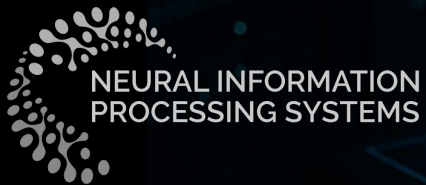


A modular framework to run AI-based models from high-resolution climate projections

Aina Gaya-Àvila, Amirpasha Mozaffari, Amanda Duarte, Oriol Tintó



Climate Change AI

NeurIPS Climate Change AI
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Computational
Power



Barcelona
Supercomputing
Center
Centre Nacional de Supercomputació



Funded by
the European Union

Destination Earth



EuroHPC
Joint Undertaking

LUMI



Barcelona
Supercomputing
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Computationally
expensive



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Destination Earth



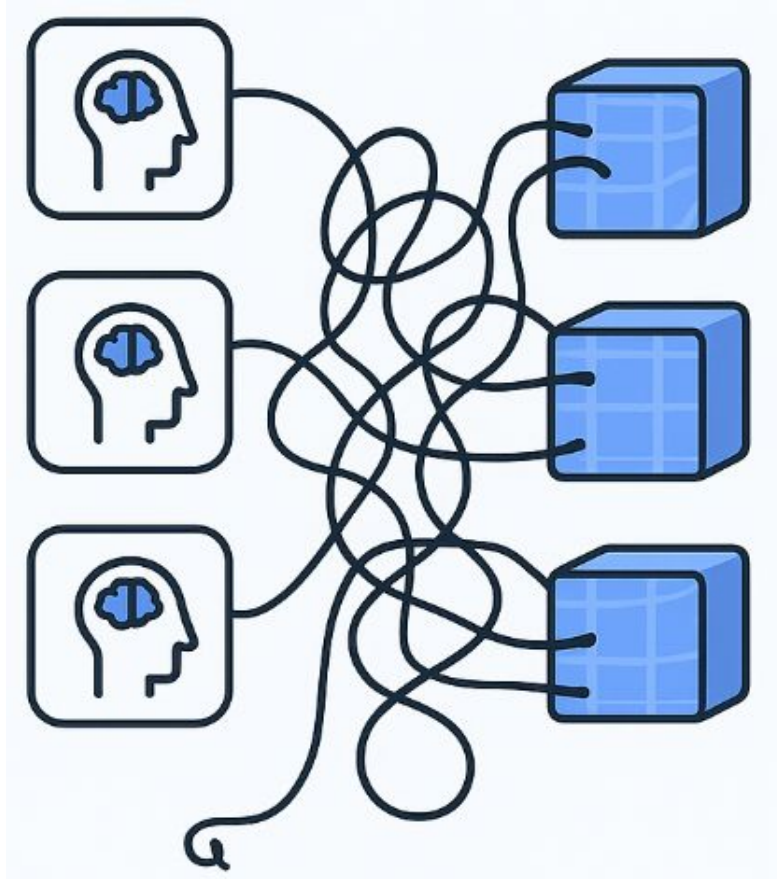
EuroHPC
Joint Undertaking

LUMI

**Computationally
expensive**

**Outputs that they
produce are currently not
directly prepared to be
ingested by AI-models**

Integrating AI-models with High-Resolution Simulations

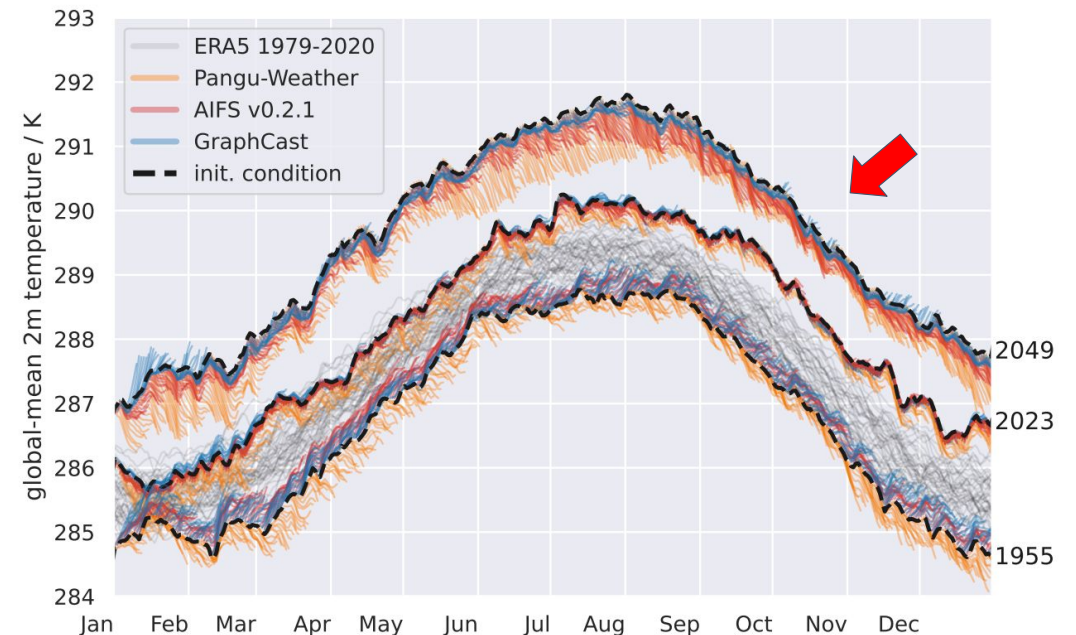


- Current integration is ad hoc
- Mostly model-specific
- Hard to reproduce

➔ **Slows research progress**

Integrating AI-models with High-Resolution Simulations

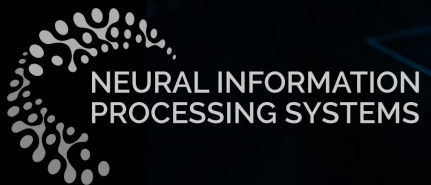
- Check performance of AI-models under different conditions
- Increase the data sample in a cheaper way
- Be able to produce uncertainty metrics



