

# Let's Make Predictions **Actionable**: Our Next 5 Years

*with many thanks to Muto, Hayashi, Saito and Shiraishi-san for arrangements*

Shunji Kotsuki

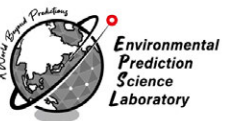
Environmental Prediction Science Laboratory

Center for Environmental Remote Sensing, Chiba University

Lab. Kick Off Conference (April 2nd, 2026)




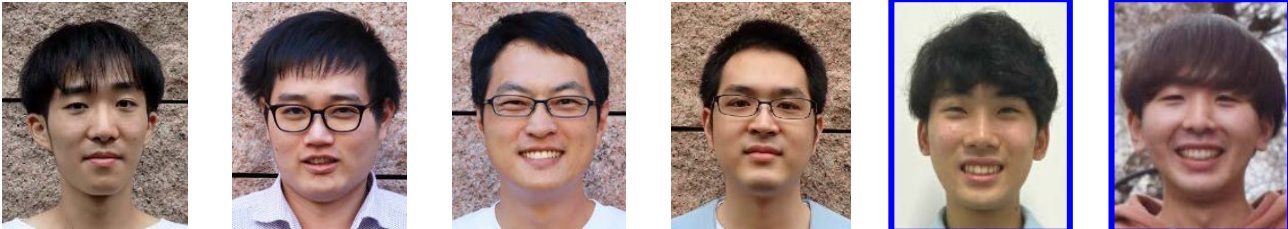
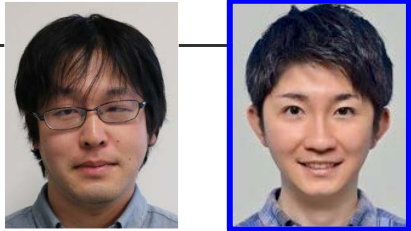
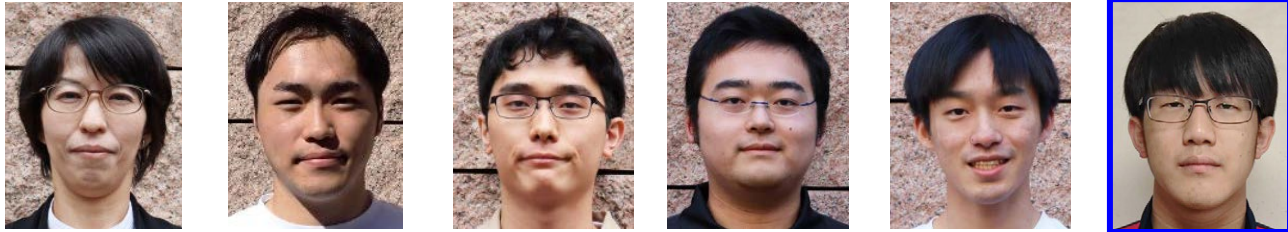


CHIBA  
UNIVERSITY



Q. How many members are  
in our lab this fiscal year?

A. 31 members!

# Kotsuki G Members for FY2026

PI & Researchers	
PhD Students	 <div style="float: right; border: 2px solid orange; border-radius: 15px; padding: 10px; margin-left: 20px;"> <p>□: new members</p> <p>Visiting Scholars</p>  </div>
MS/BS Students	
URAs	
Tech/Admin Staffs	

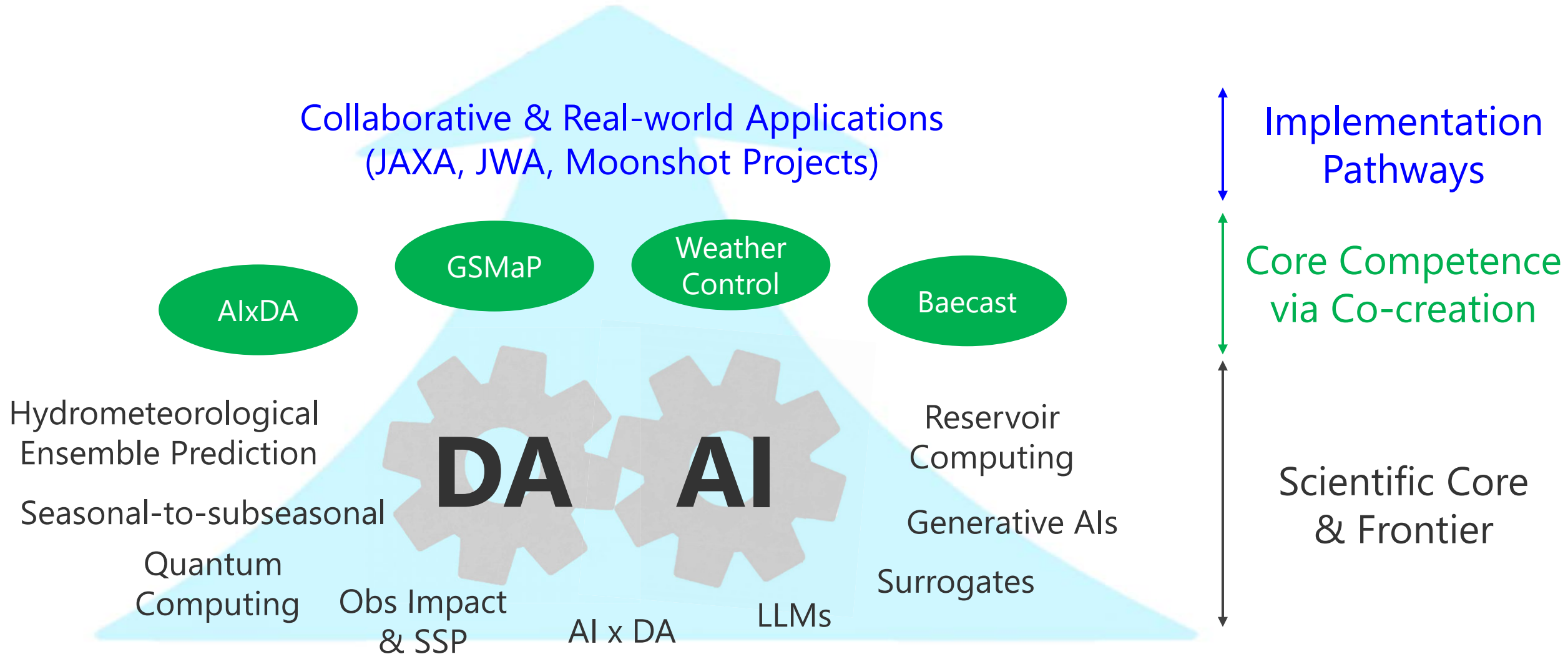
More members means more potential but not automatically more impact.

Six years have passed since foundation, we are no longer only building the lab.

