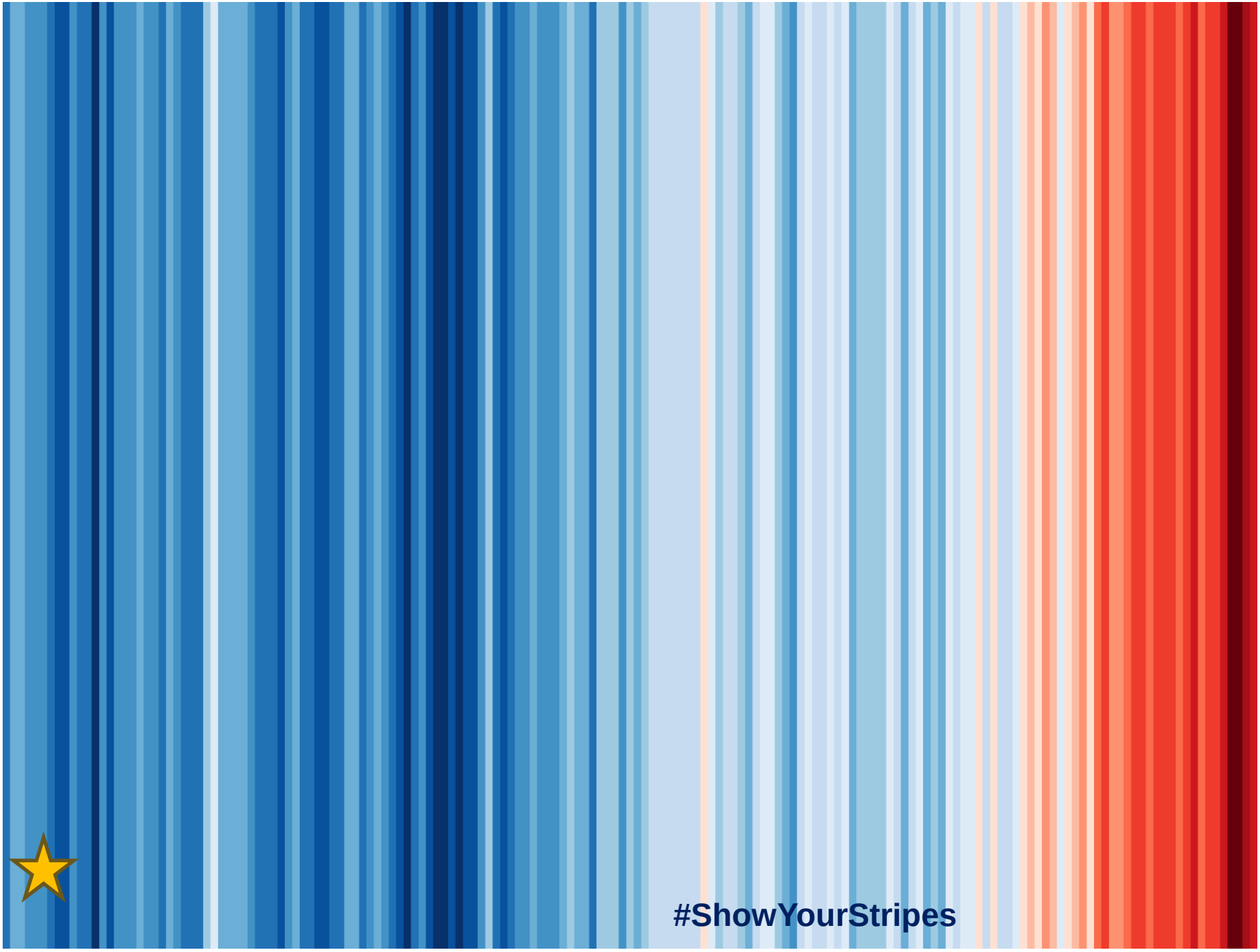
Welcome to PFTC5!

Vigdis Vandvik
@vvandvik
@PFTCourses

UNIVERSITY OF BERGEN


#ShowYourStripes

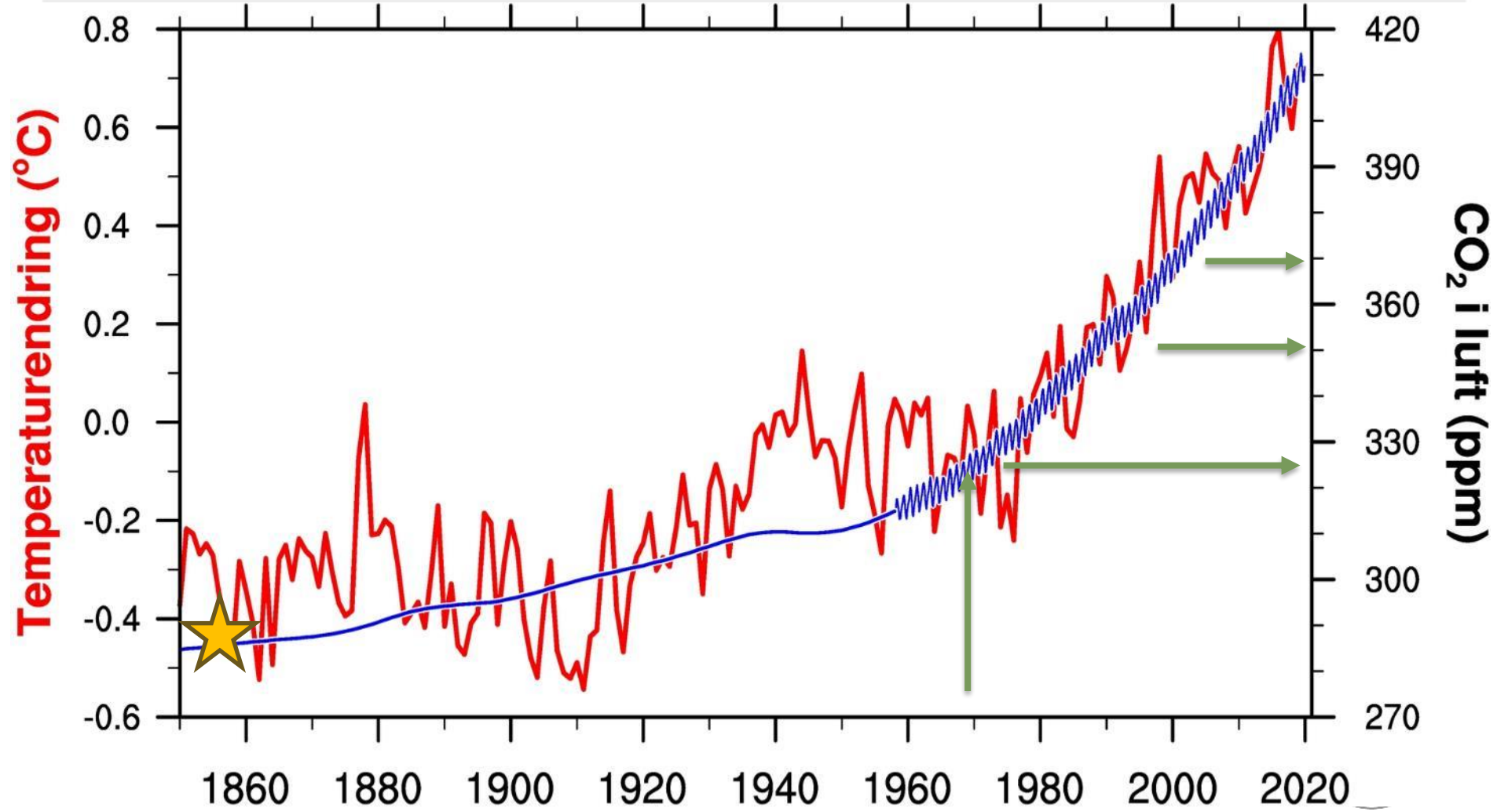
Eunice N. Foote (1819-1888)

