IceNet

Demonstrating data-driven climate science for real-world applications

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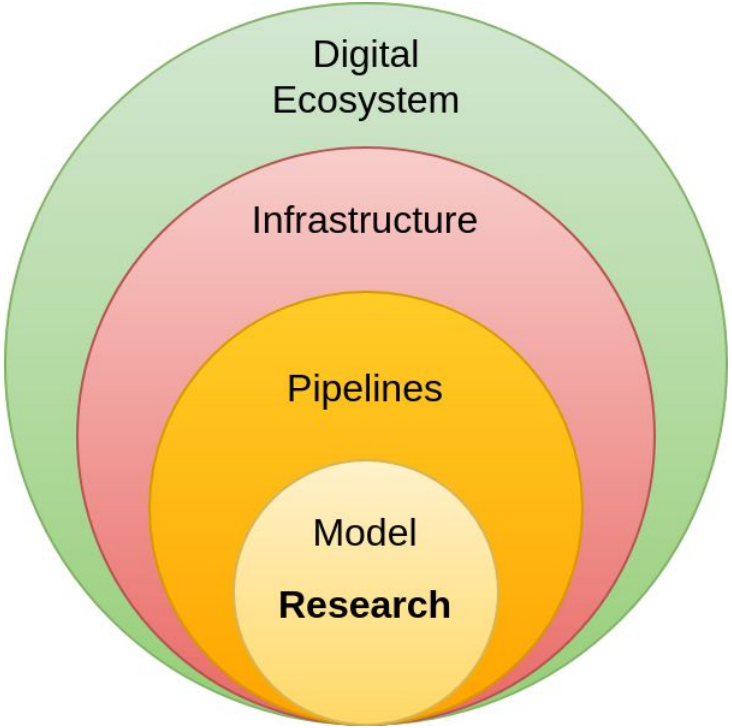
What is IceNet?

1. A sea ice prediction system
2. An example of an environmental prediction system

Alliums? Tree rings? TOR!? IceNet's built in layers using sustainable software…



What are these layers!?!

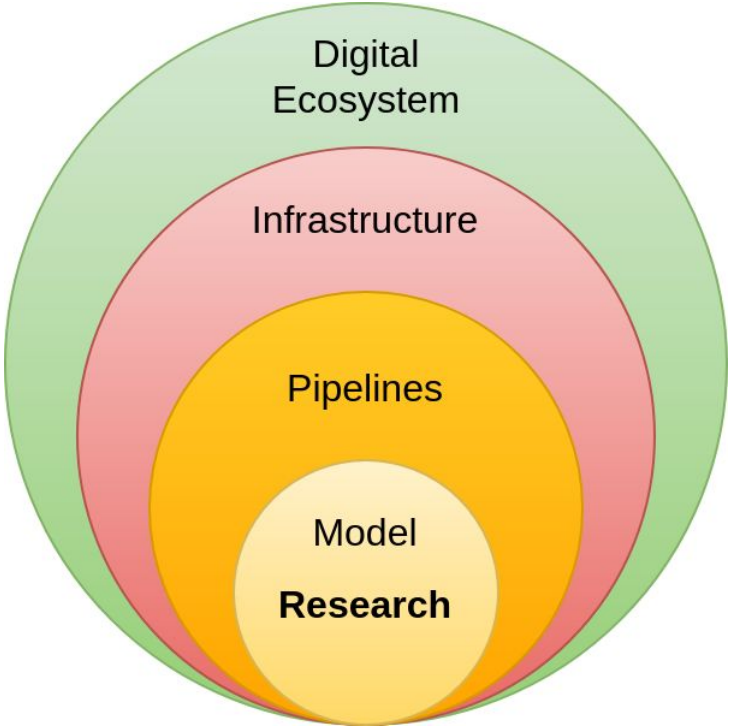
Model: The producer(s) of research data products.

Pipelines: The operational layer providing tooling, automation and simplifying model usage.

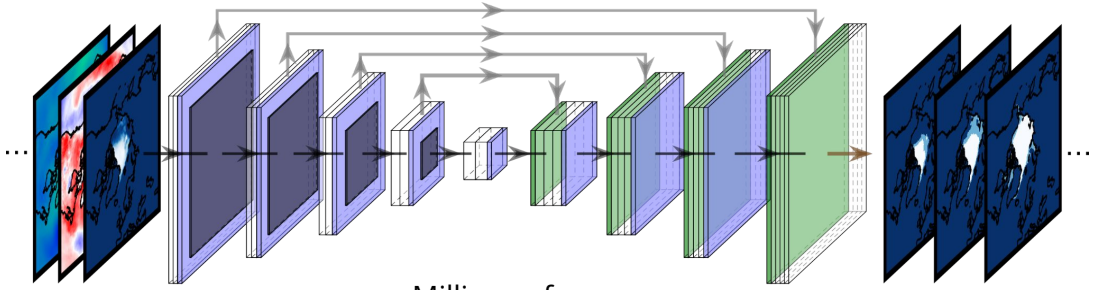
Infrastructure: Enabling access and to products and services providing by pipelines.

Digital Ecosystem: Building interaction through standardisation and FAIR access to infrastructure.