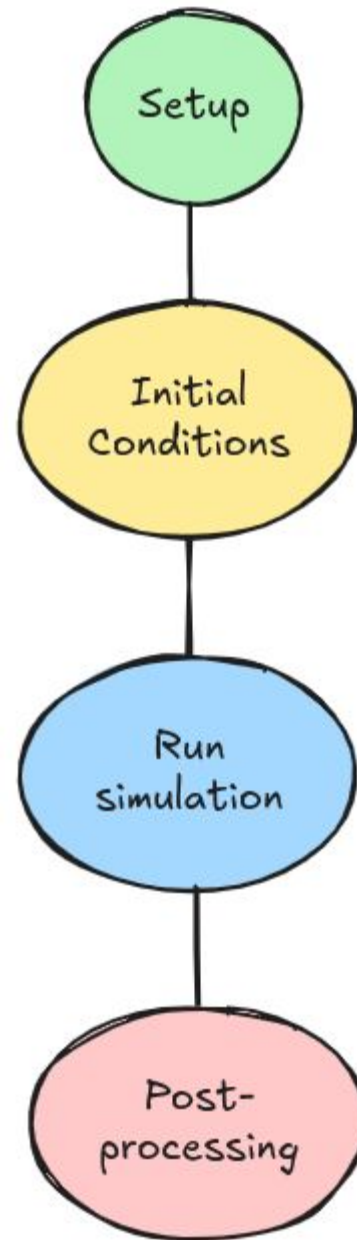
Objective

- Build a framework that runs multiple AI models on heterogeneous datasets.
- **Built on Best Practices:** Uses established climate science workflow methods.
- **Portable & Reproducible:** containerization for seamless deployment. FAIR-compliant.
- **End-to-End Automation:** Standardizes data prep, automates model runs, and integrates post-processing & evaluation.
 - **Modular & Extensible:** Easily add new models or datasets.
- **Focus on Science:** Researchers can design experiments without technical overhead.