"*The receiver containing this gas became itself much heated—very sensibly more so than the other—and on being removed [from the Sun], it was many times as long in cooling*." Looking to the history of the Earth, Foote theorized that "*An atmosphere of that gas would give to our earth a high temperature; and if, as some suppose, at one period of its history, the air had mixed with it a larger proportion than at present, an increased temperature from its own action, as well as from increased weight, must have necessarily resulted*."

he question was introduced by Wm. Partridge, of Binghamton, who took the position, that density of the atmosphere, and not the angularity of the sun's rays, was the principal reason why it was warmer in valleys than on the tops of mountains. His views were opposed by other correspondents, but none of them supported their opinions with practical experiments to decide the question; this we are happy to say has been done by a lady. A paper was read before the late meeting of the Scientific Association, by Prof. Henry for Mrs. Eunice Foot, detailing her experiments to determine the effects of the sun's rays on different gases. These were made with an air pump and two glass receivers of the same size—four inches in diameter, and thirty in length. The air was exhausted from one and condensed in the other, and they were both placed in the sun light, side by side, with a thermometer in each. In a short period of time, the temperature in the receiver containing the condensed air, rose thirty degrees higher than the other; thus proving conclusively that the greater density of air on low levels is at least one cause of greater heat in valleys than on mountains. Experiments were also tried with moist air, and its temperature was elevated above dry air. Hydrogen gas was placed in one receiver and oxygen in the other, when the temperature of the former rose to 104°, but the latter to 106° Fah.; while, in carbonic acid—a more dense gas than either —it rose to 126°. It is believed and taught by geologists that during the period preceding the carboniferous era,—when the coal bed materials were forming—that the atmosphere of the earth contained immense quantities of carbonic acid, and that there was a very elevated temperature of atmosphere in existence, in comparison with that of the present day. Those who believe that this earth was once a fiery ball, attribute this ancient great atmospheric heat to the elevated temperature of the earth; but Mrs. Foot's experiments attribute it to a more rational cause, and leave the Plutonists but a small foundation to stand upon for their theory.

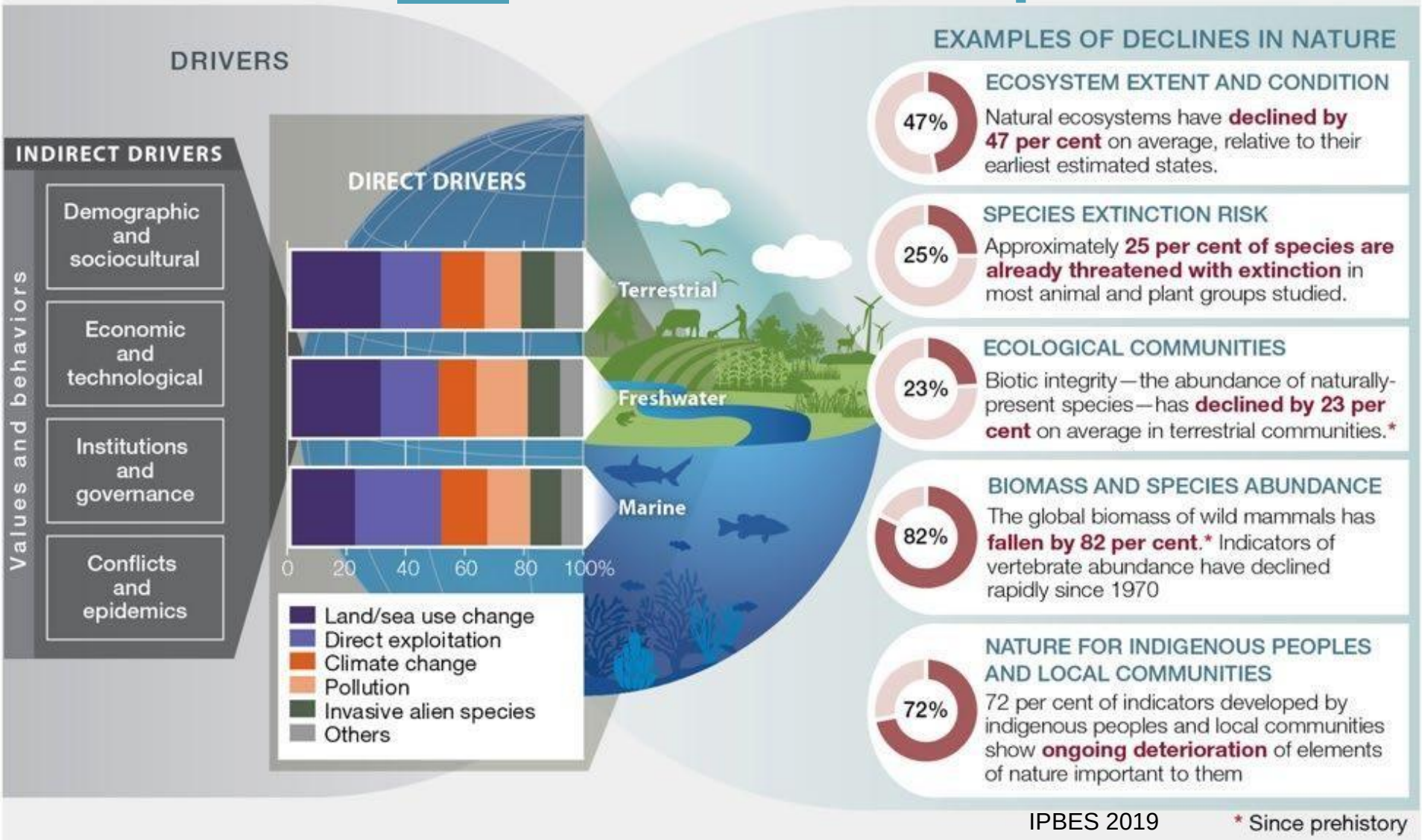
(Scientific American, 1856)

I am almost a 100 ppm old!