Researchers do **research**, which enables real world applications! IceNet is an example…



IceNet: the **model** and **research**



Sea ice satellite obs + environmental variables → Millions of parameters, trained on past data from Arctic & Antarctic → 25 km sea ice concentration forecast

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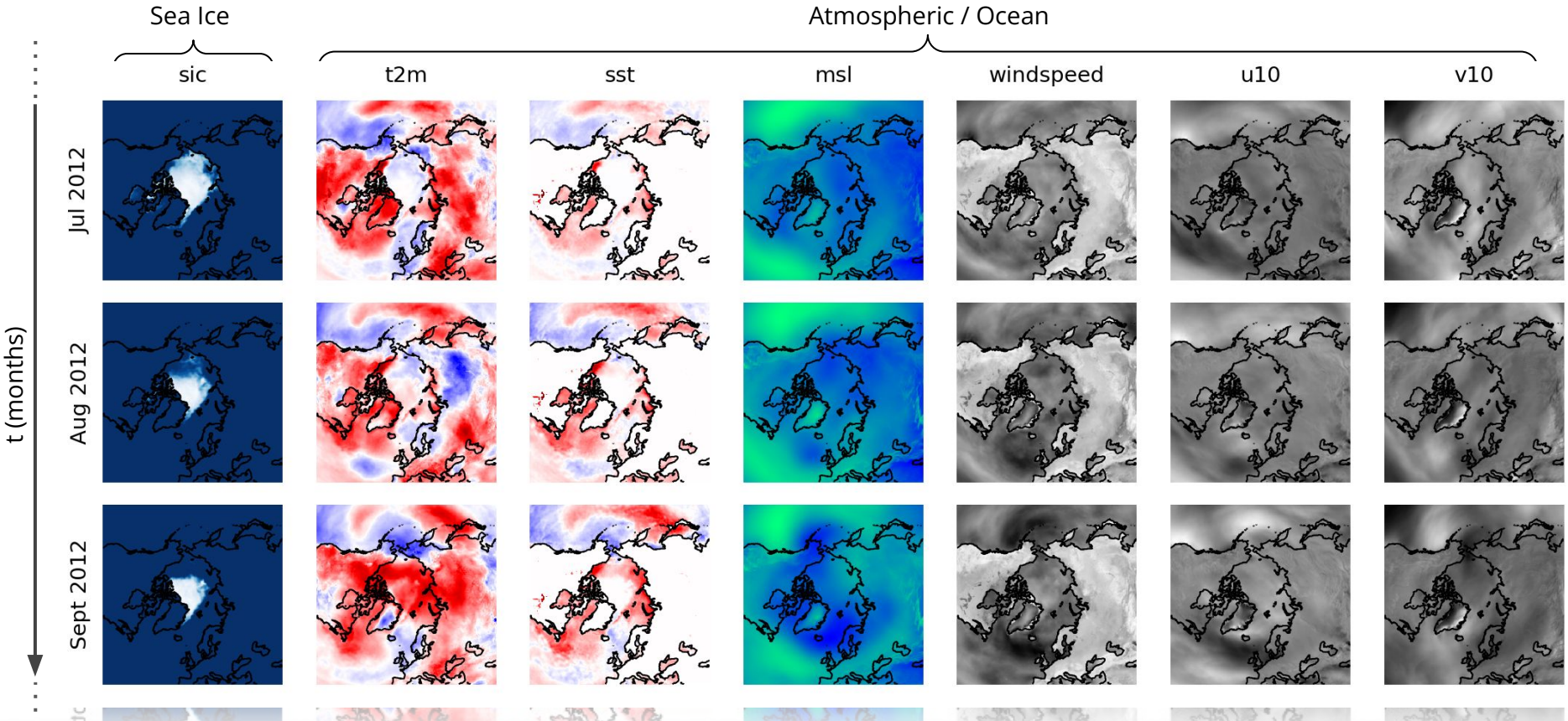
Seasonal Arctic sea ice forecasting with probabilistic deep learning

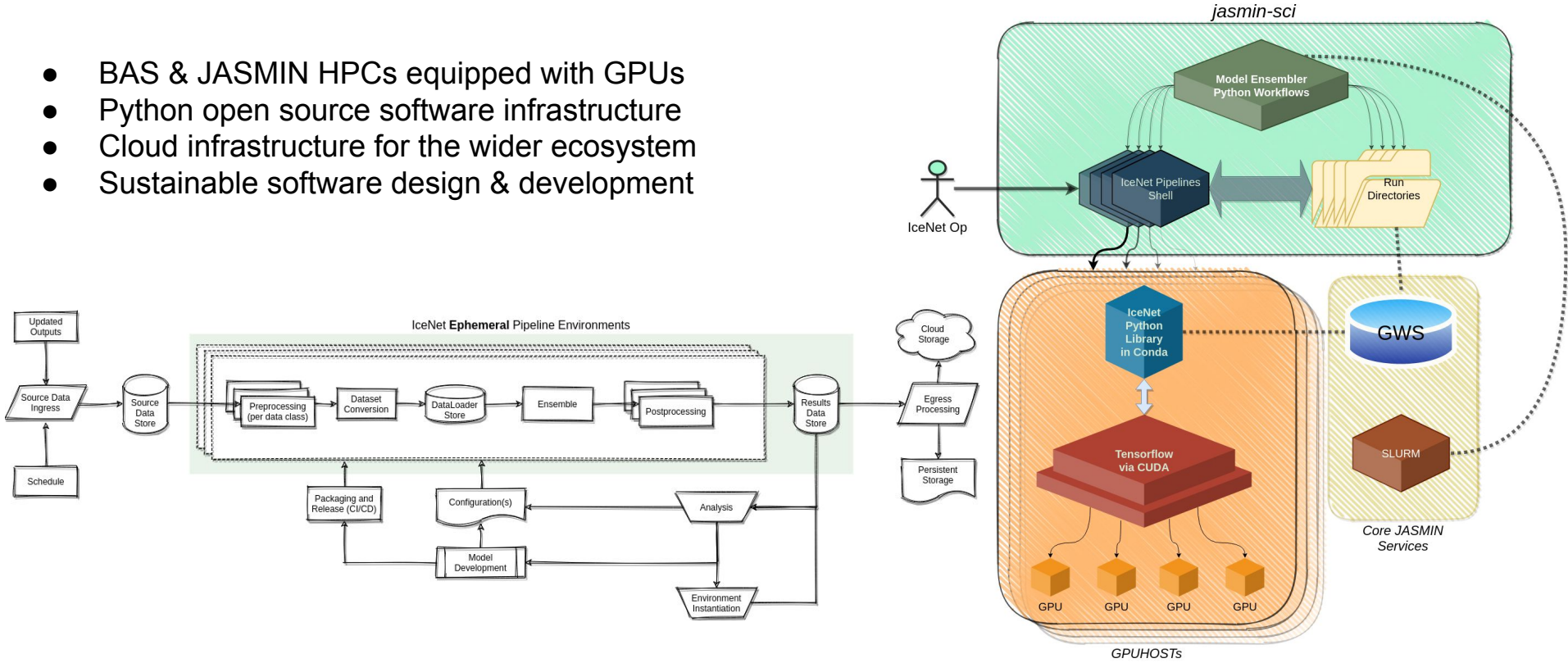
Tom R. Andersson ✉, J. Scott Hosking, María Pérez-Ortiz, Brooks Paige, Andrew Elliott, Chris Russel