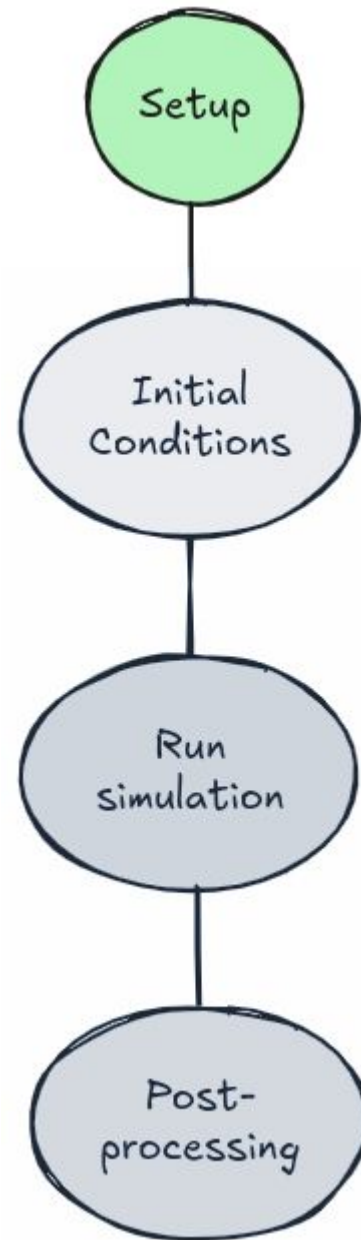
The framework



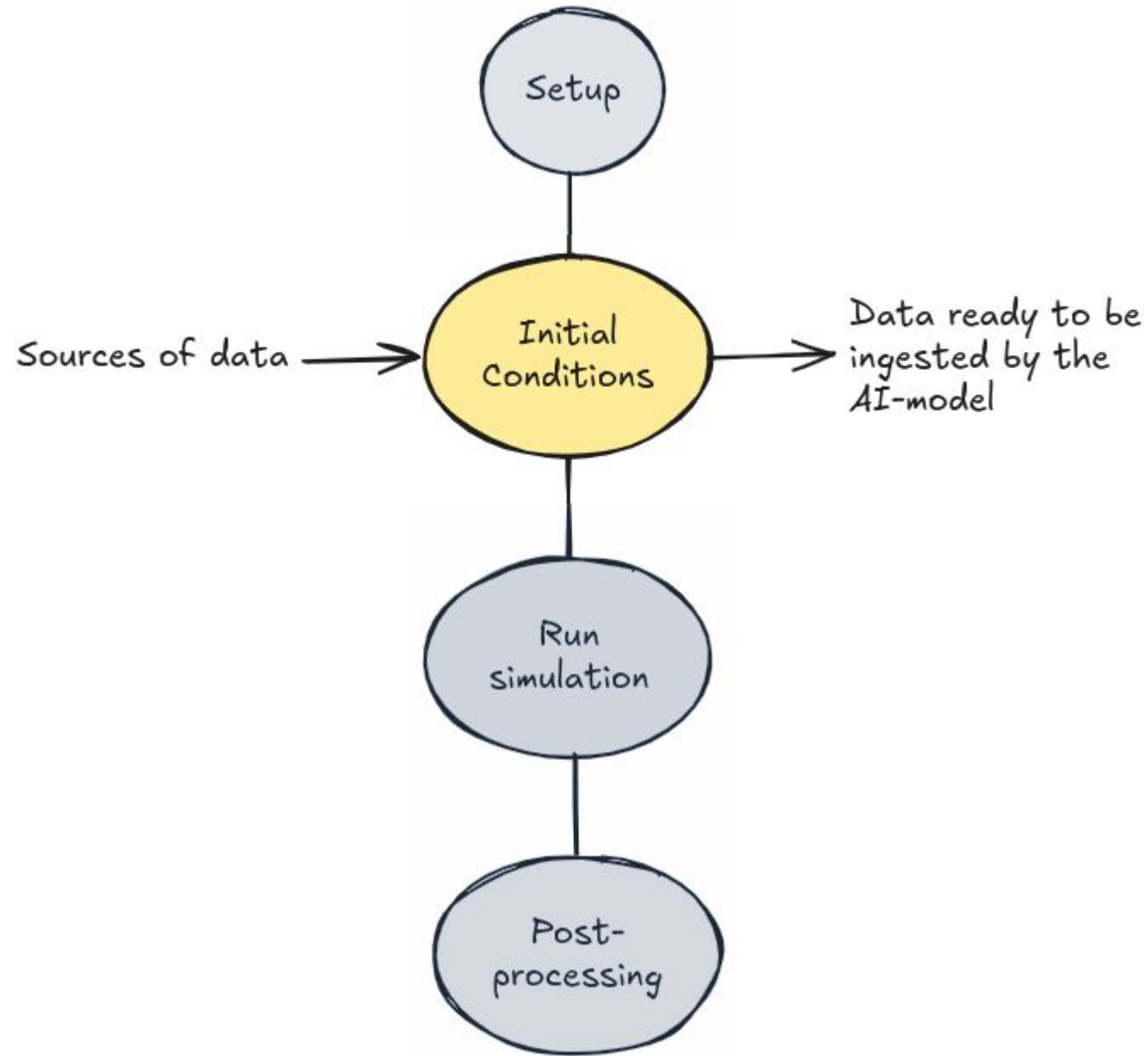
The framework