**We are now defining what this lab stands for (= our vision).**

Q. What have we achieved  
so far?

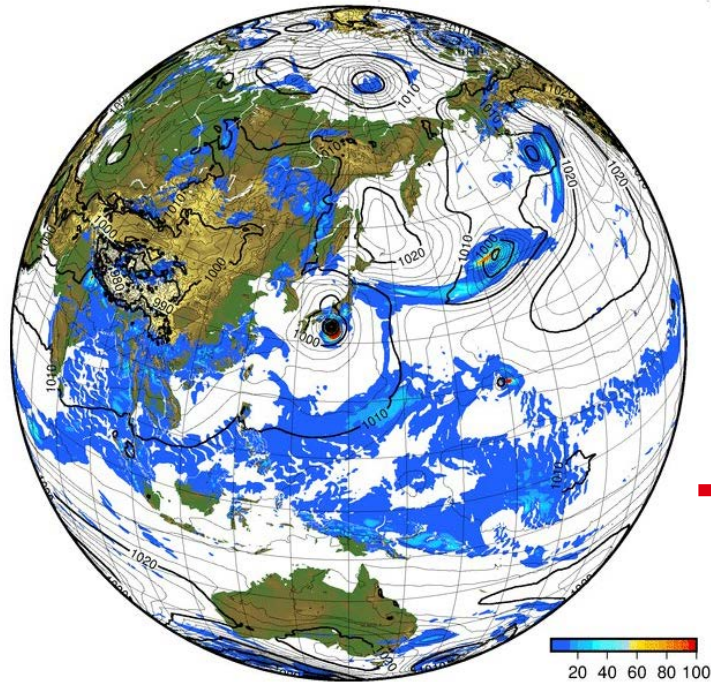
# Our Research Architecture



# The Underlying Philosophy of the Research

High-dim. Atmosphere

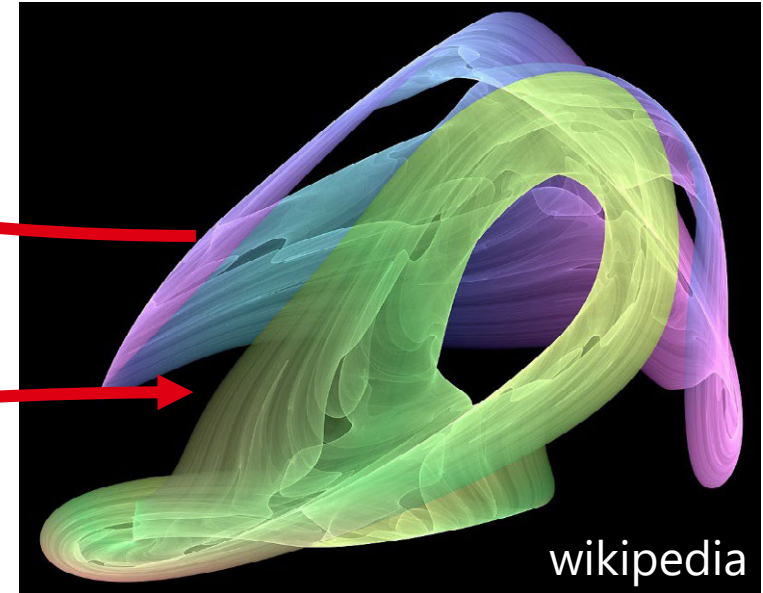
Low-dim Latent Space (or attractor)



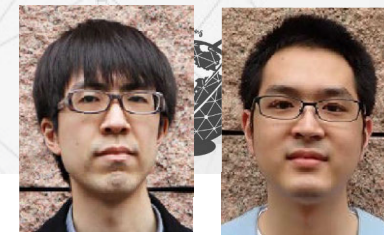
**Decode**



**Encode**

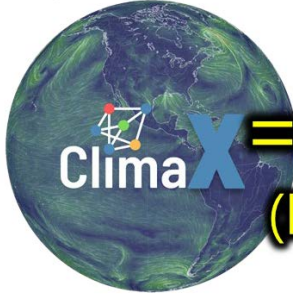


# Core Competence: AI x DA



A. Takeshima K. Shiraishi

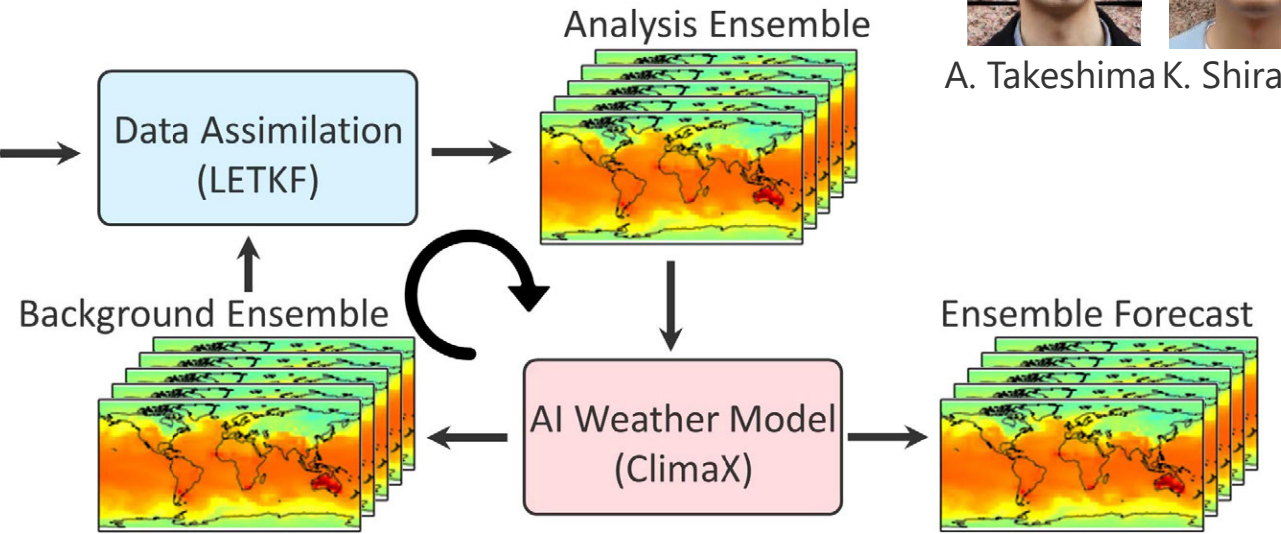
AI model (ViT)  
(Cyber Space)



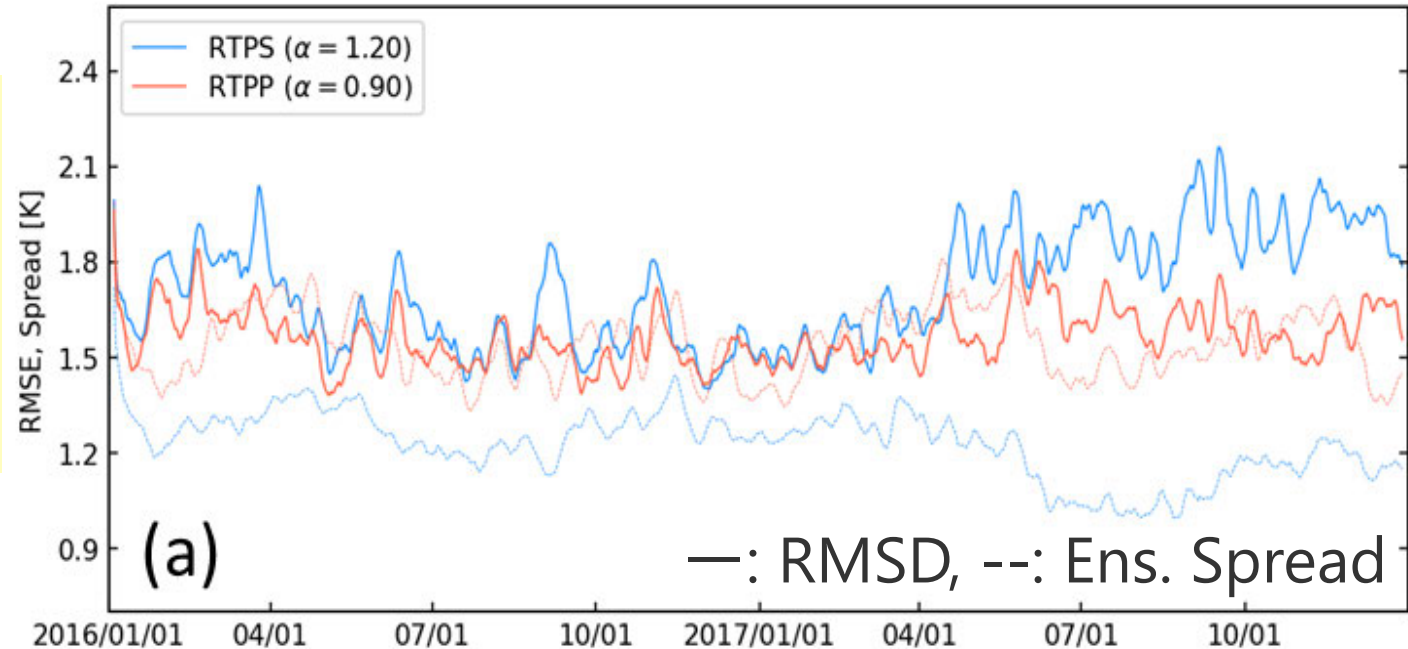
Obs  
(Real World)



**ClimaX = DA = (LETKF)**



*ClimaX-LETKF worked stably  
for two years!  
(data x data-driven AI)*



ClimaX-LETKF: Kotsuki et al. (2025, GMD)  
PREPBUFR DA: Takeshima et al. (in review)