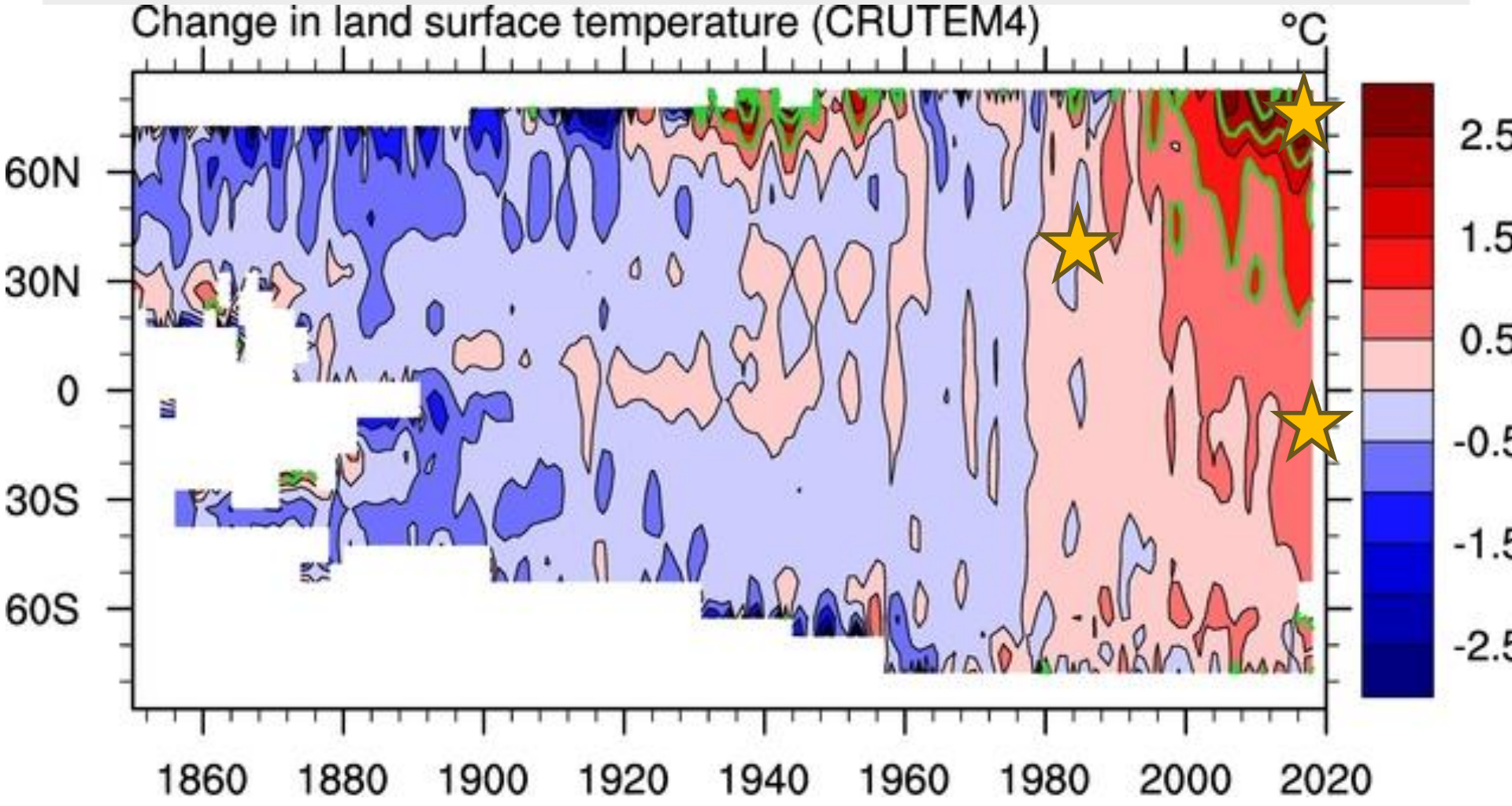
Helge Drange, Bjerknessenteret, UIB

Caveat:
Climate is not nature's main problem…



How do we study climate change impacts?

We are starting to feel the heat



Helge Drange, Bjerknessenteret, UIB

ITEX – the coming of age of climate change experiments

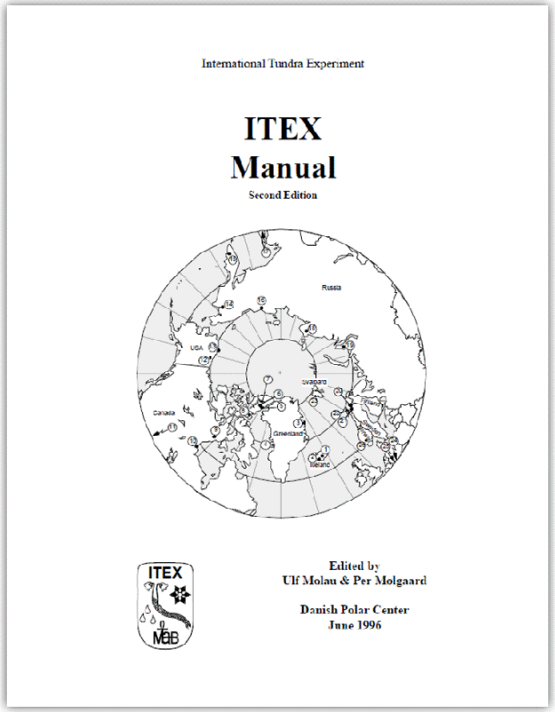
- **Challenge**: “why are botanists not trying to monitor climate change using plant response the way we use permafrost and ground temperature?”… “explore the idea that ***plant phenology might be used to monitor climate warming***”

- **Whole organism focus:** questions from arctic residents about the fate of organisms, such as fish and berries, upon which they depend. They did not deny the importance of the total system questions but ***they though that the scientists were ignoring the organisms***.

- **Technology**: Small ***open top chambers*** to passively warm tundra plants and to measure their response.

- **Timeline**: Initial ideas 1987, workshop proposal, funded, ITEX launched 1990.