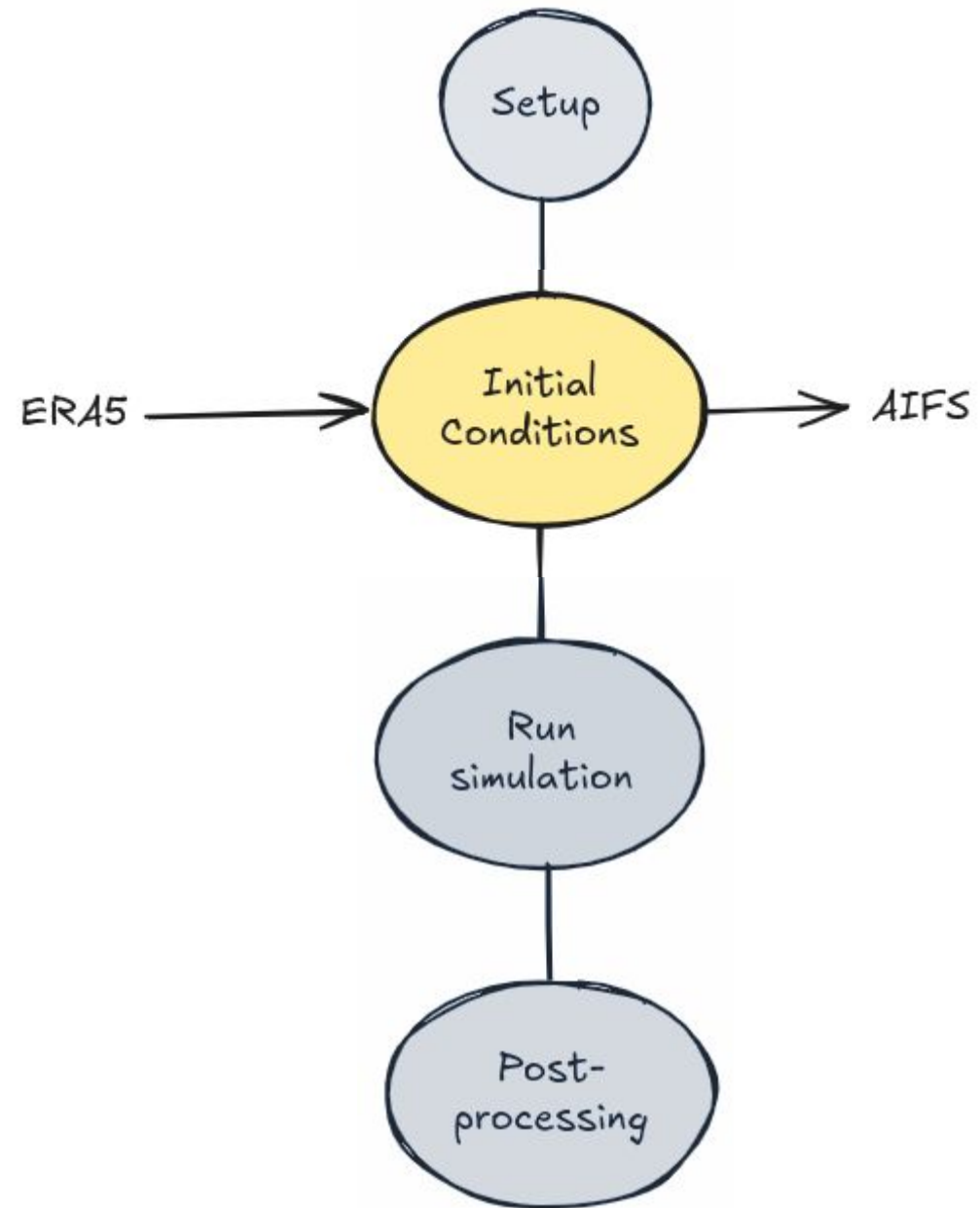
The framework



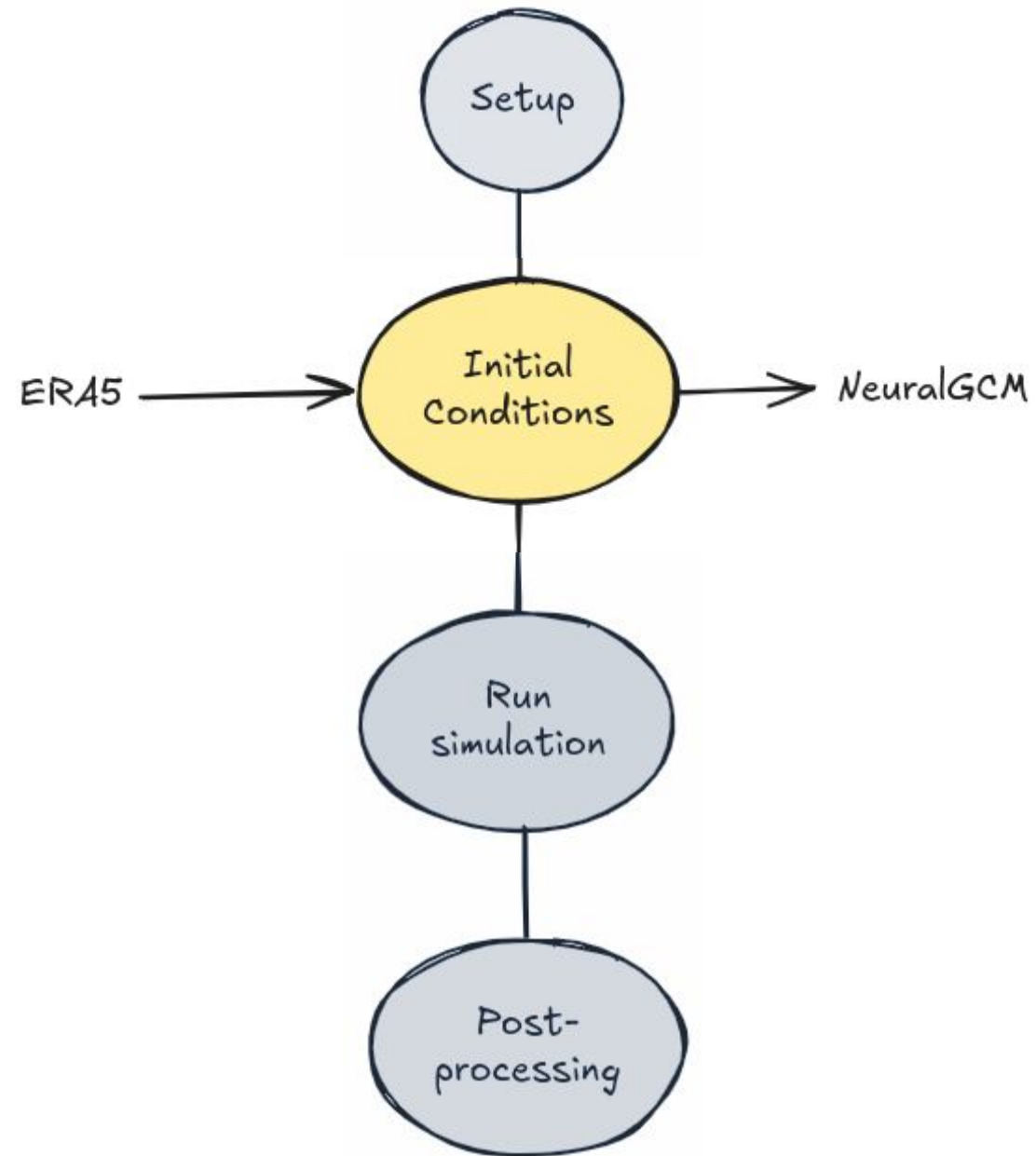