IceNet training data: learning from observations



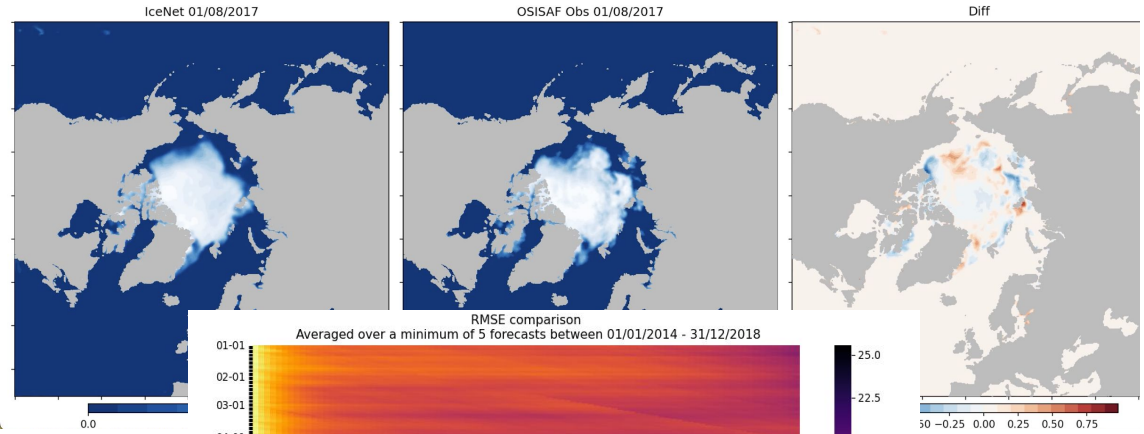
Pipelines facilitating **research** and **operational** use

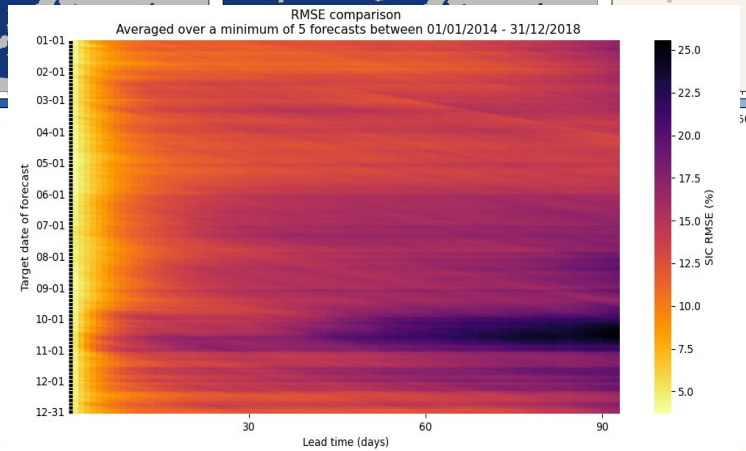
- BAS & JASMIN HPCs equipped with GPUs
- Python open source software infrastructure
- Cloud infrastructure for the wider ecosystem
- Sustainable software design & development