Pat and Mukta Webber

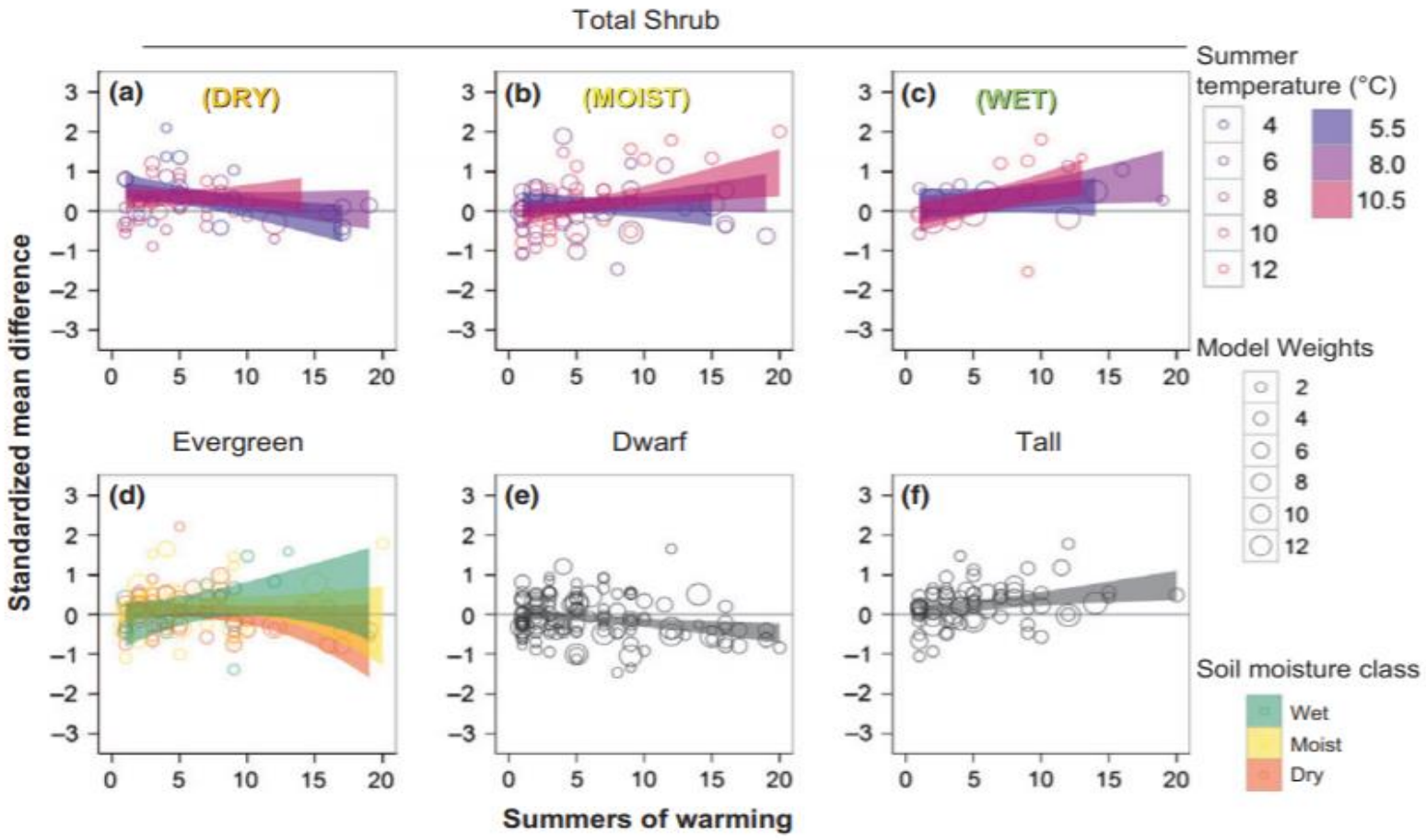


ECOLOGY LETTERS

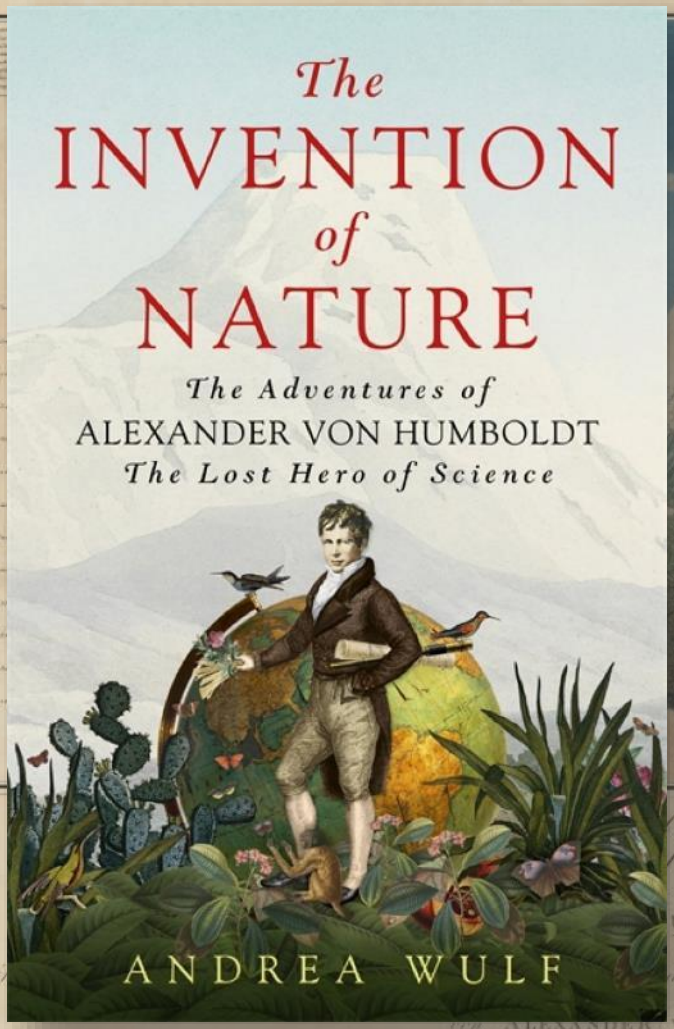
Ecology Letters, (2012) **15**: 164–175 doi: 10.1111/j.1461-0248.2011.01716.x

REVIEW AND SYNTHESES

Global assessment of experimental climate warming on tundra vegetation: heterogeneity over space and time



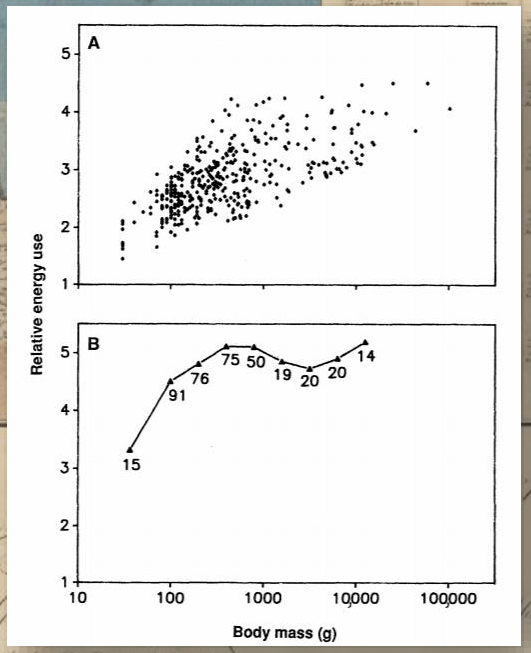
‘Macroecology - top-down approaches to organismal form and function zoom in