The framework



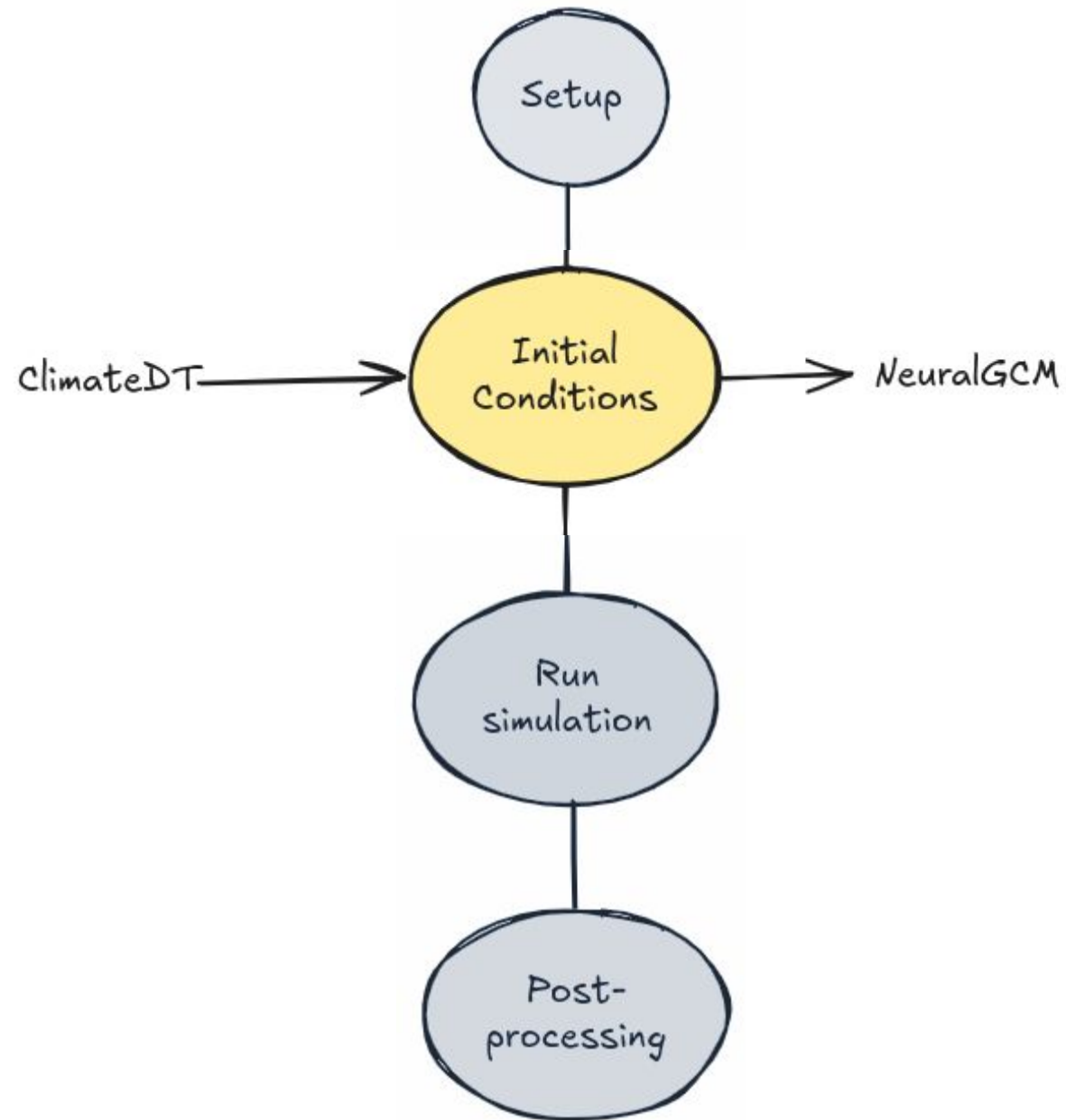
The framework



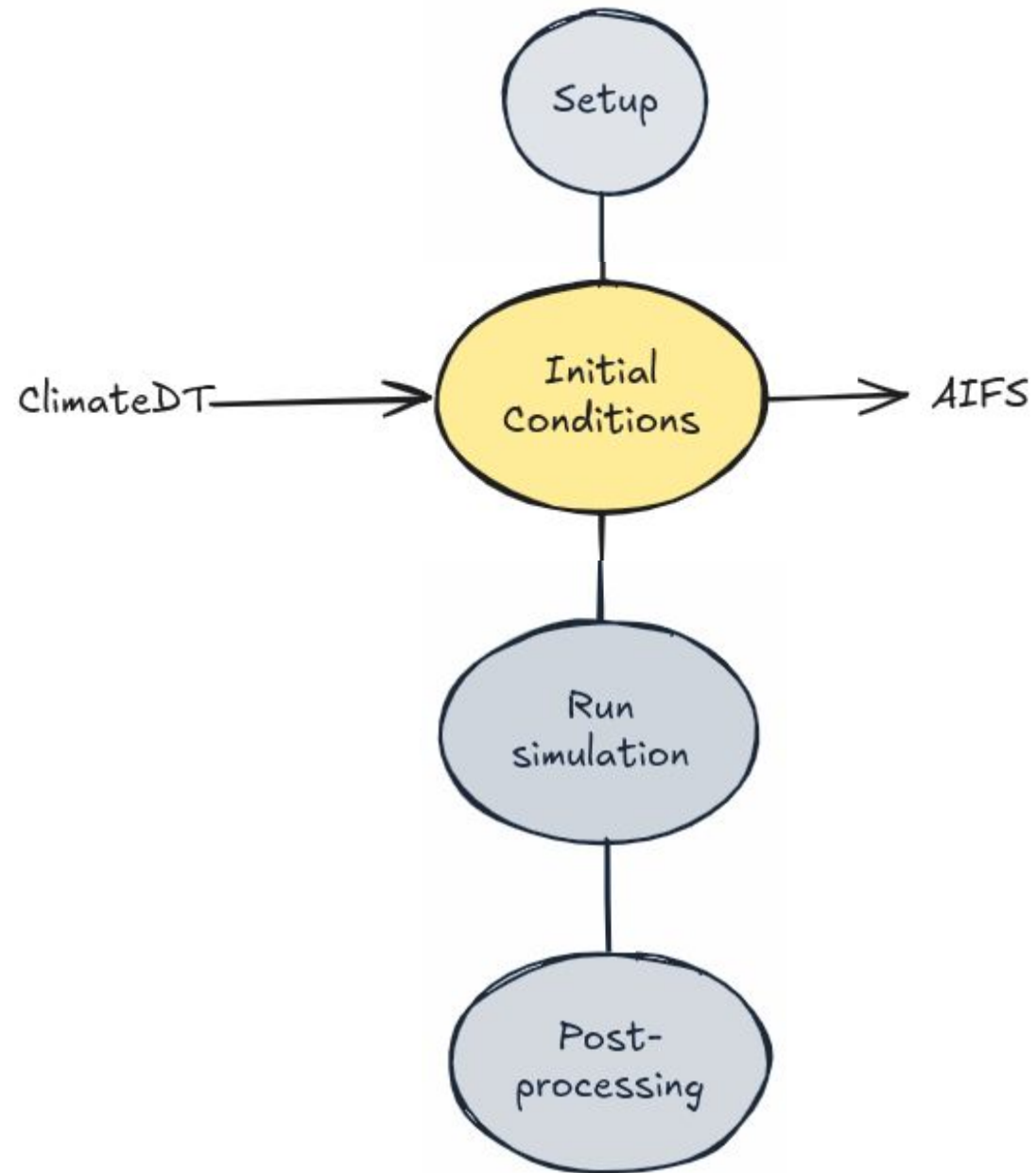