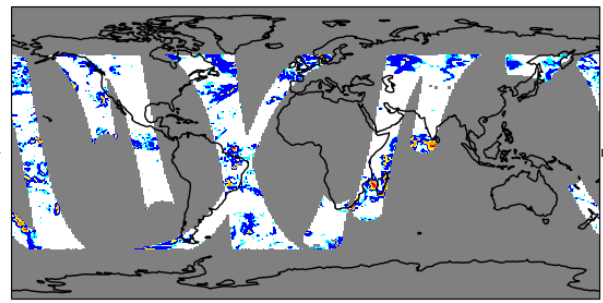
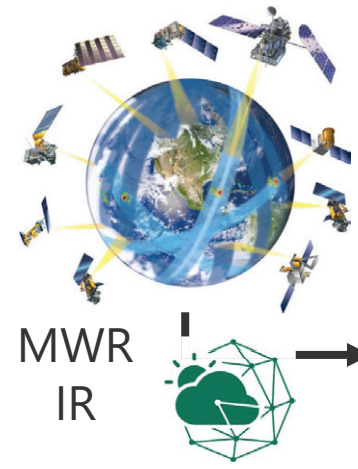
# Competence: JAXA's GSMaP



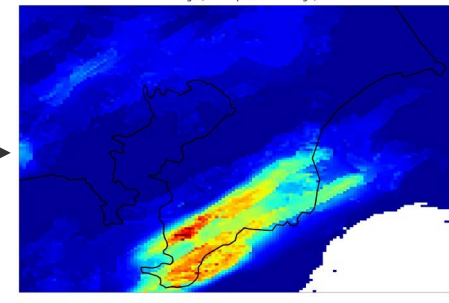
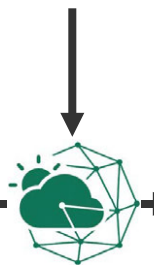
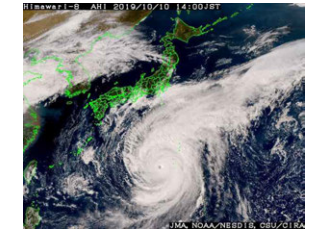
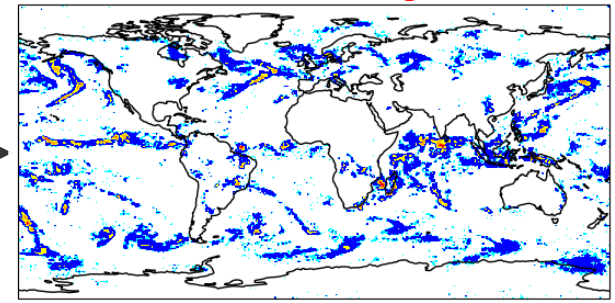
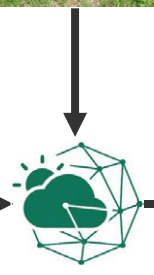
Y. Muto D. Kishikawa H. Hayashi

## Global Precipitation

*data-driven*



Gauge



# Lab's Core Competence: MS Weather Control



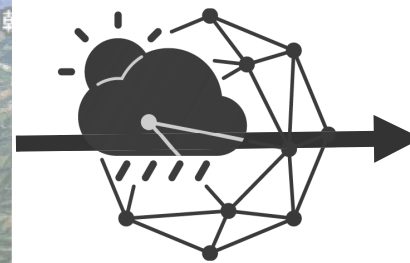
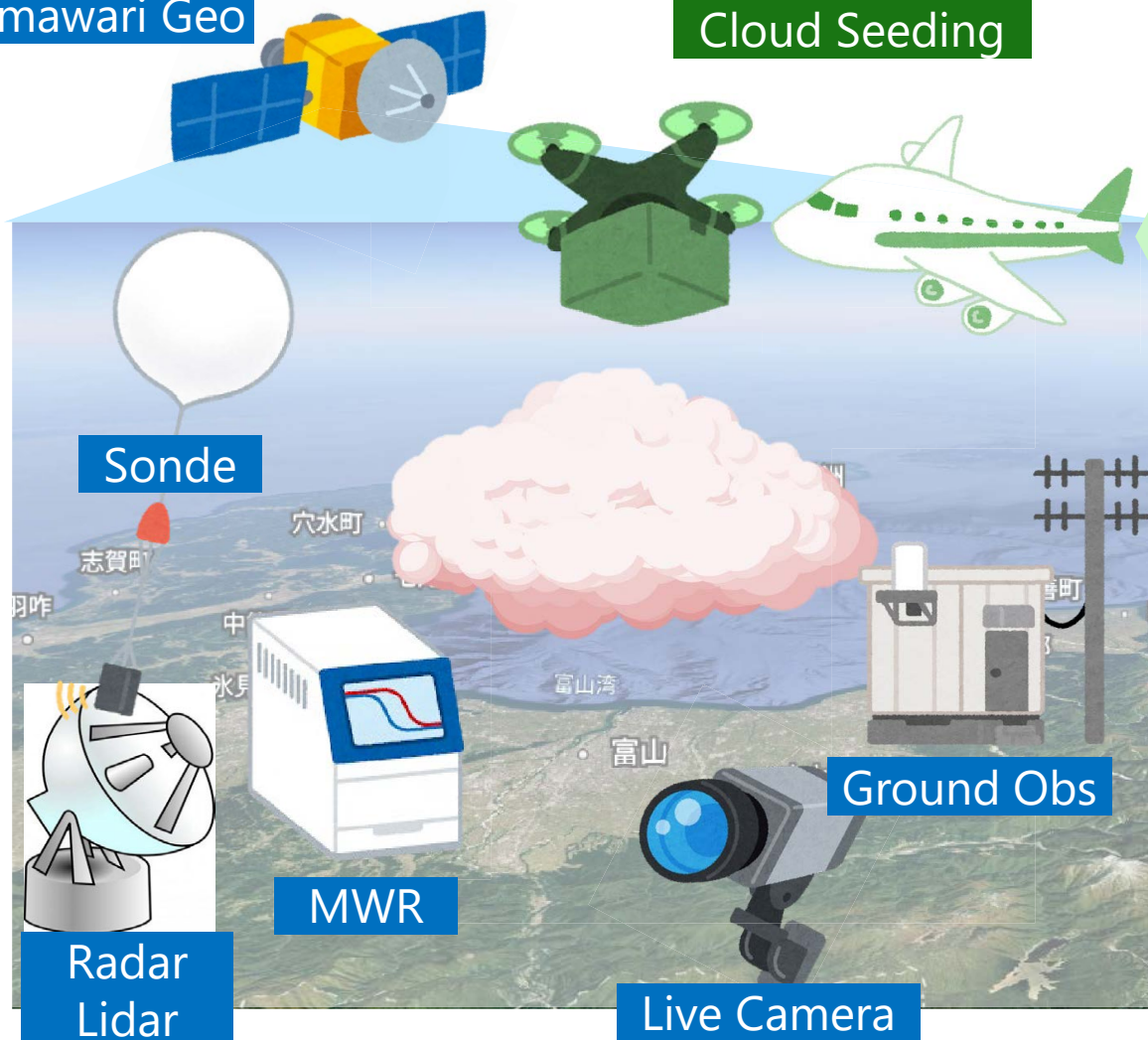
We have started exploring weather modification assisted by AIs and DA.  
This unique and challenging research poses various unique problems.