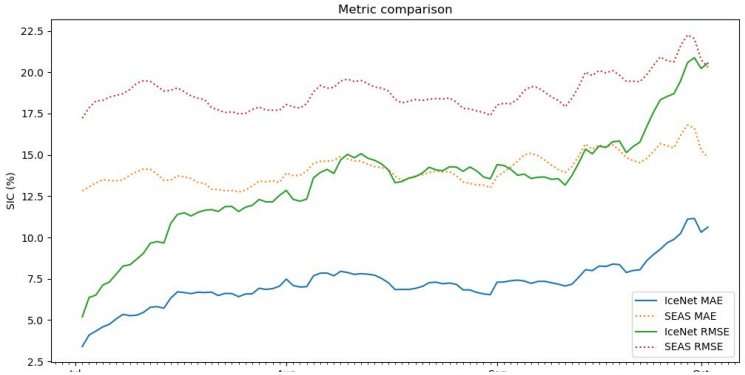


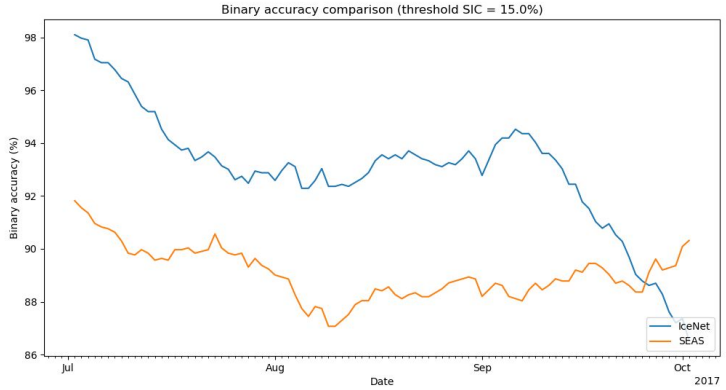
Question: How can we validate / evaluate our forecasts?

Compare **IceNet** SIC predictions against the **ground truth OSISAF** and other **numerical predictions**.