The framework



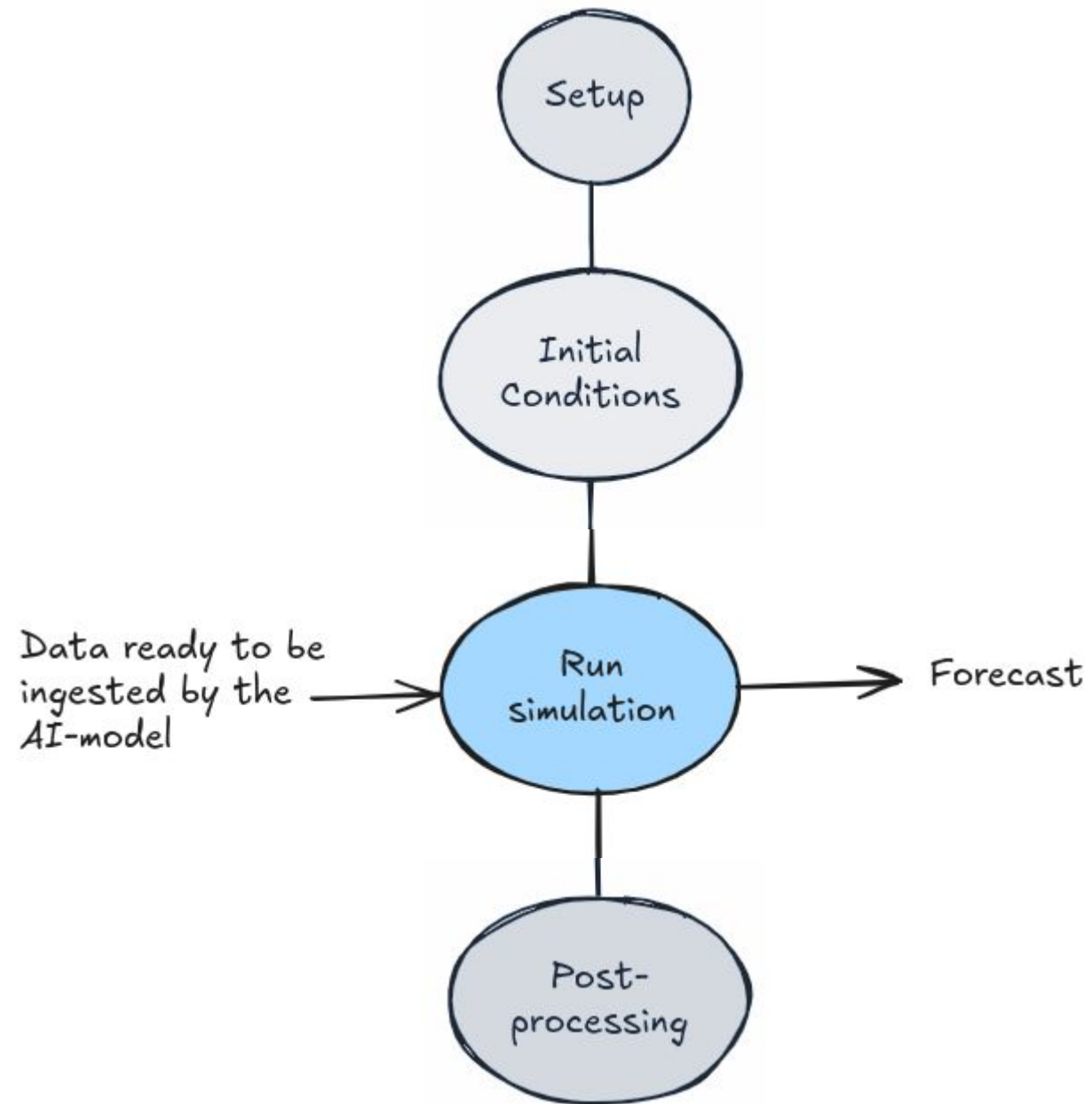
The framework



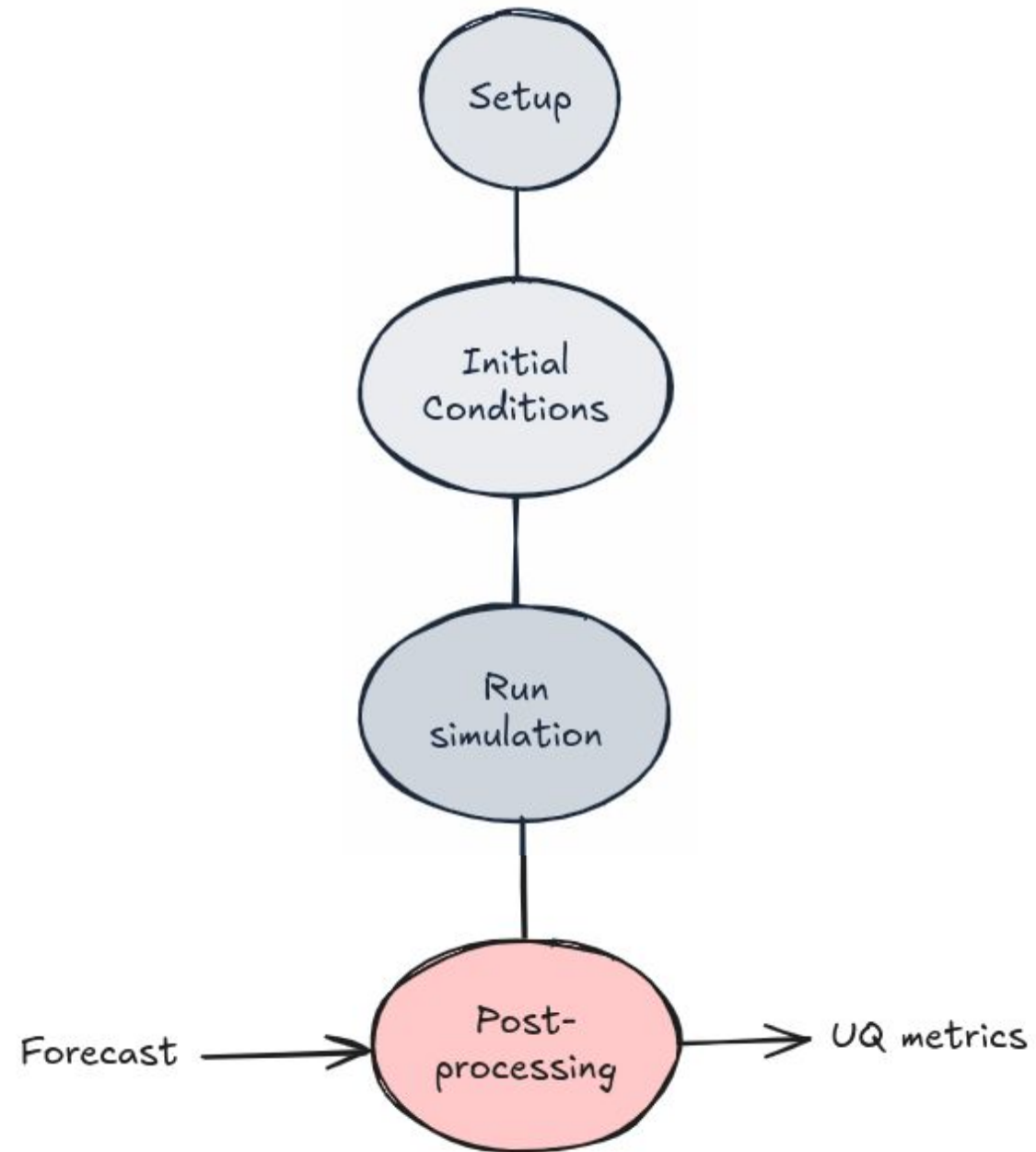