Himawari Geo

Cloud Seeding

Seeding Operation

Seedability Reports



Digital Twin (DA, AI)



Decision Making

# Baecast: An Imaginable Weather Forecast

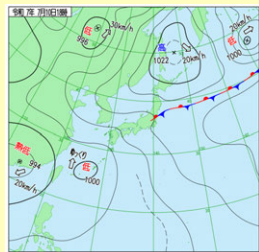


D. Kishikawa R. Kaneko

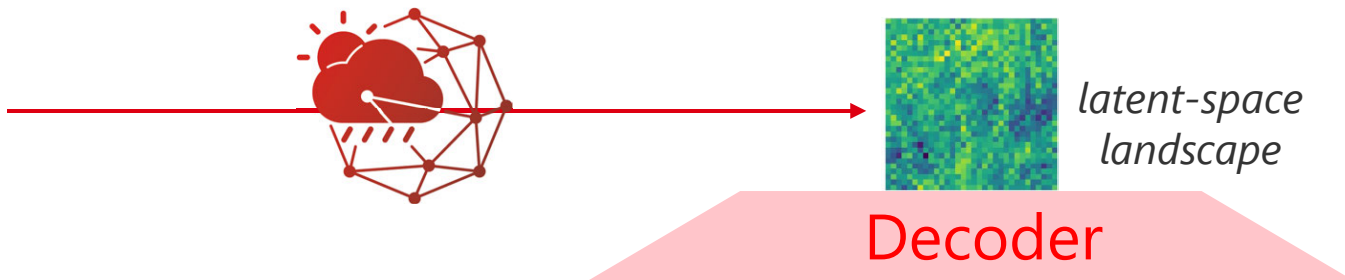
## Himawari Geo Weather



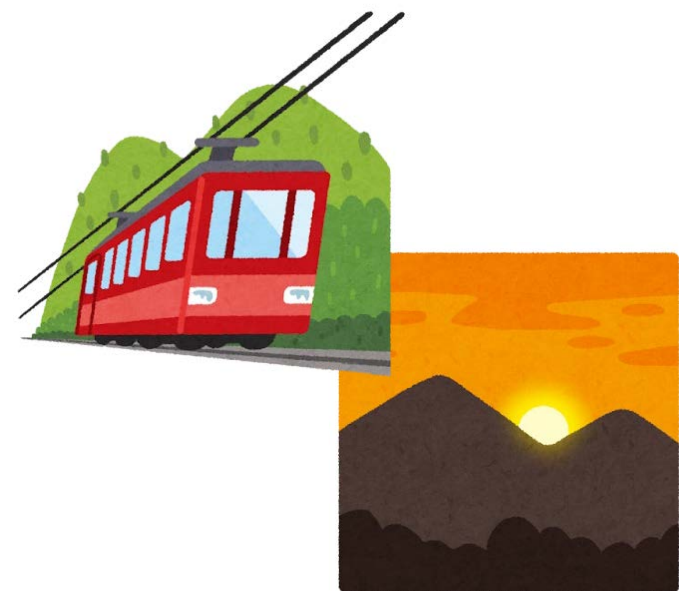
Based on Illustration provided by the Japan Meteorological Agency



"Weather Map: July 10, 2025, 6:00 p.m." (from the Japan Meteorological Agency website)



Potential applications in tourism?



# Baecast: An Imaginable Weather Forecast



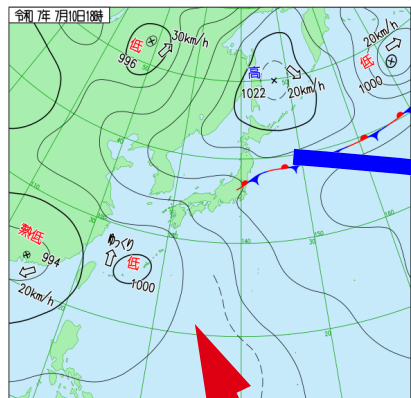
D. Kishikawa R. Kaneko

Himawari Geo



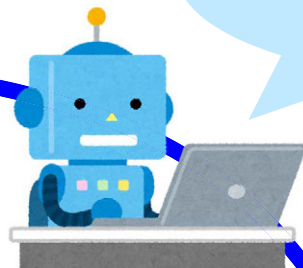
Based on Illustration provided by the Japan Meteorological Agency

Weather Data



"Weather Map: July 10, 2025, 6:00 a.m."  
(from the Japan Meteorological Agency website)

**Decoder  
(obsopo)**

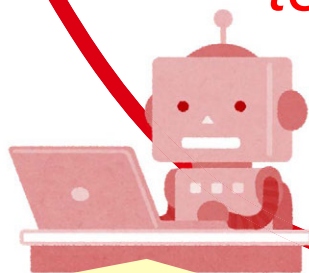


*Consistency  
learning*

Obs Space (LiveCamera)



**Encoder  
(DA)**



The point is ?  
AI opens doors to  
assimilate unused big data!

# Our Research Architecture



## Actionable Environmental Prediction

not only accurate, but also leads to human and societal actions.

Collaborative & Real-world Applications  
(JAXA, JWA, Moonshot Projects)

AIxDA

GSMaP

Weather  
Control

Baecast

Hydrometeorological  
Ensemble Prediction

Seasonal-to-subseasonal

Quantum  
Computing

Obs Impact  
& SSP

AI x DA

LLMs

DA

AI

Reservoir  
Computing

Generative AIs

Surrogates

Transformative  
Impacts

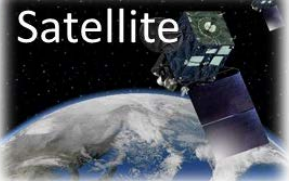
Implementation  
Pathways

Core Competence  
via Co-creation

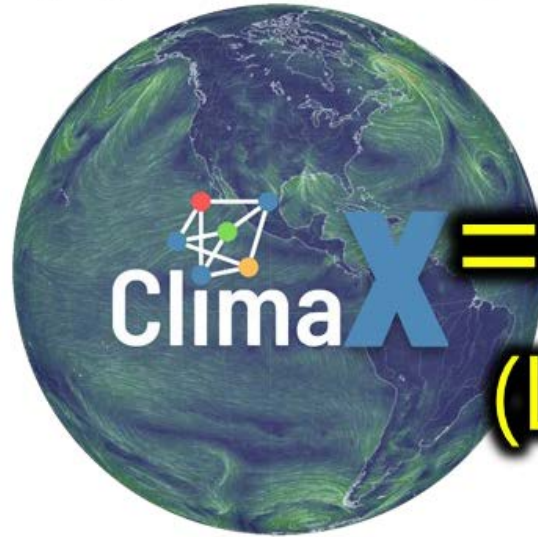
Scientific Core  
& Frontier

# Actionable Prediction Co-Created with Society

Conventional Obs.



AI model (ViT)  
(Cyber Space)



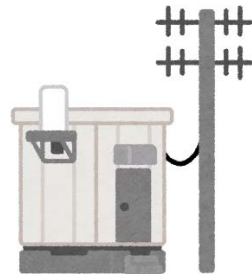
Obs  
(Real Word)



**Cl**ima**X** = **DA** =  
(LETKF)

**Co-Creation with Society**

Unused  
Big Data



+ Citizen  
Science

# Why Actionable Predictions?

1. strategic reason
2. scientific reason
3. societal reason

# Strategic Reason: Background



We are entering an era in which AI can carry out research end to end.  
Research based on open data and open code will be rapidly commoditized.

We must pioneer research that AI cannot easily replace (w/ unique problem and data).

nature

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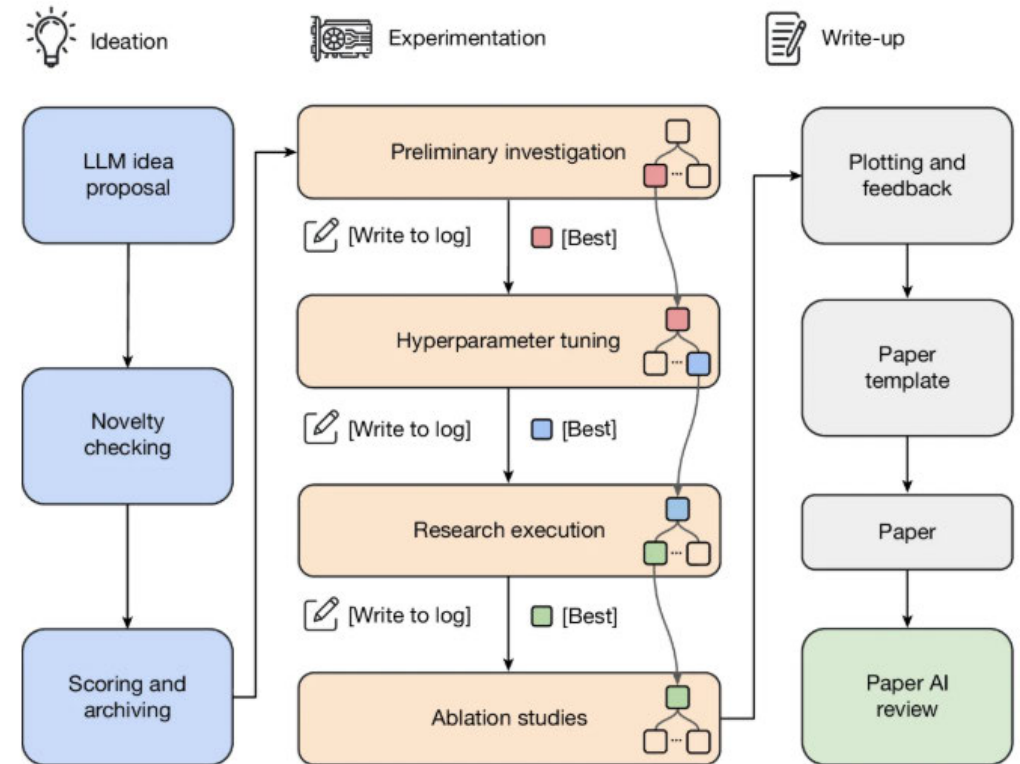
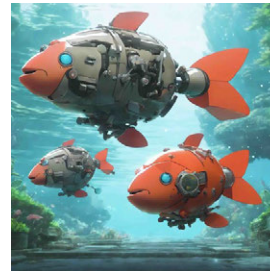
Article | [Open access](#) | Published: 25 March 2026