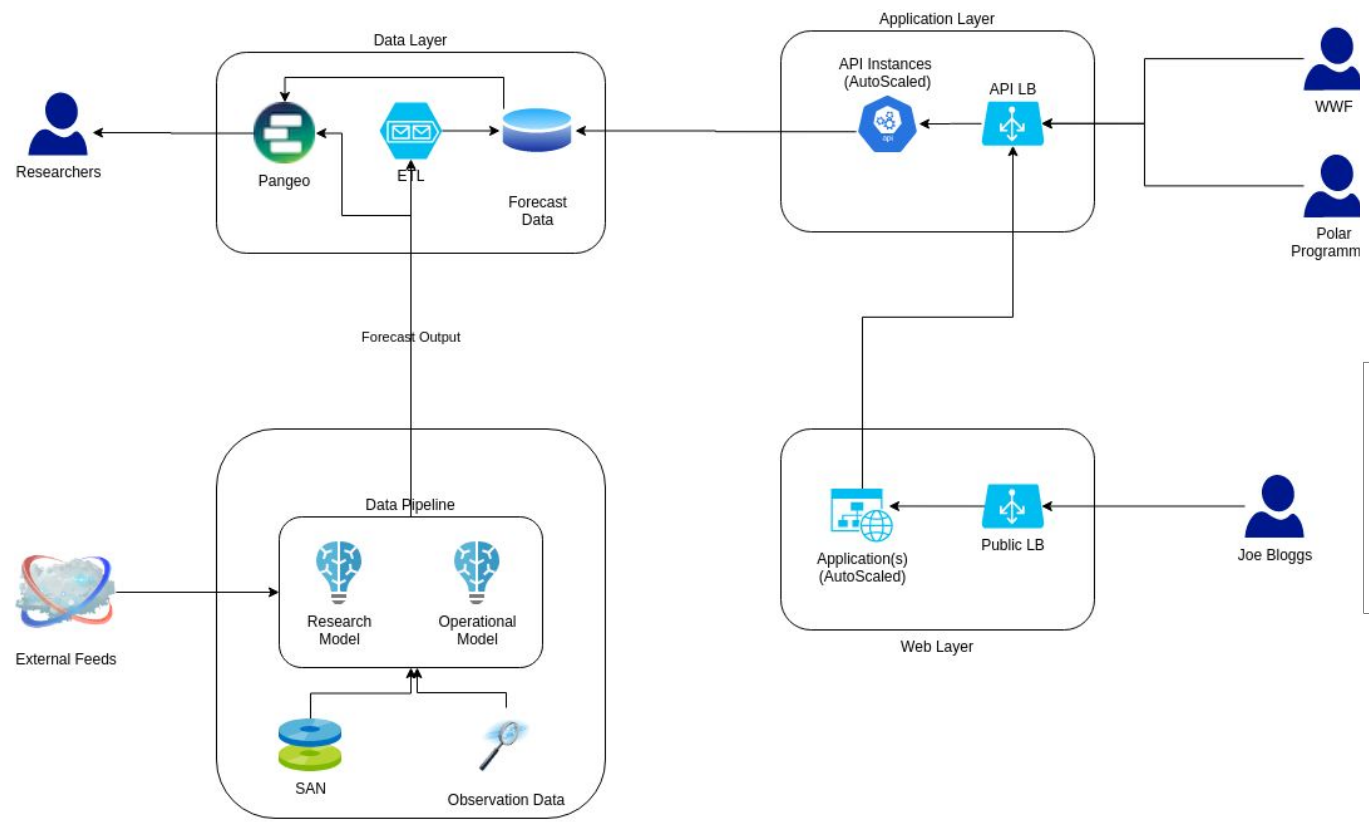


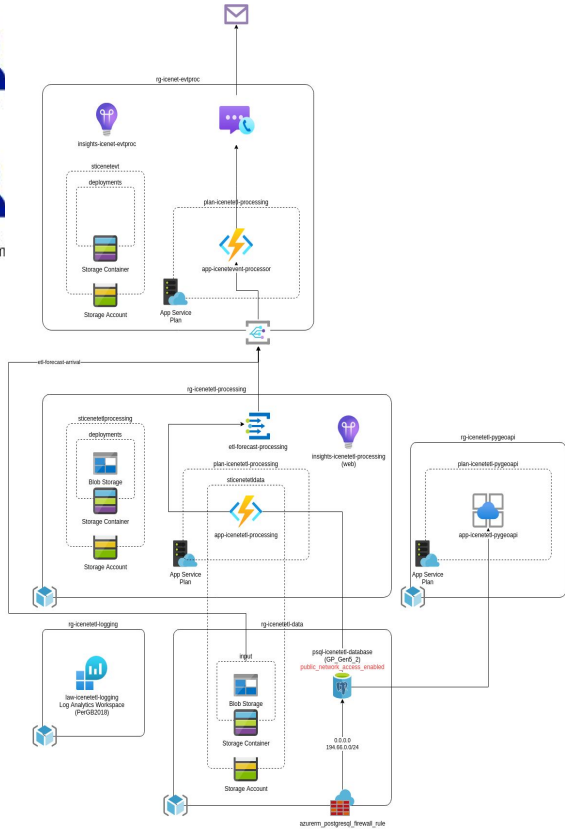




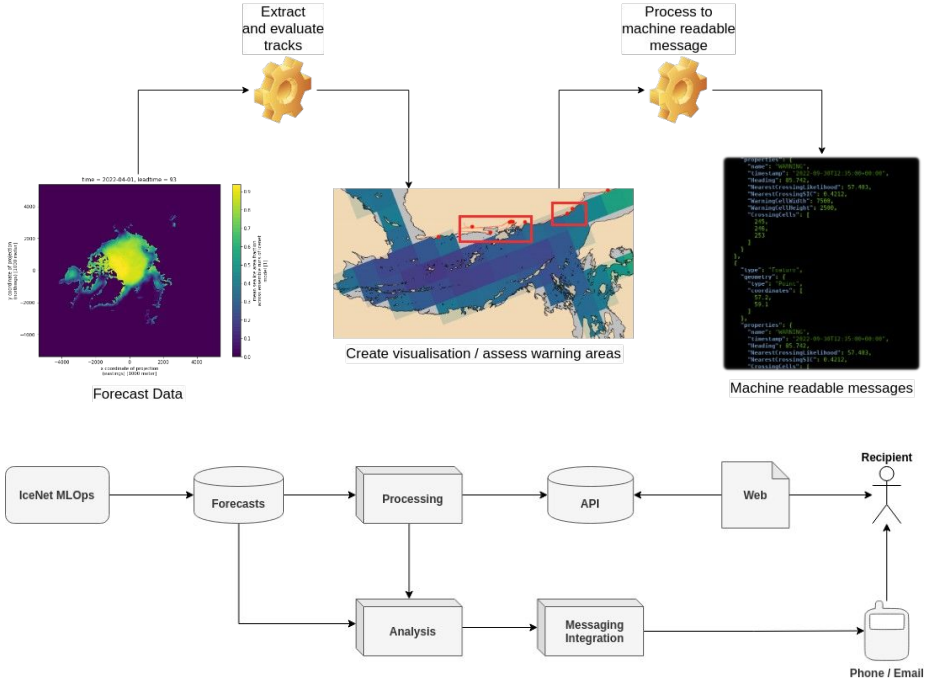


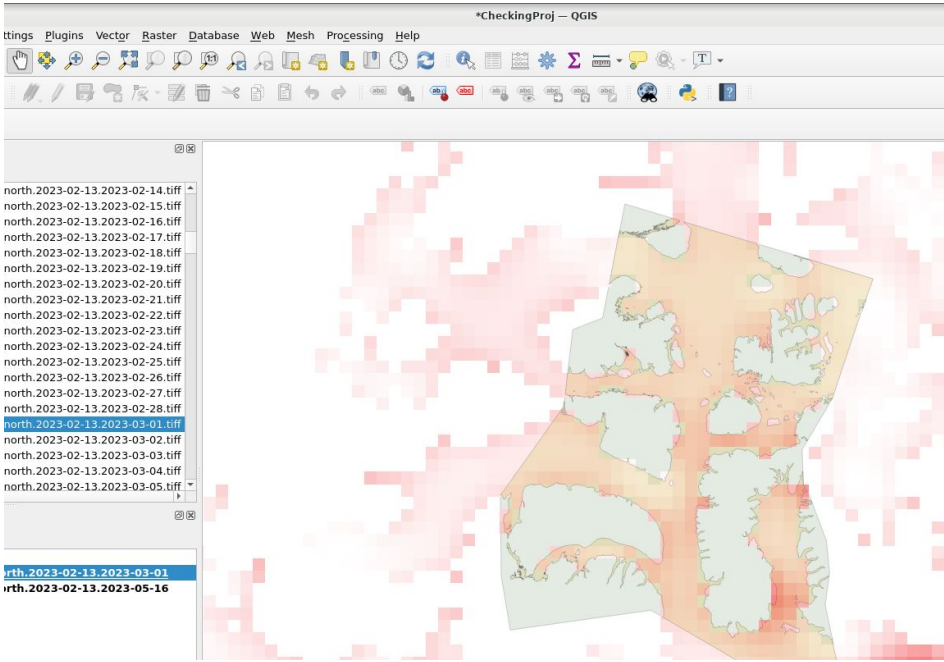
Building **infrastructure** provides access to **products** and **services**