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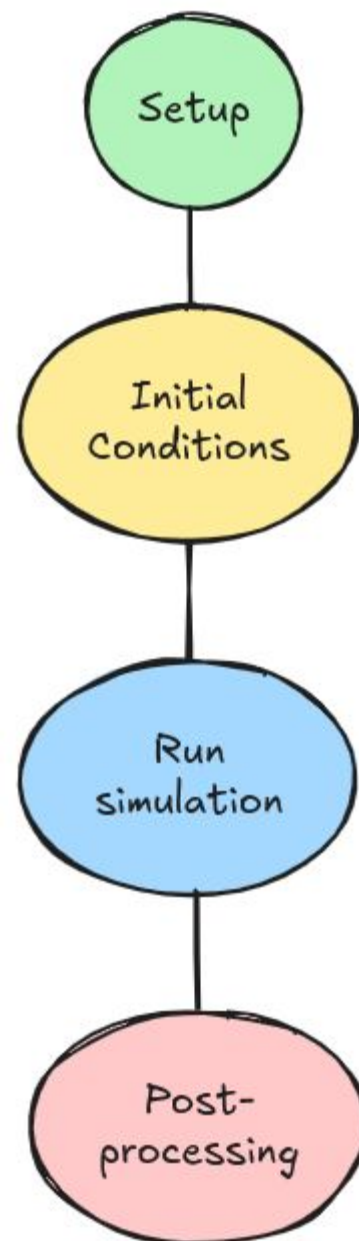
The framework