## Towards end-to-end automation of AI research

[Chris Lu](#), [Cong Lu](#), [Robert Tjarko Lange](#), [Yutaro Yamada](#) ✉, [Shengran Hu](#), [Jakob Foerster](#), [David Ha](#) ✉ & [Jeff Clune](#) ✉

*Nature* **651**, 914–919 (2026) | [Cite this article](#)

**75k** Accesses | **444** Altmetric | [Metrics](#)



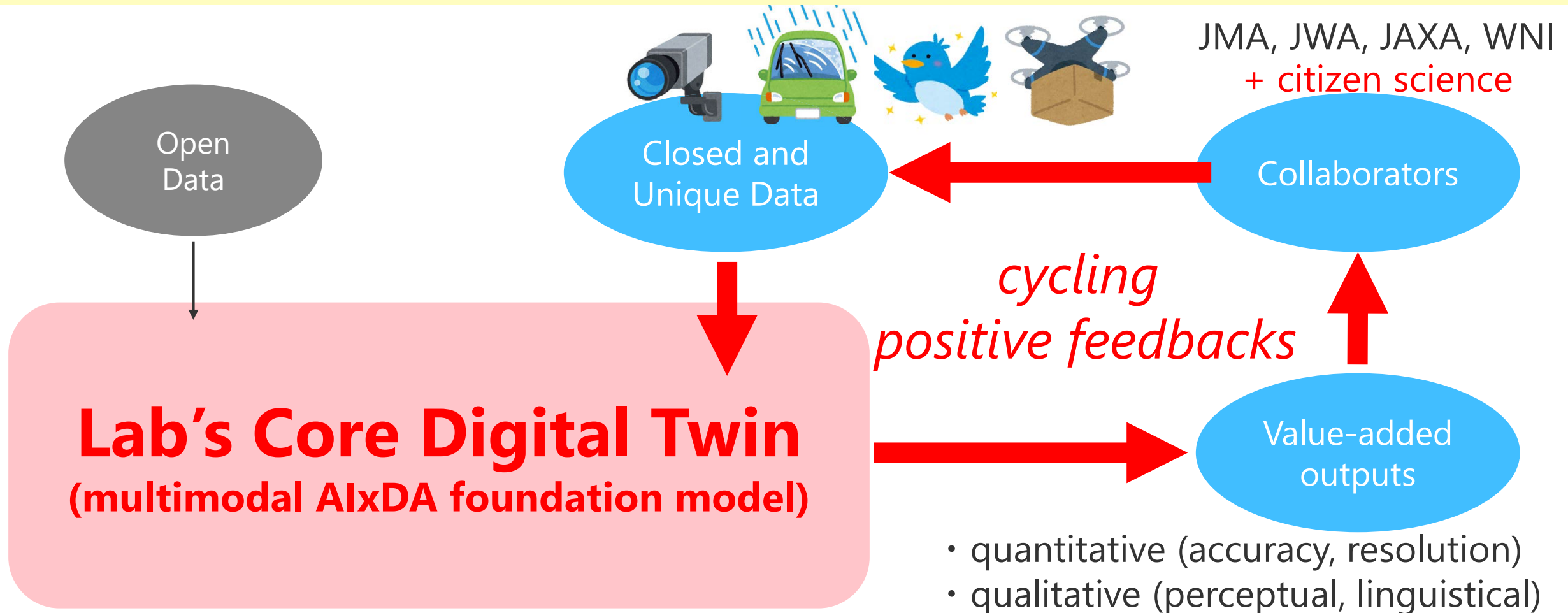
# Strategic Reason: Defensibility



# Strategic Reason: Defensibility

Our strategy is to create high-value scientific outputs by tackling unique problems with unique data and collaborators.

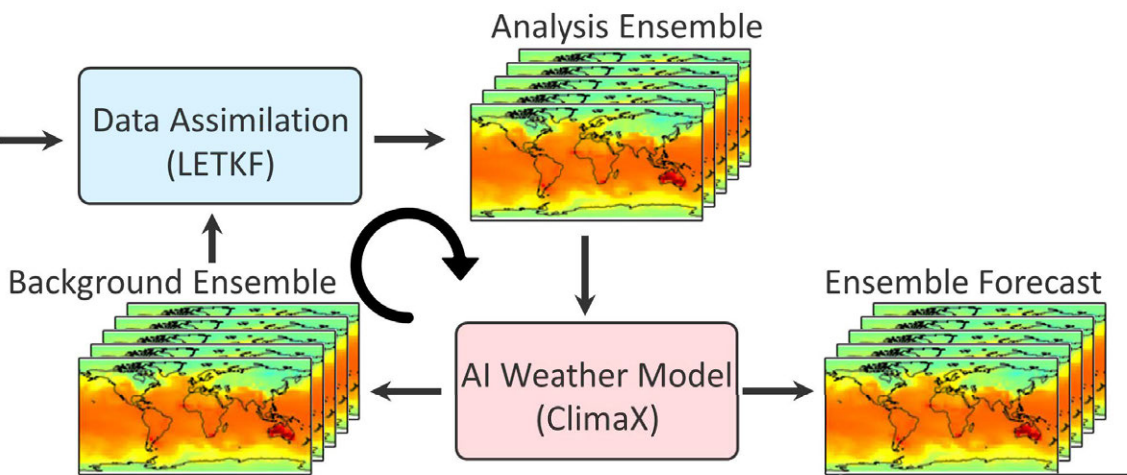
Introducing closed big data enables defensible research.



# Scientific Reason: Frontier of AI x DA Research

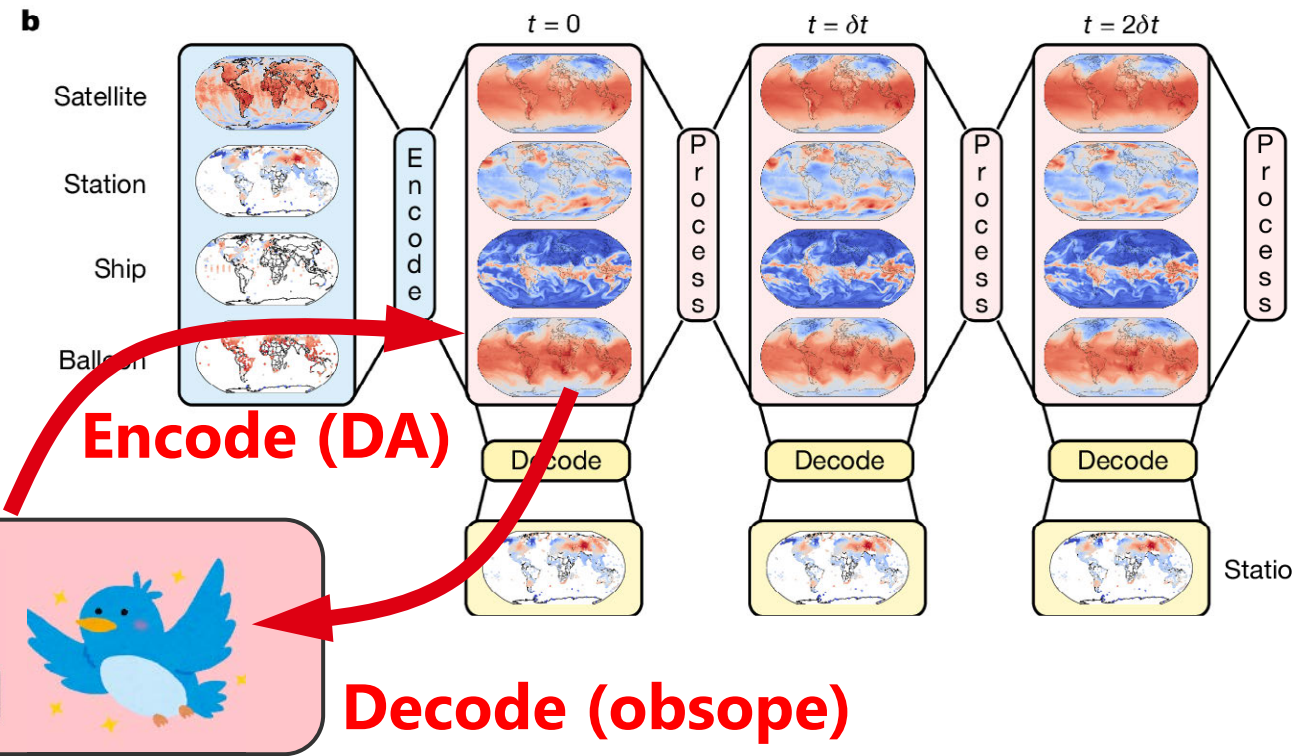
Actionable prediction requires richer obs.  
 AI-enabled big data assimilation is a scientific frontier.  
 In addition, introducing closed big data enables defensible research.

