Beyer

Elisabeth Blaschke

Judith Lazak

Wayne M. Getz

Samt denne gjengen naturligvis:



Shane Köttig

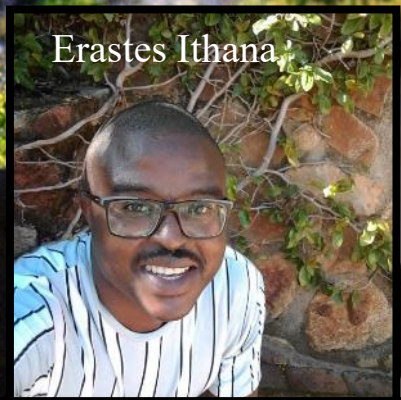


Kjente
fjes fra
anthrax-
gruppen i
Etosha:

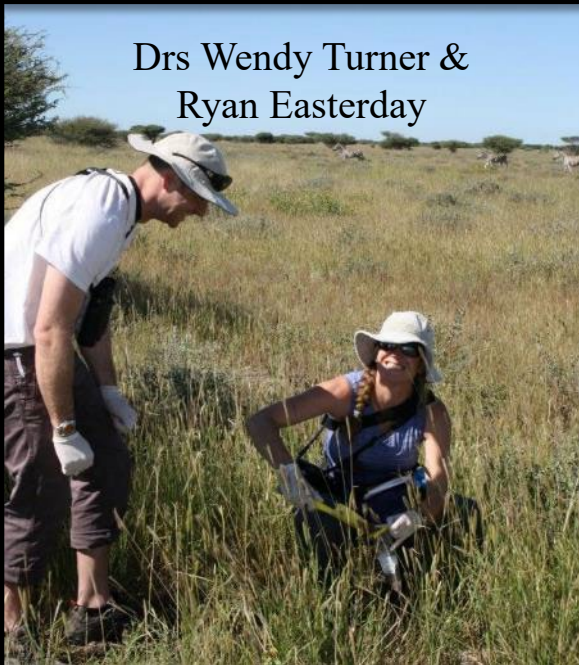


Prof. John Mfuné

Erastes Ithana



Drs Wendy Turner &
Ryan Easterday



Gabriel «Gabes» Shatumbu



Dr. Wilferd Versfeld



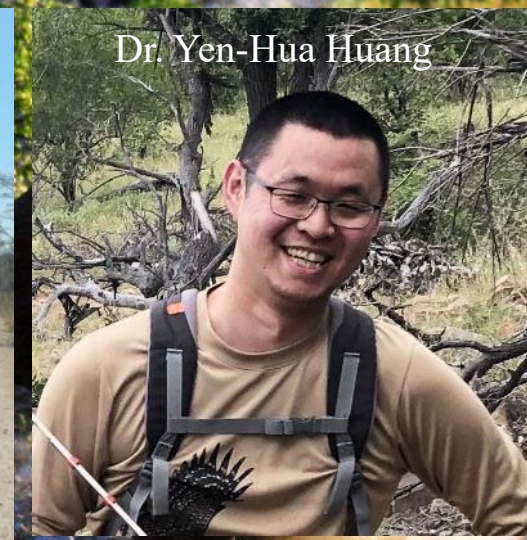
MSc Zoë Mbarandongo



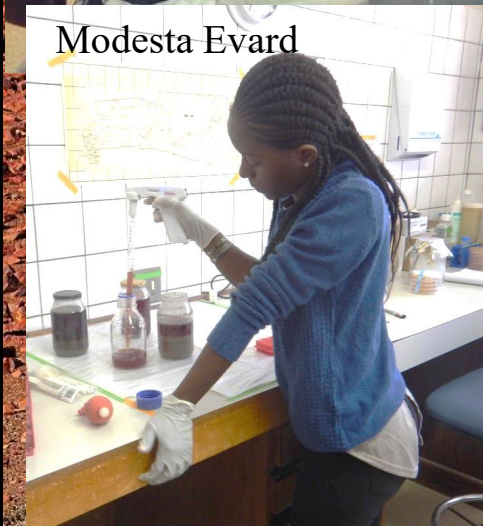
Hannah E. Schønhaug



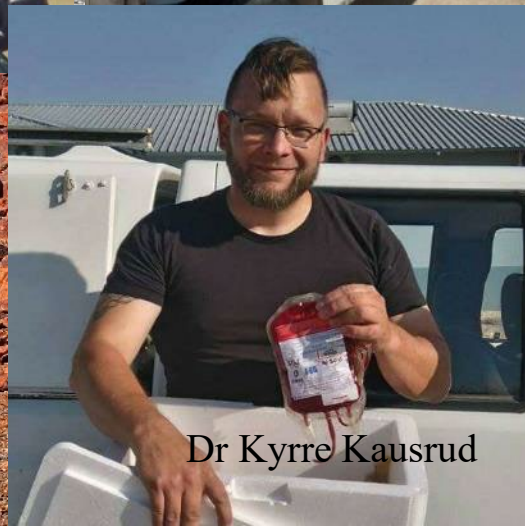
Dr. Yen-Hua Huang



Modesta Evard



Dr Kyrre Kausrud



MSc Claudine C. Cloete





Støtte ny f



arbeid



Bygge på praktiske erfaringer



Studere historien

FoodPlanC:
**Food Security
Planning
and Climate Change**



Cross-sectional contingency planning for Norwegian food security under long-term climate change and rising socioeconomic uncertainty



Veterinærinstituttet
Norwegian Veterinary Institute

Én helse!
Fra jord til bord

www.vetinst.no