Articles

Macroecology: The Division of Food and Space Among Species on Continents

JAMES H. BROWN AND BRIAN A. MAURER

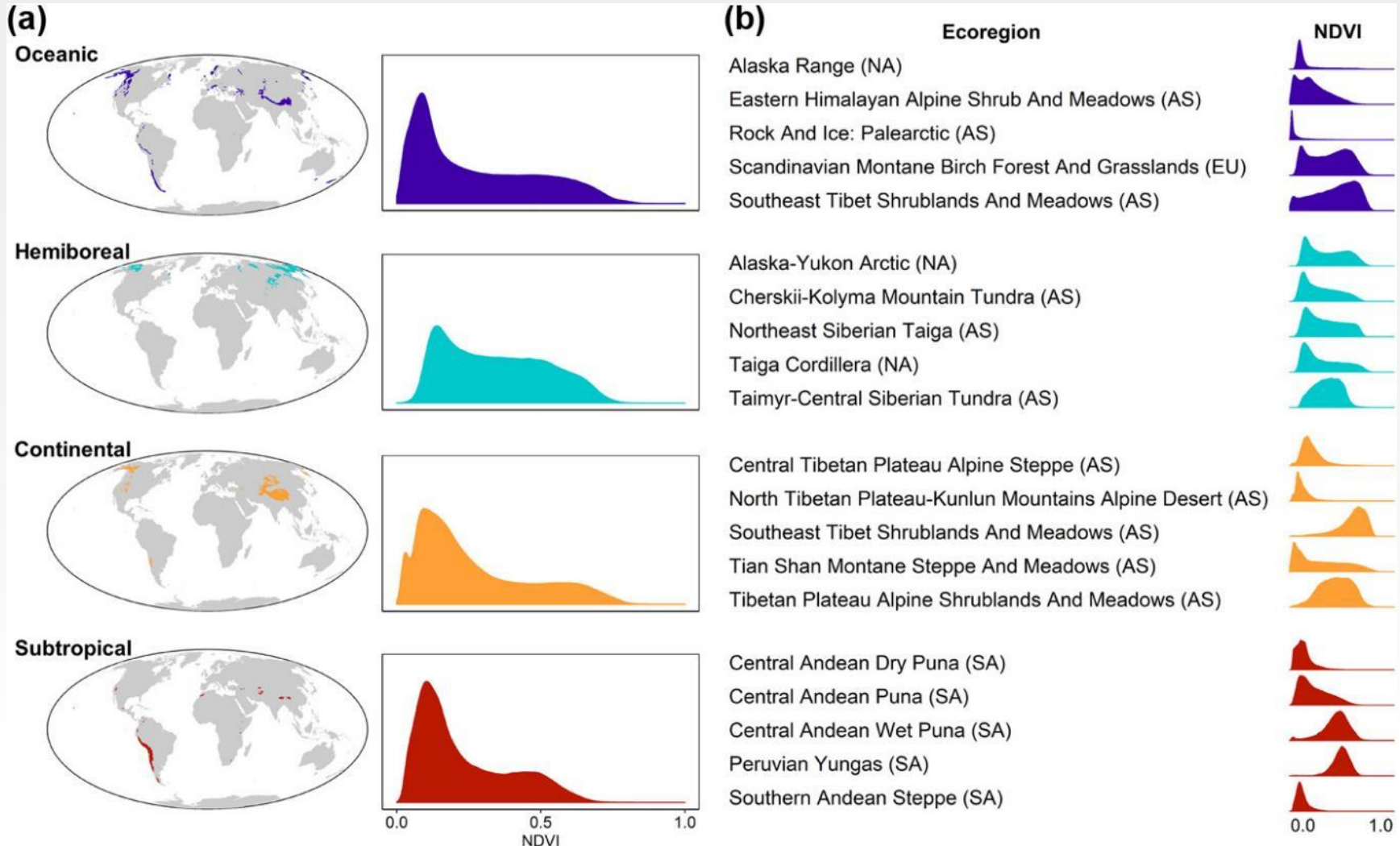


Global distribution and bioclimatic characterization of alpine biomes

Riccardo Testolin ✉, Fabio Attorre, Borja Jiménez-Alfaro

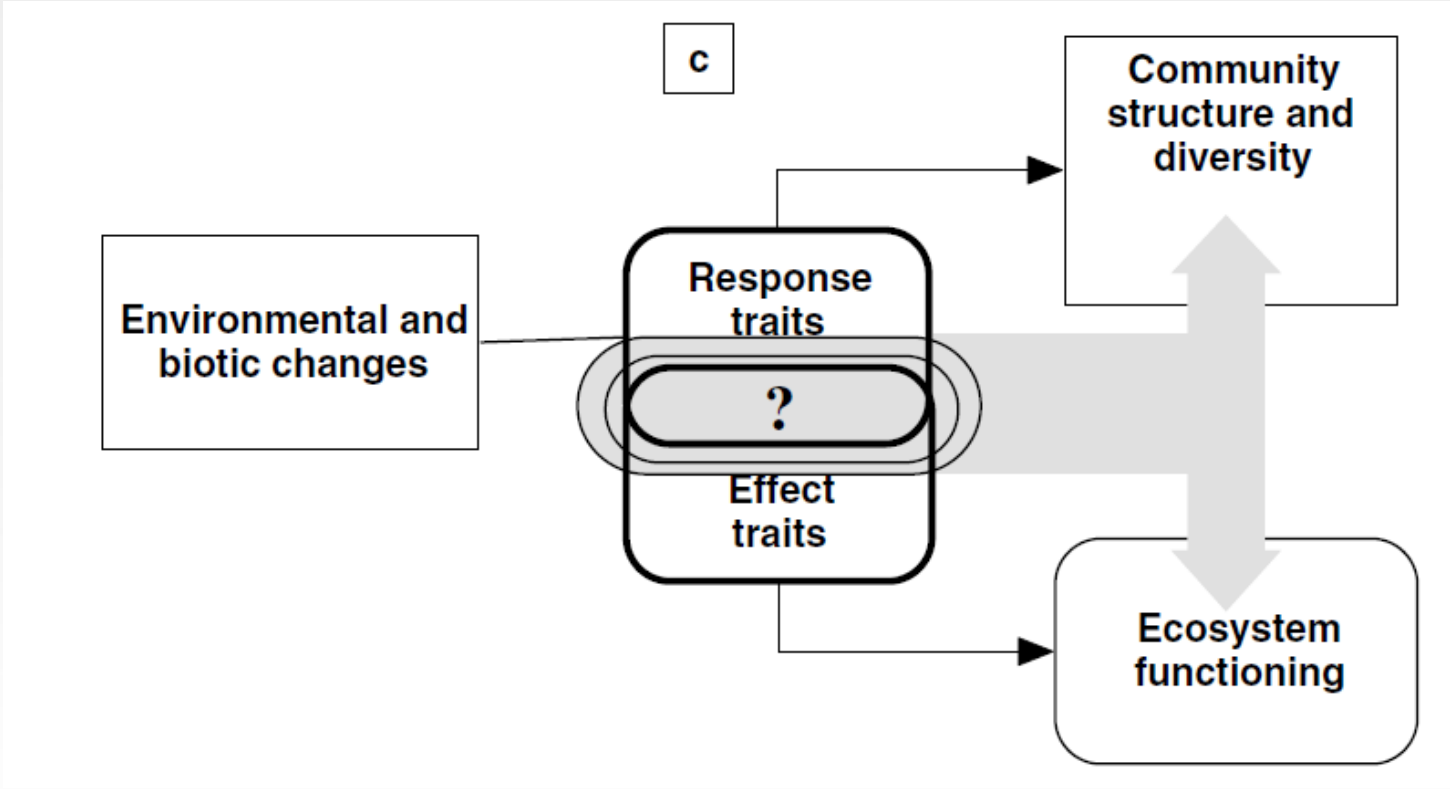
ECOGRAPHY

First published:28 February 2020 | https://doi.org/10.1111/ecog.05012



Why traits?

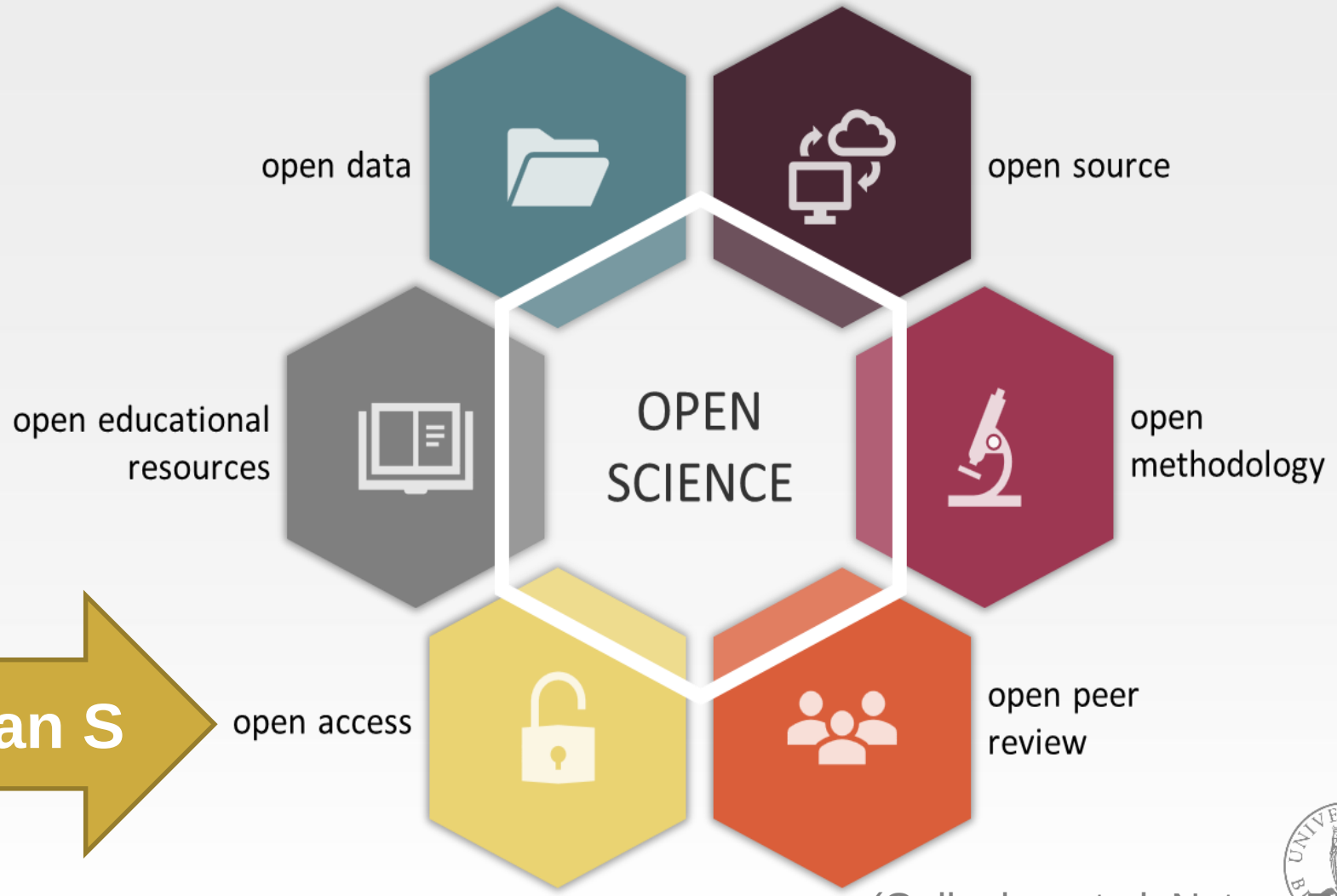
Traits to generalize across regions and systems, establish causality, link effects and responses, upscale…



(Lavorel & Garnier “Holy grail” 2002)