Present: AI model w/ Conventional DA (ClimaX-LETKF)



about 95 % of satellite data is not used for NWP (mainly due to bias, non-gaussian)

Future: AI model w/ AI-enabled DA (end to end)



# Societal Reason: To Make Society Actionable

Behavioral economics has shown that humans do not always make decisions rationally. In modern society, we are exposed to an overwhelming amount of information.

More accurate and precise prediction  $\neq$  More actionable prediction

We need prediction that is not only accurate, but also supports human action.

Sheena S. Iyengar

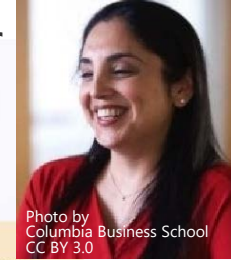
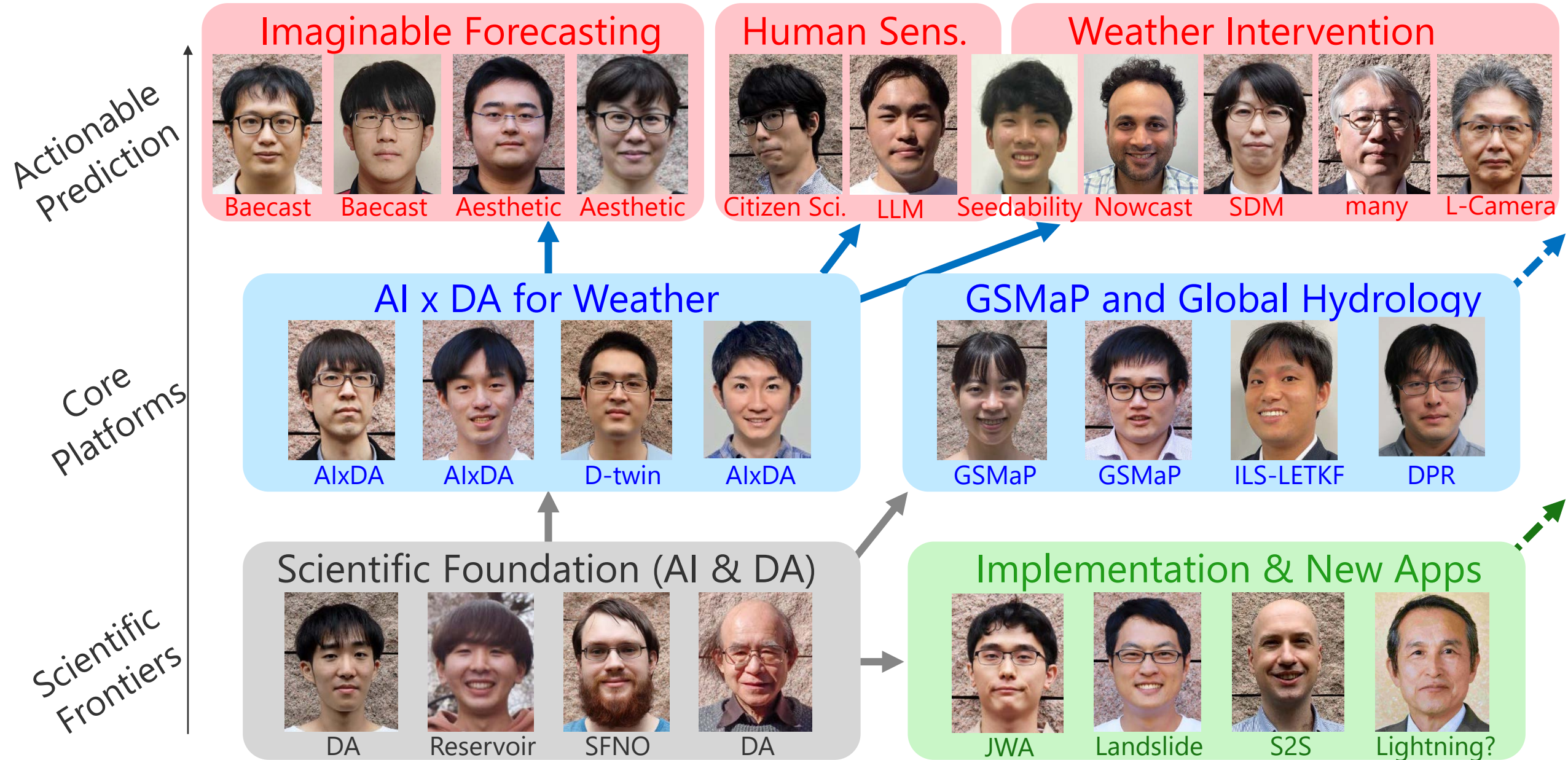


Photo by Columbia Business School CC BY 3.0

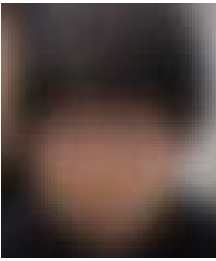
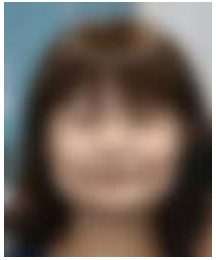
## People Who Bought Jams