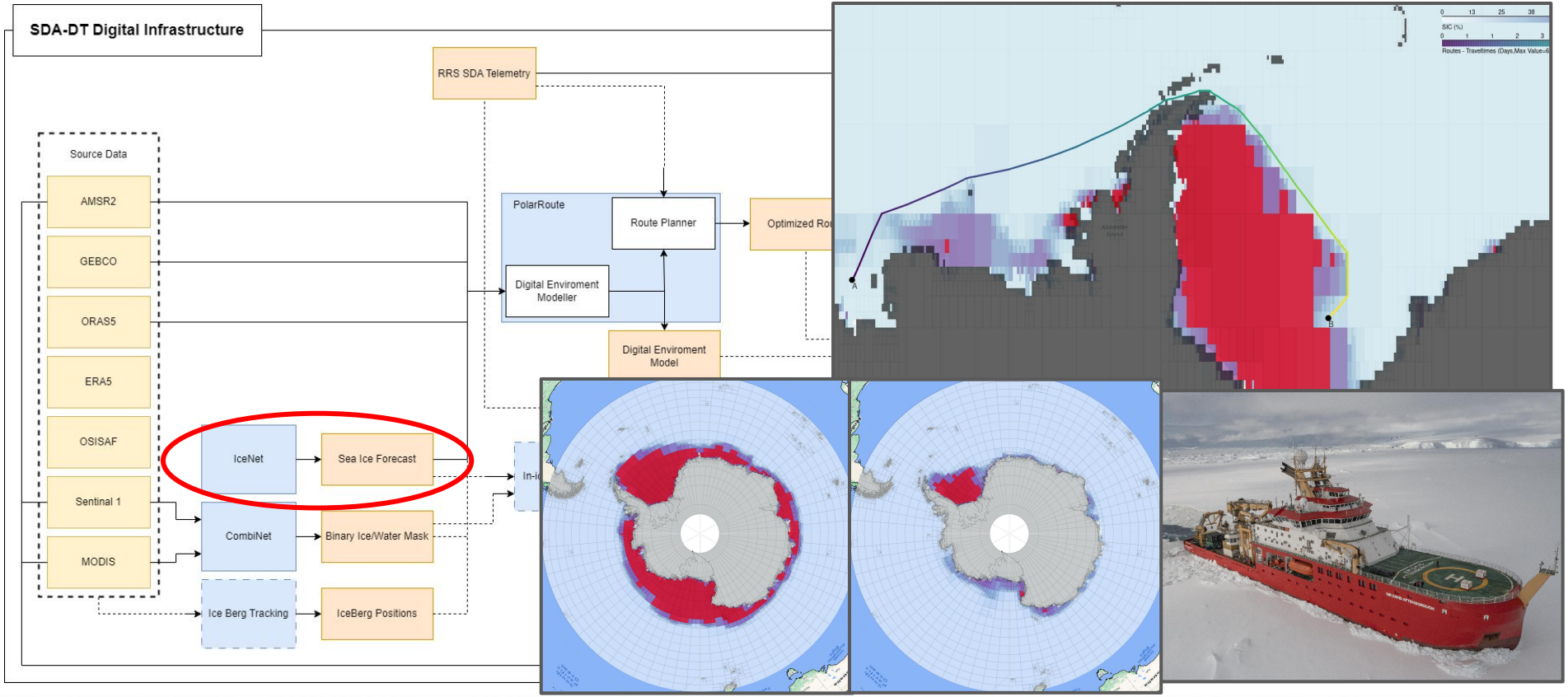


Infrastructure requirements driven by conservation use cases

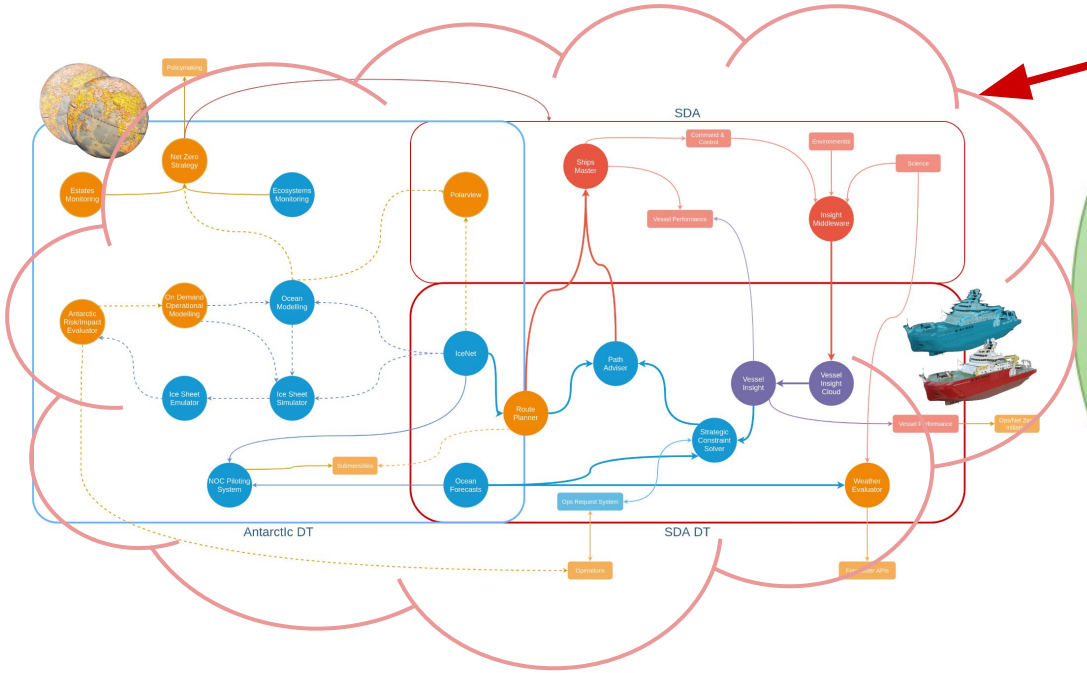


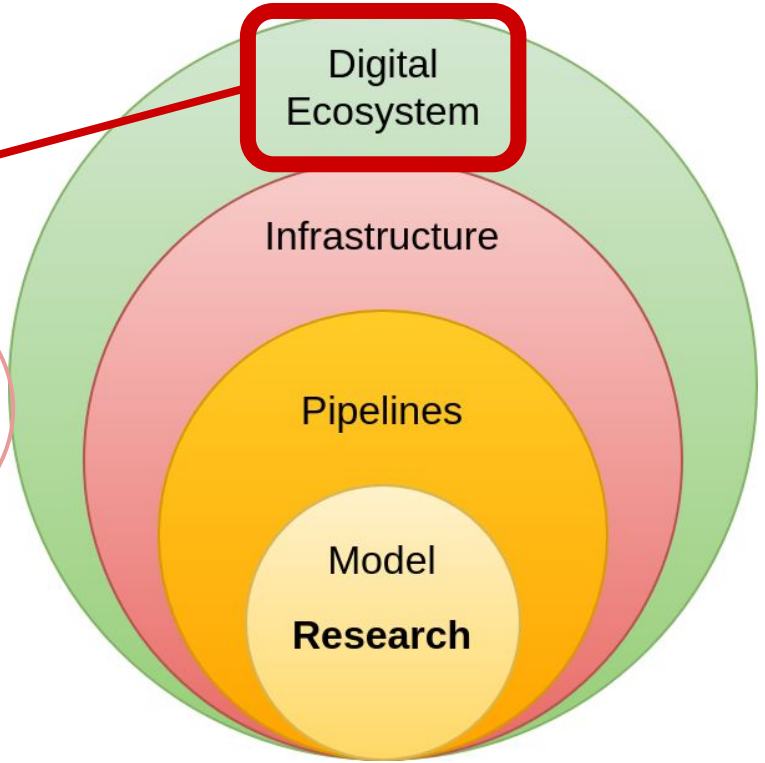


BAS real world use case: Sir David Attenborough Route Planning

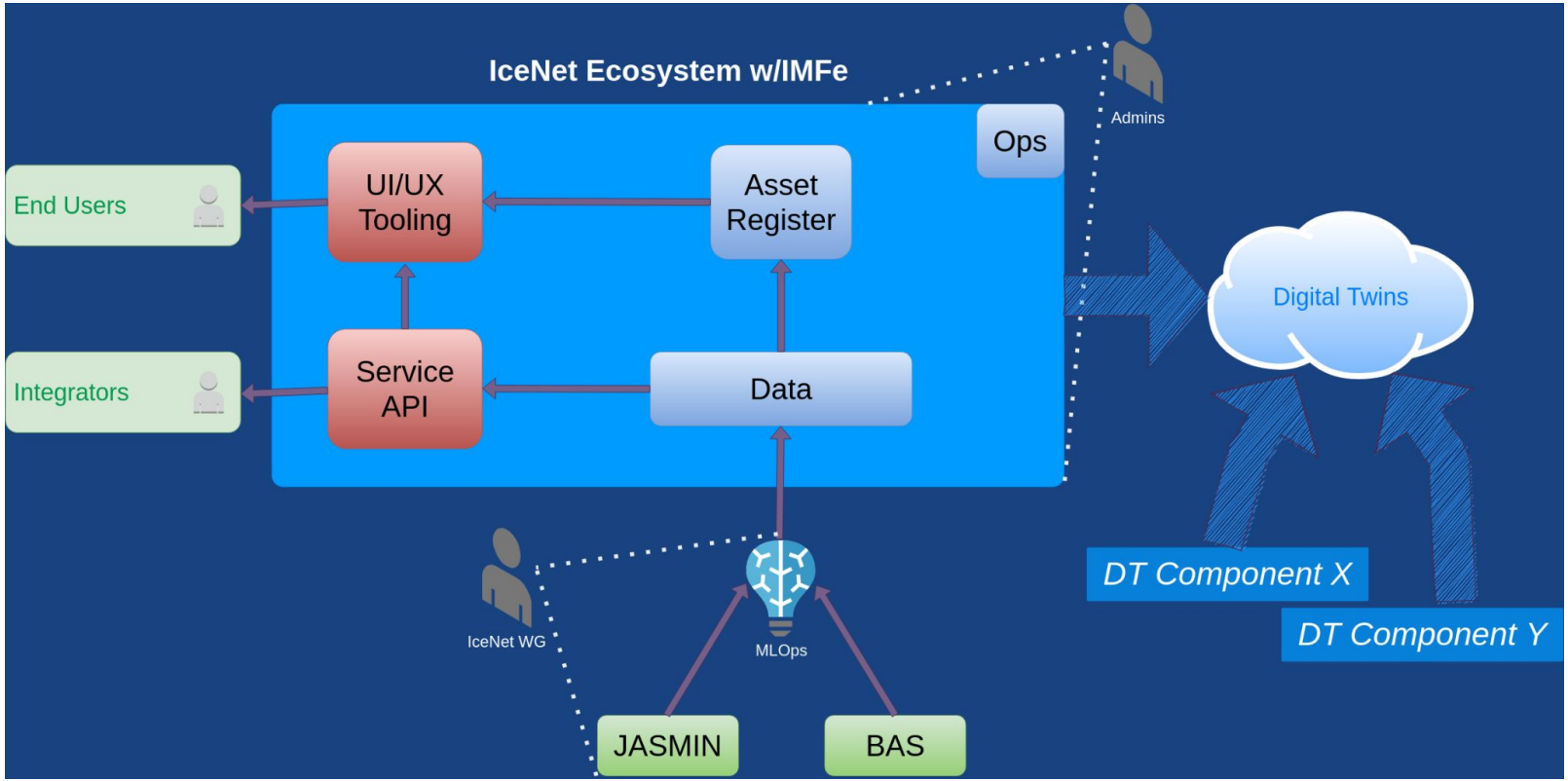


Infrastructures as part of **Digital Ecosystems**