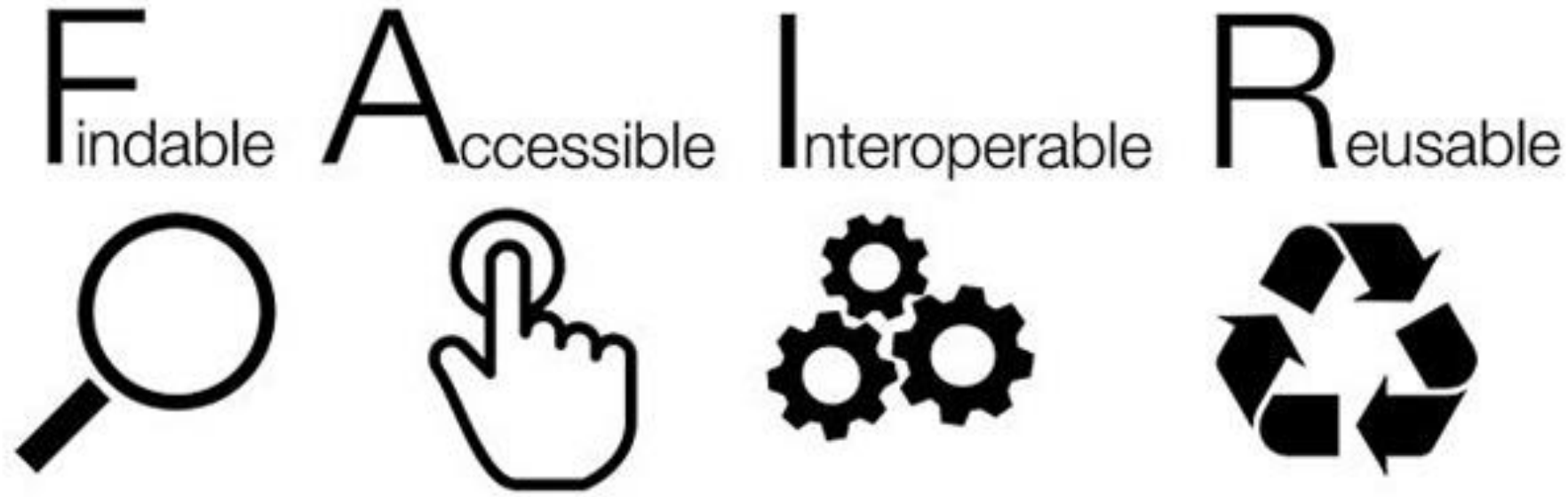
Why this focus on data documentation?

The larger Open Science picture



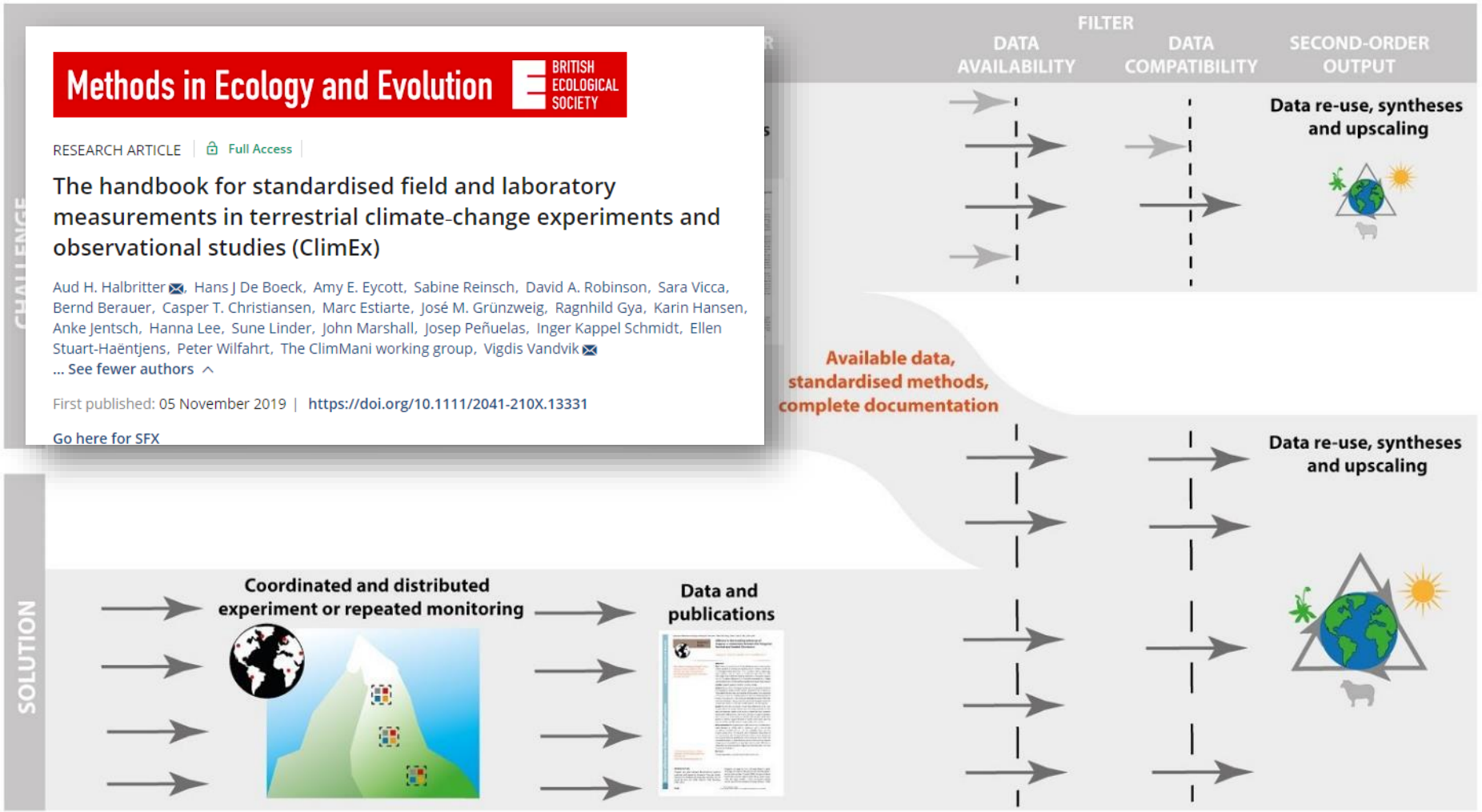
(Gallagher et al. Nature Ecol 2020)