# Your Research within Our Vision

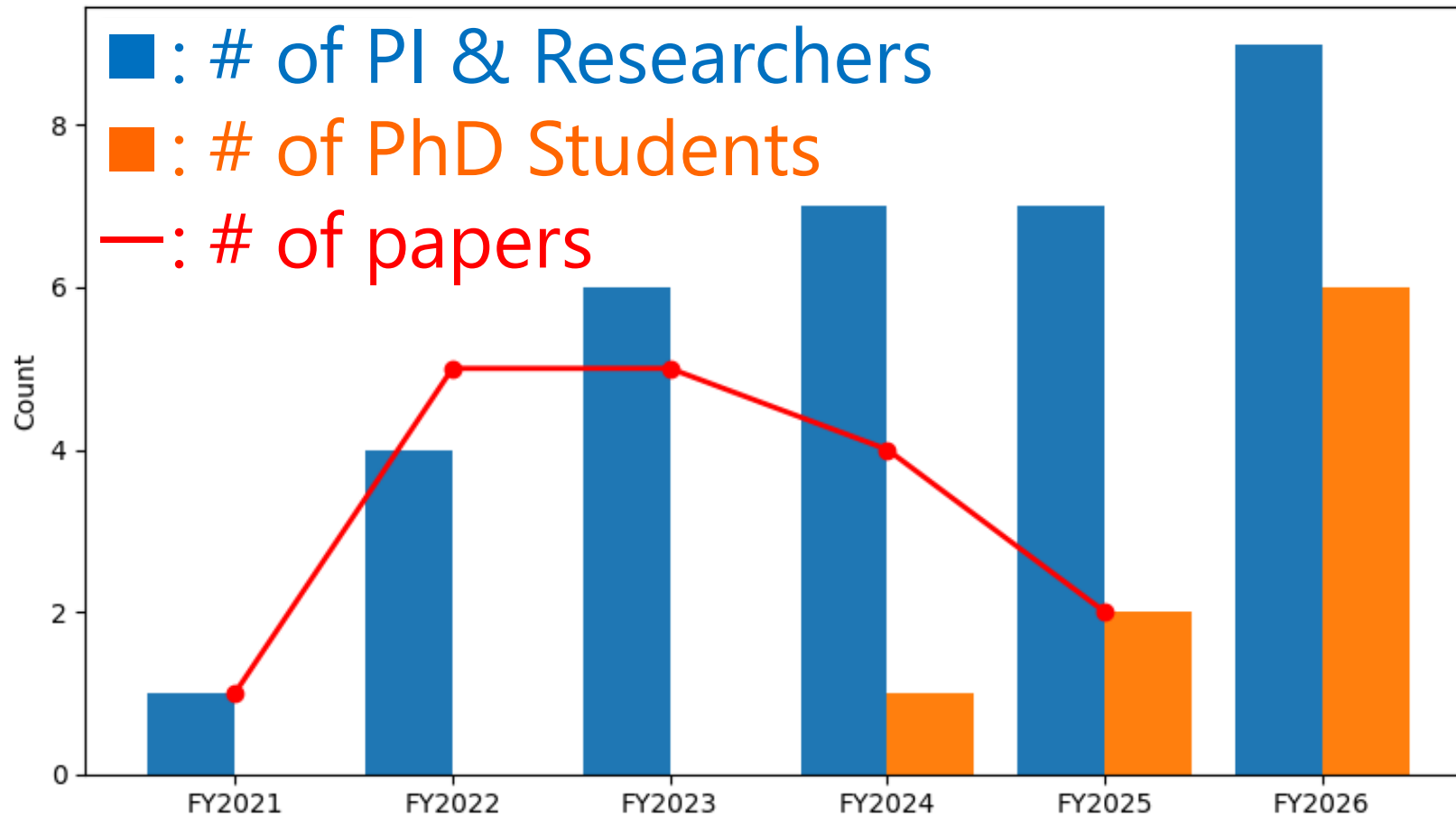


# Your Research within Our Vision



# This Year's Challenge

# Q. What does this graph show?



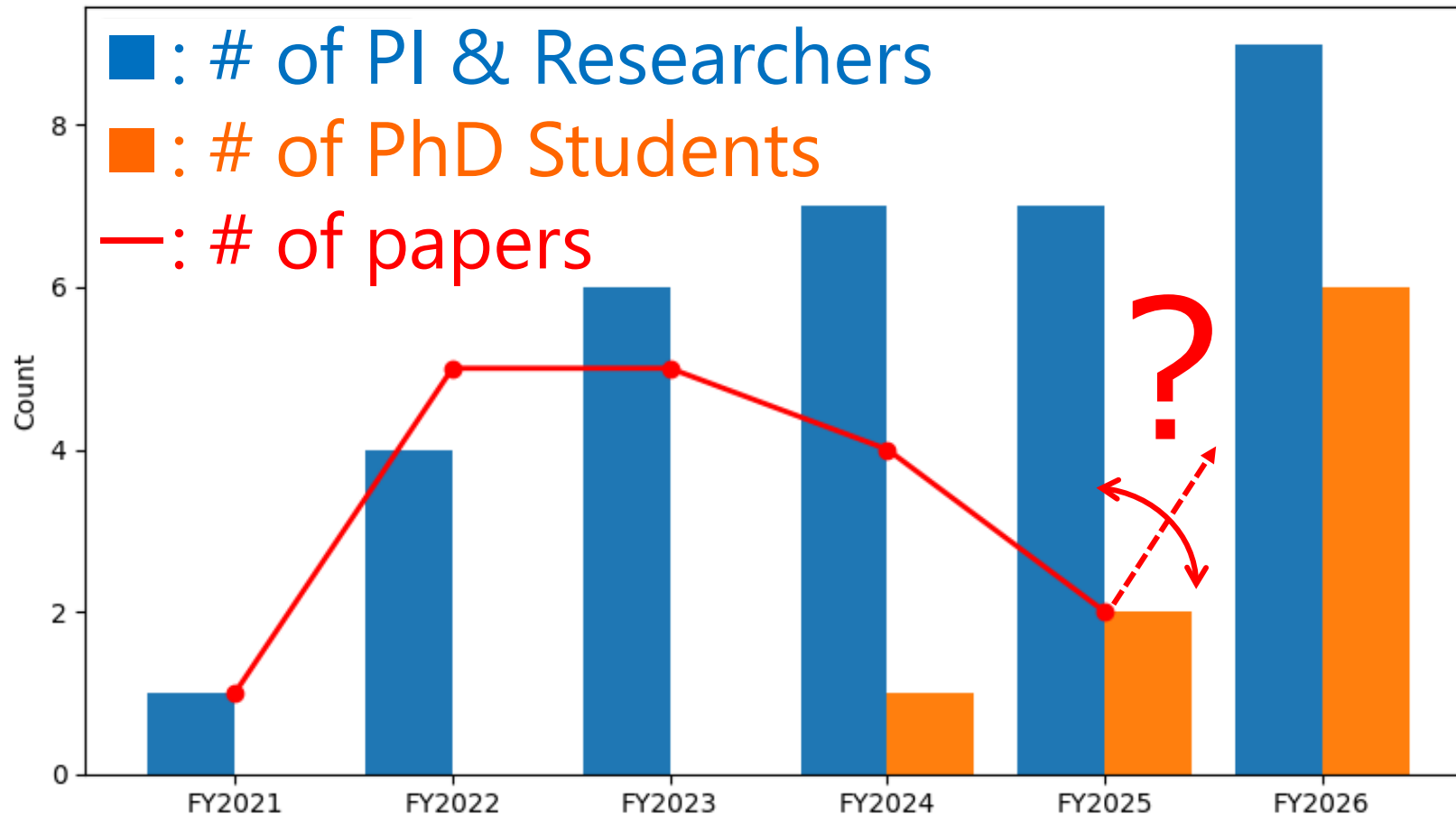
# Lab's Stats and Problem: Publications

For a team of our size, our publications in international journals are still quite limited 😞

Globally, research without papers is often invisible to the community.

We must publish to shape the field of “actionable prediction” and to advance your career.

Lab Members and Papers by Fiscal Year



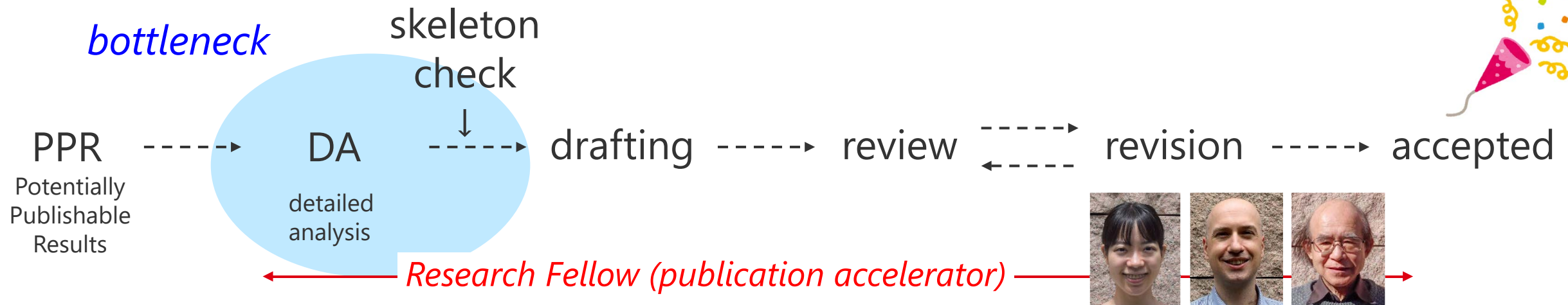
# This Year's Theme: GRIT (やり切る力)

- **Individual GRIT**

- bring your research to publication
- take ownership of turning results into real outcomes