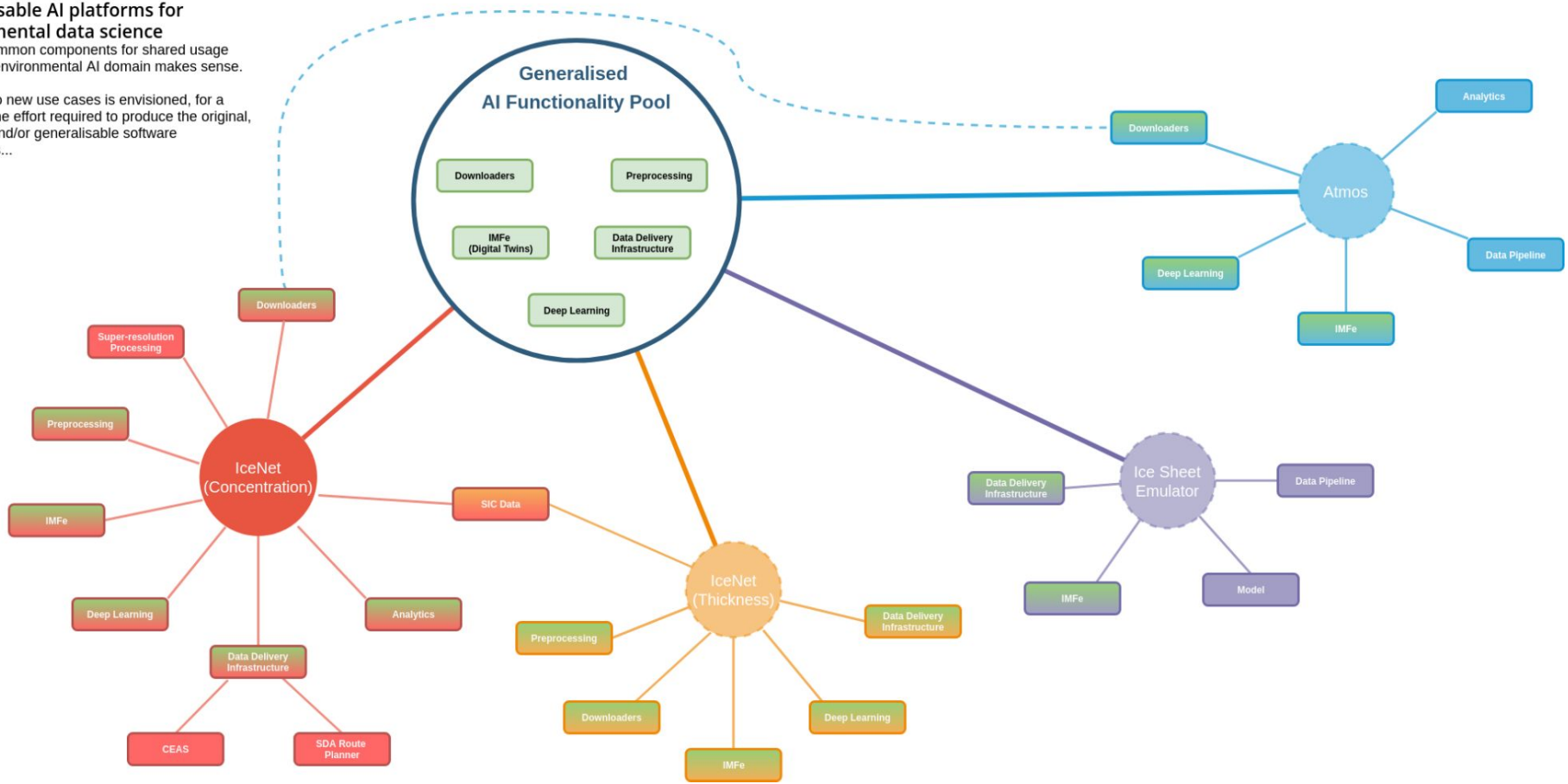
Information Management Frameworks for environmental Digital Twins



Generalisable AI platforms for environmental data science

Creating common components for shared usage across the environmental AI domain makes sense.

Extending to new use cases is envisioned, for a fraction of the effort required to produce the original, adaptable and/or generalisable software components...



Takeaways…

1. Develop your **research** responsibly!

2. Develop **pipelines** and **infrastructure** to support your users (real or imaginary, research or operational!)

3. Layered approaches promote reuse, adaptability, interoperability. The core concepts for a **digital ecosystem**.

Questions?