It’s not enough for data to be open: they also need to be



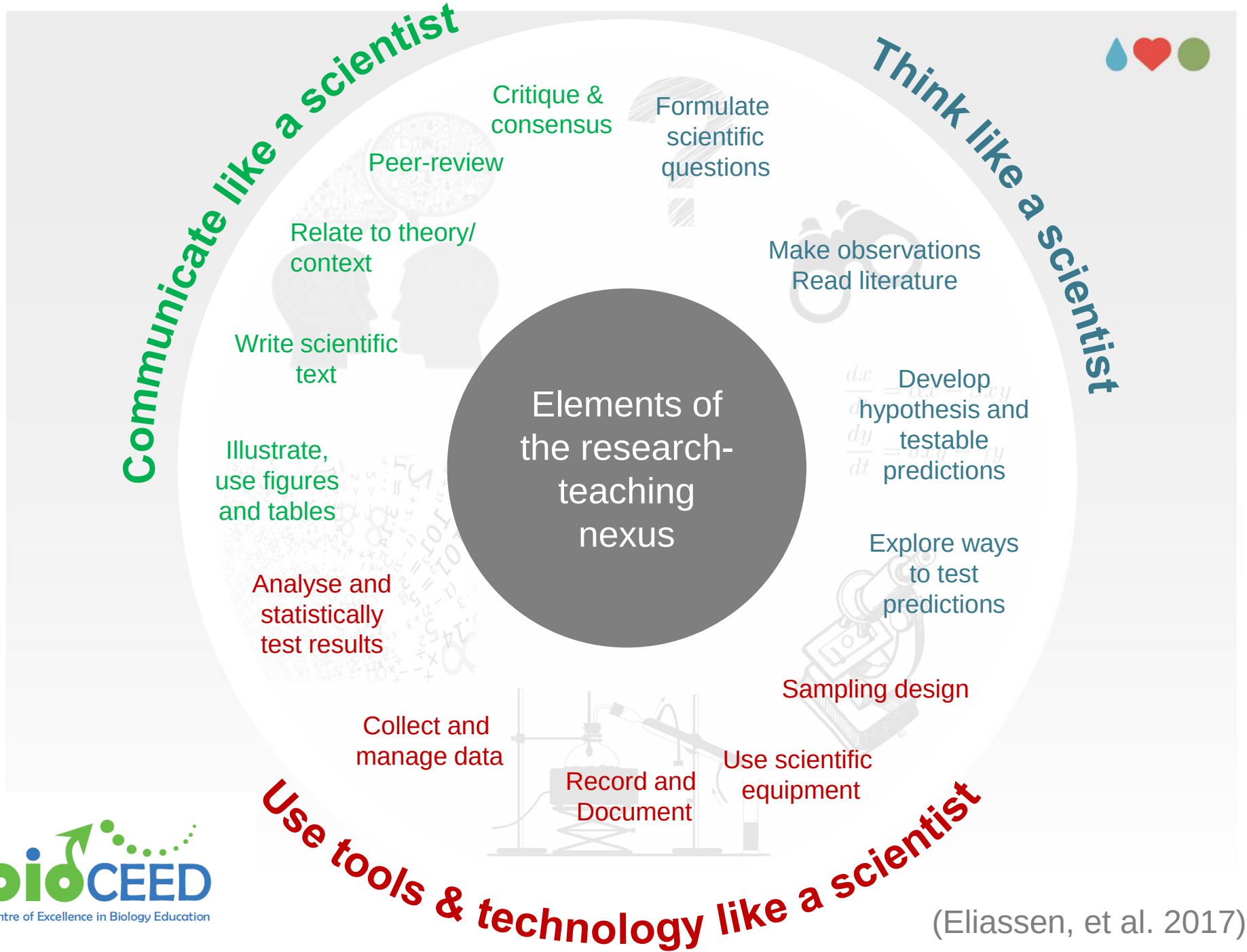
#spidergate

To make your data useful beyond *your perfect papers*



(Halbritter et al. MEE 2020) > 500 page of detailed methods descriptions!!

Why course *and* full-scale data campaign?



bioCEED
Centre of Excellence in Biology Education

(Eliassen, et al. 2017)

So: What should be the final course product?

“The cycle” (Julia Kemppinen, Suomen Luonto photo competition finalist!)

Research-based education – what is it, and why do it?

bioCEED
Centre of Excellence in Biology Education

- **Subject content** based on the latest development in the field → **updated *content***
- **Learning methods** are based on what educational research says about effective learing → ***effective* learning**
- Use **research as learning method,** learn how to ‘research’ in the process → **research *skills***
- Student researchers - **education embedded in ‘real’ research** → **learn in *context***
- ~~Course taught by a researcher~~

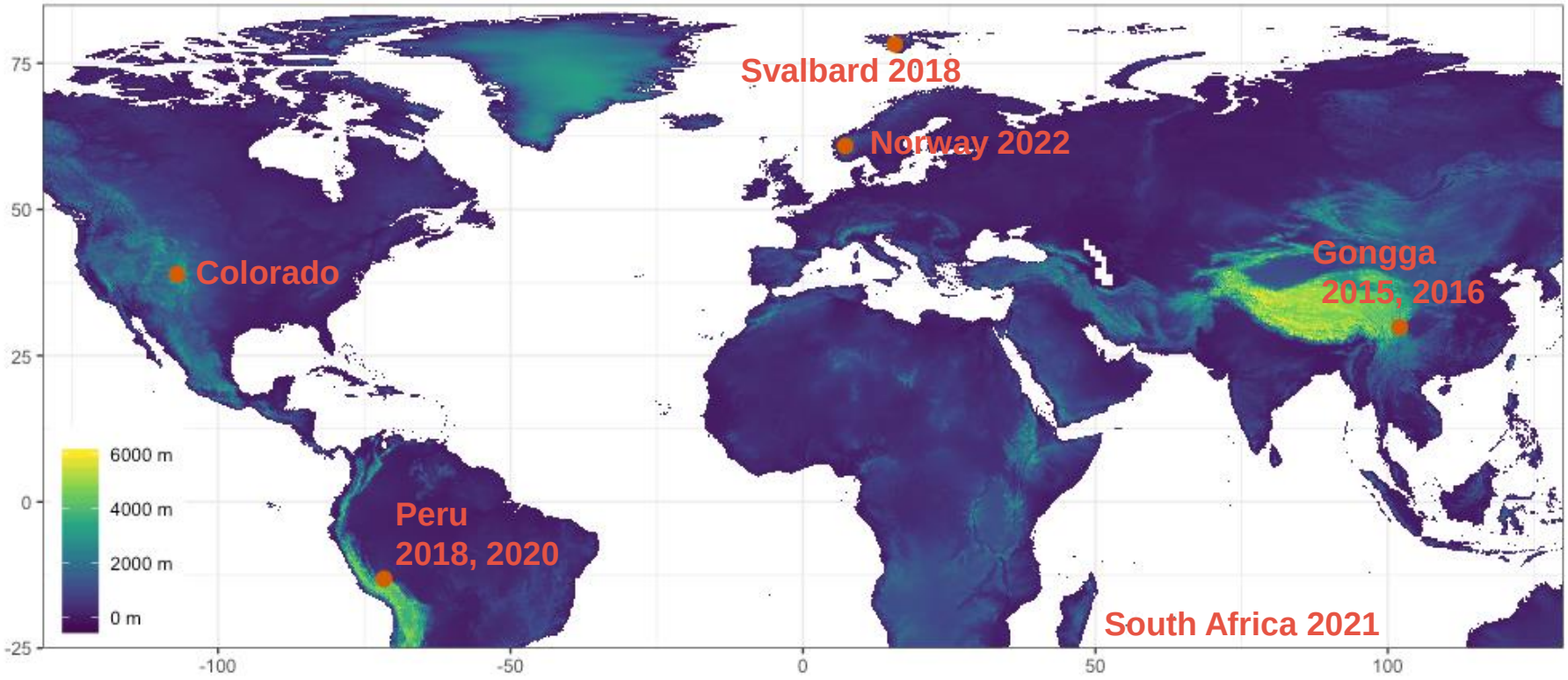
Why include science communication?

World Economic Forum (Davos): Top 5 risks to global economy

2007 2020

The Plan!

Plant Functional Traits Courses



Collect research-grade trait+ data along elevational gradients

- **[vegetation], leaf traits, ecosystem C fluxes, photosynthesis, imagery,**

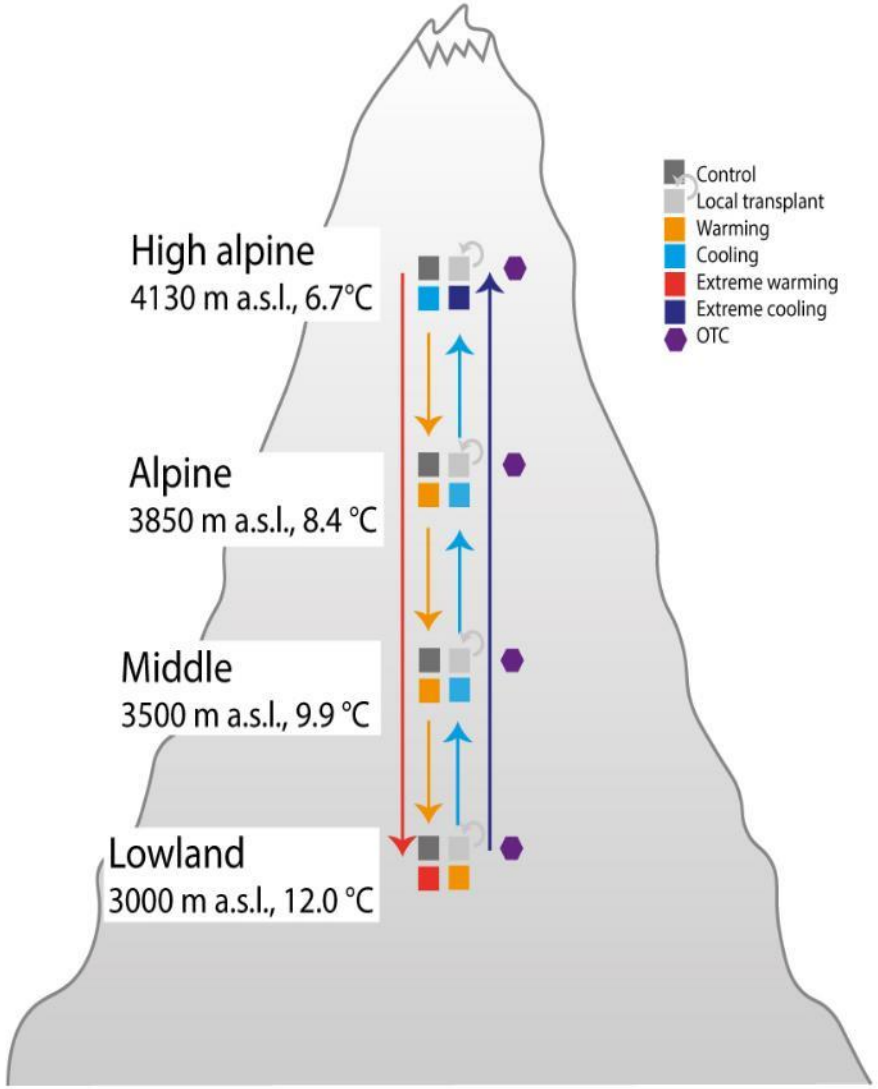
Tag onto existing studies, experiments

- **augment these with detailed trait-related data**

Learn the ropes while doing real science!