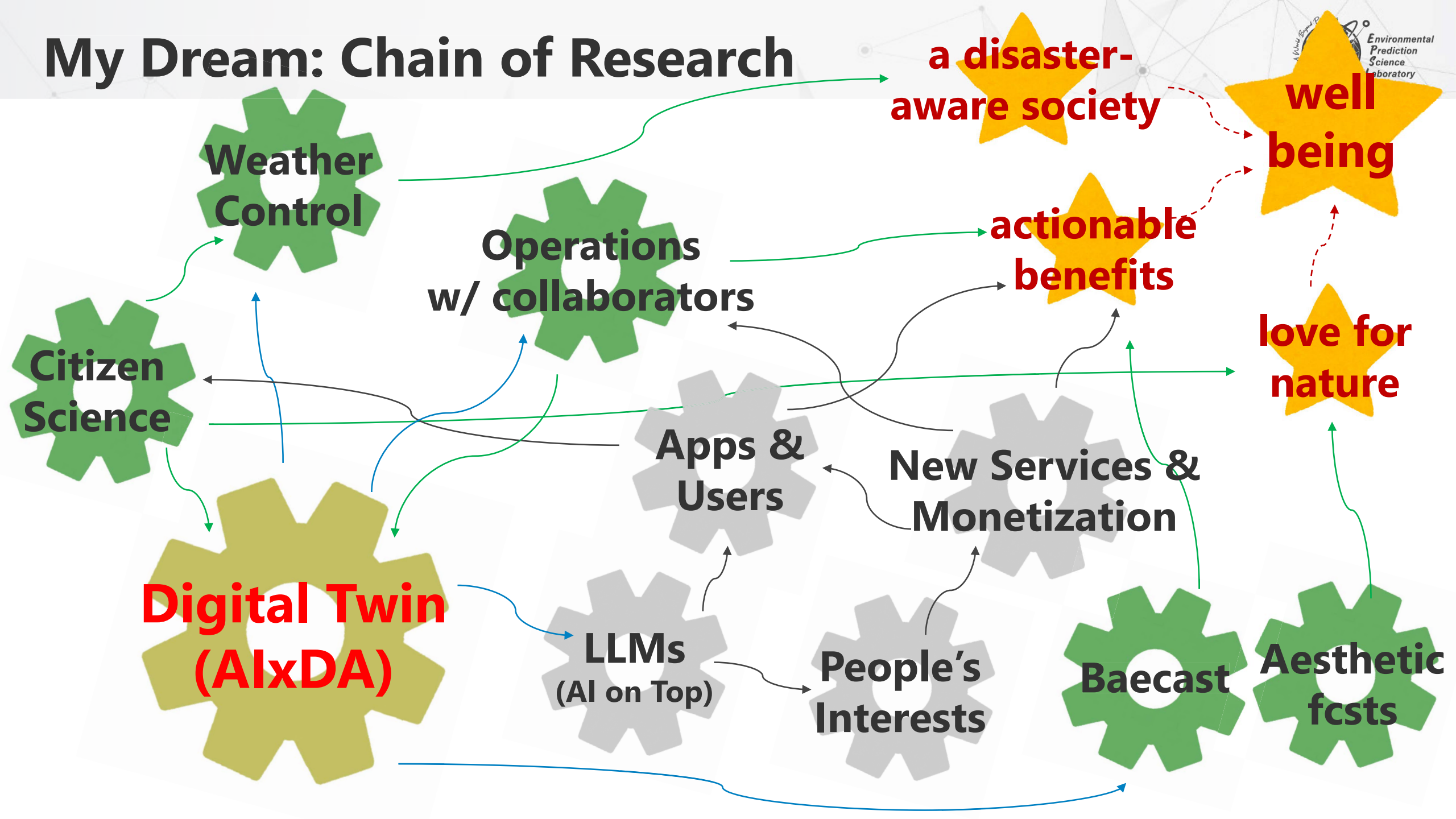
- **Team GRIT**

- break down the path to publication into concrete steps
- identify and remove the bottlenecks in our lab.

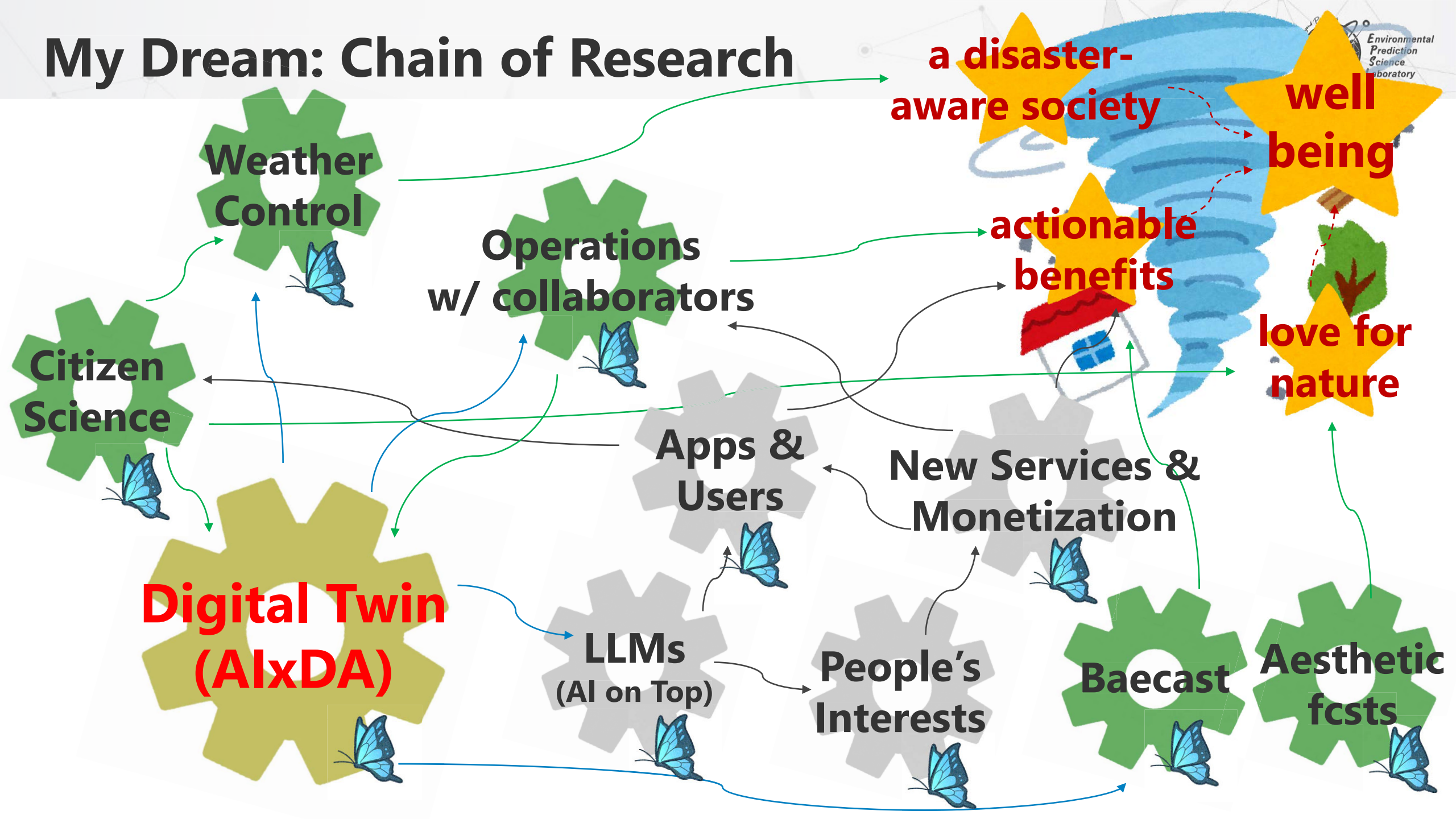


# Summary

# My Dream: Chain of Research



# My Dream: Chain of Research



# Our Vision: Transforming Environmental Predictions

Exploring “actionable” predictions with AI and DA

imaginable

engageable

controllable



Making predictions actionable  
(imaginable fcst)

Empowering citizens to obs weather  
(co-creation via citizen science)

Enabling us to act on the weather  
(through Moonshot Project)

With Publications!

# Thank you for your attention!



環境予測科学で創る  
想像を超える未来

A World Beyond Predictions

Center for Environmental Remote Sensing (CEReS), Chiba University  
Environmental Prediction Science Lab.

<https://kotsuki-lab.com>