PFTC1 & 2: What did we learn?

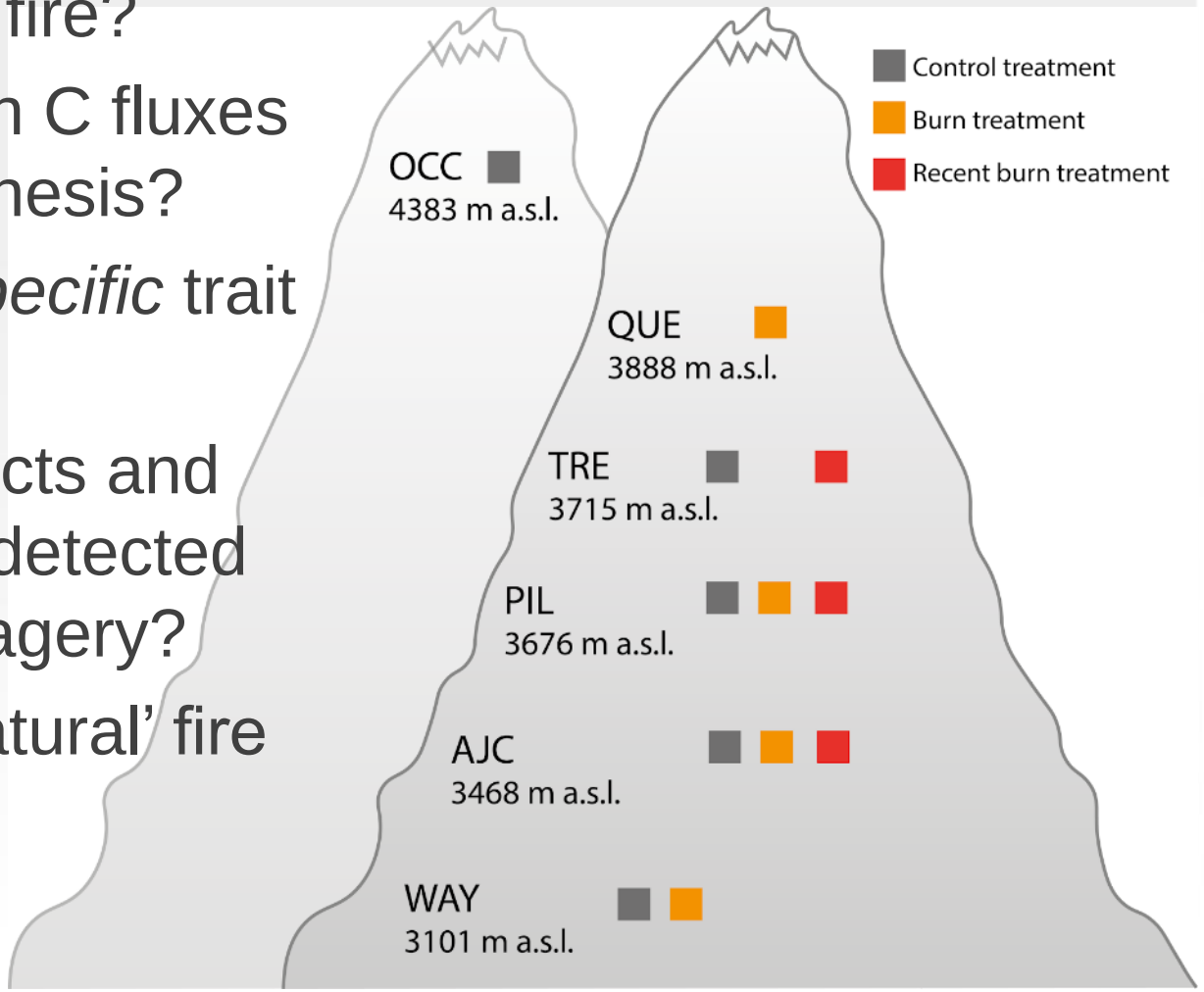
- We can collect loads of cool data in a short time!
  - **193 taxa (100 new)**
  - **6671 leaves**
  - **36.743 trait datapoints (+600%)**
  - **C fluxes, photosynthesis, ….**
- Managing the fieldwork, data, people is harder, and more important, than we first realized…
- **Data documentation!!***



**we are now writing up the PFTC data as 'data papers' – you'll be particpating for Peru!*

PFTC 3 & 5: Wayquecha, Peru

- What are trait *responses* to altitude and fire?
- ..trait *effects* on C fluxes and photosynthesis?
- ..role of *intraspecific* trait variability?
- Can these effects and responses be detected from drone imagery?
- Exploring a ‘natural’ fire experiment…



Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	9. March	**10. March**	**11. March**	**12. March**	**13. March**	**14. March**	**15. March**
6:30 - 7:30	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
8:00-10:00	**Vigdis / Brian** Course outline **Sehoya:** Interviews and science communication	Group work	Travel to Wayqecha	Field/lab	Field/lab	Field/lab	Field/lab
10:00-12:00 Starting with coffee break	**Groups meet, discuss plans, communication**	Students interview locals/tourists, incl lunch	Get rooms, introduction to Wayqecha Canopy walk	Field/lab	Field/lab	Field/lab	Field/lab
12:00-13:00	Lunch		Lunch	Lunch	Lunch	Lunch	Lunch
13:00-15:00	**Students and teachers:** One slide (3 min!) presentation of scientific interests **Brian, all: Science discussion**	Groups present their goals; Travel info	Set up lab and trait-wheel	Field/lab	Field/lab	Field/lab	Field/lab
15:00-17:00 Starting with coffee break		**William:** Intro to the study system and ABERG gradient **Ragnhild / Aud / Dagmar:** Previous PFTC findings	**Aud:** Traits data collection and curation **Vigdis:** Open science and data documentation	Field/lab	Field/lab	Field/lab	Field/lab
19:00-20:00	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner
20:30-21:00			Show and tell		Show and tell		Show and tell

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Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
	16. March	**17. March**	**18. March**	**19. March**	**20. March**	**21. March**	**22. March**
6:30 - 7:30	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
8:00-10:00	Field/lab	Field/lab	Travel to Pisac	Data analysis/ writing	Data analysis/ writing		Participants leave
10:00-12:00	Field/lab	Field/lab		Interview locals/ tourists	Data analysis/ writing	Drive back to Cusco	
12:00-13:00	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	
13:00-16:00	Field/lab	Interview rangers, local people	**Brian M:** Coding workshop	Data analysis/ writing	Students present results		
16:00-18:00	Field/lab	Pack and clean	Data analysis/ writing	**Dagmar:** Presentation & visualization workshop	**Sehoya:** Results of the Sci Comm		
19:00-20:00	Dinner	Dinner - the pig	Dinner	Dinner	Dinner	Dinner	
19:00-20:30				Show and tell			

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Eco-Lighthouse®

(full disclosure – I do have an inordinate fondness of field experiments)