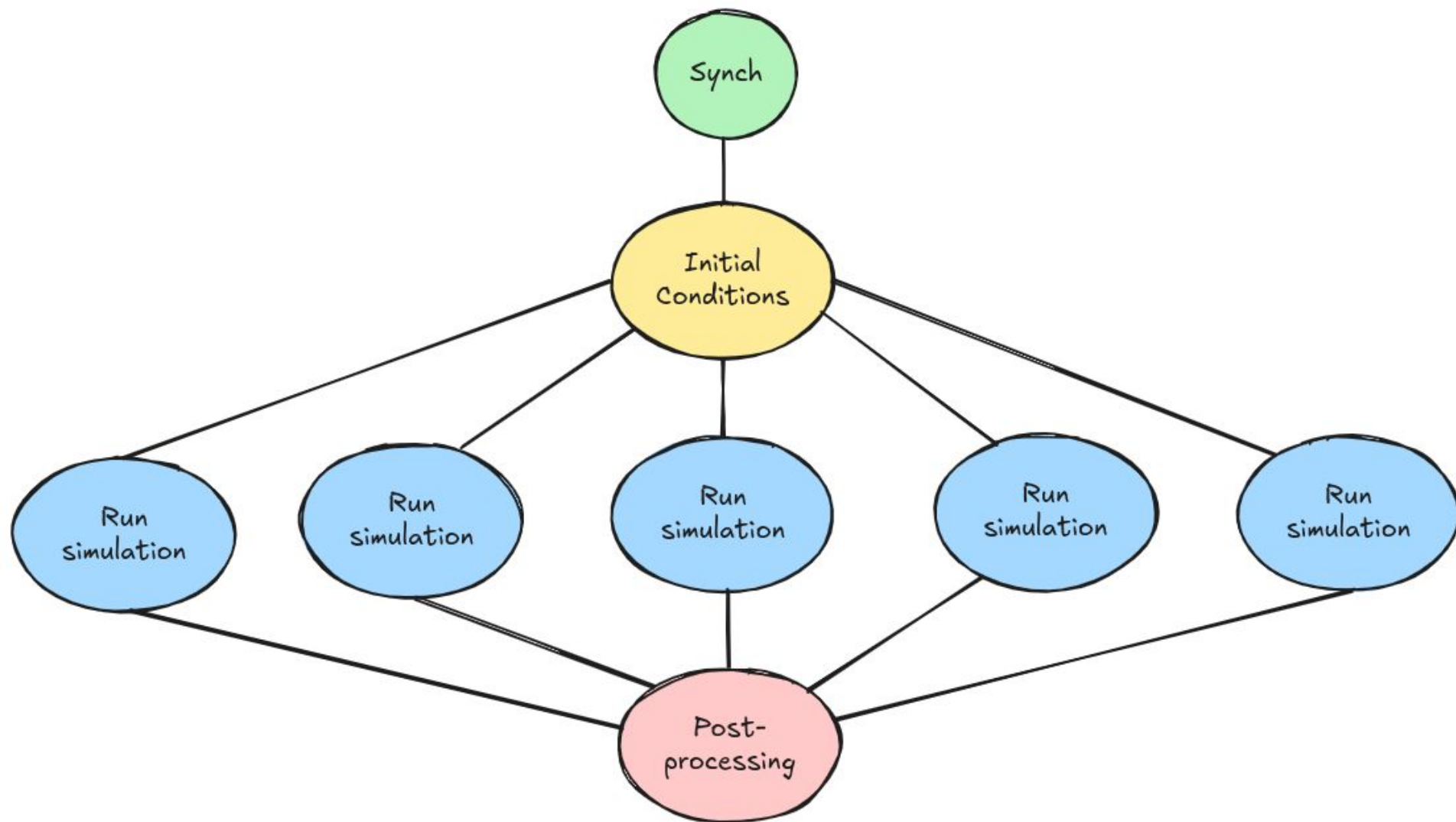
The framework



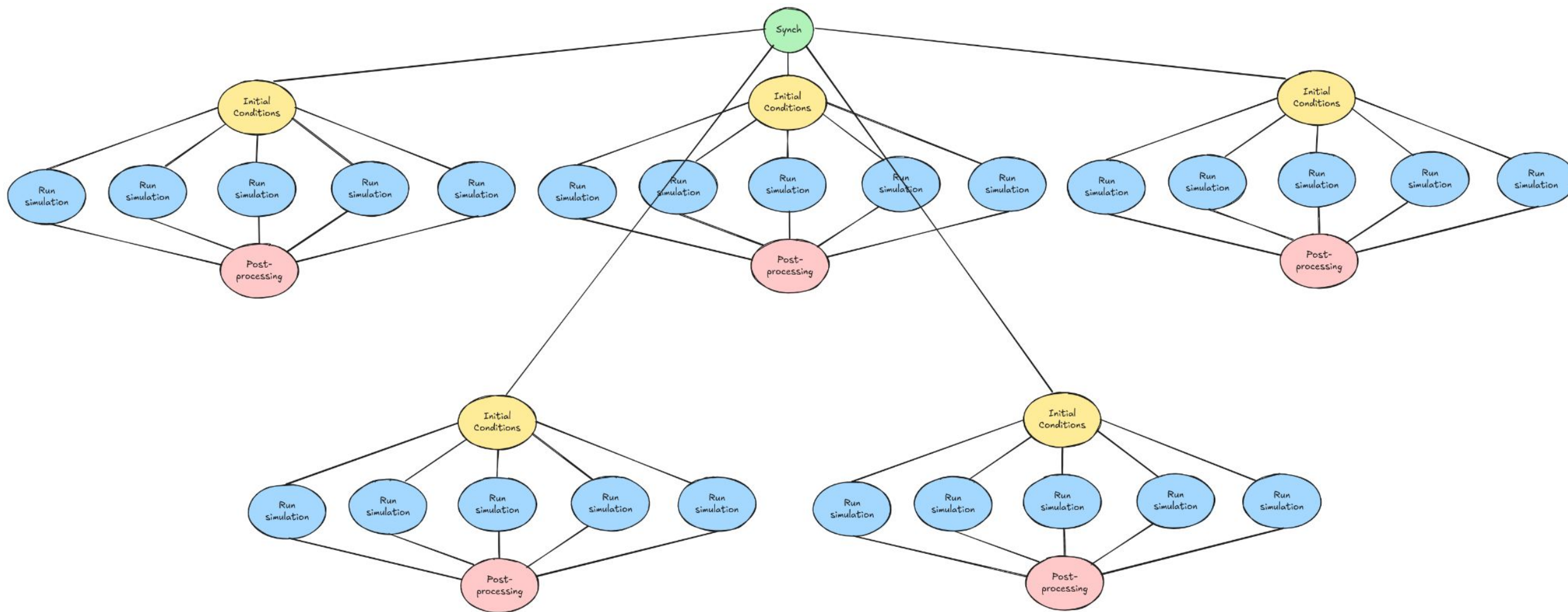
1 start date
1 member



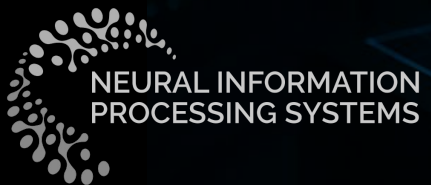
1 start date, 5 members



5 start dates, 5 members



Usage examples



Basic test



conf.yml

```
AI_MODEL: aifs  
INITIAL_CONDITIONS: climatedt  
EXPERIMENT:  
  DATELIST: 20390106  
  MEMBERS: 1  
  UNIT: day  
  LENGTH: 10
```



conf.yml

```
AI_MODEL: neuralgcm  
INITIAL_CONDITIONS: climatedt  
EXPERIMENT:  
  DATELIST: 20390106  
  MEMBERS: 10  
  UNIT: day  
  LENGTH: 10
```

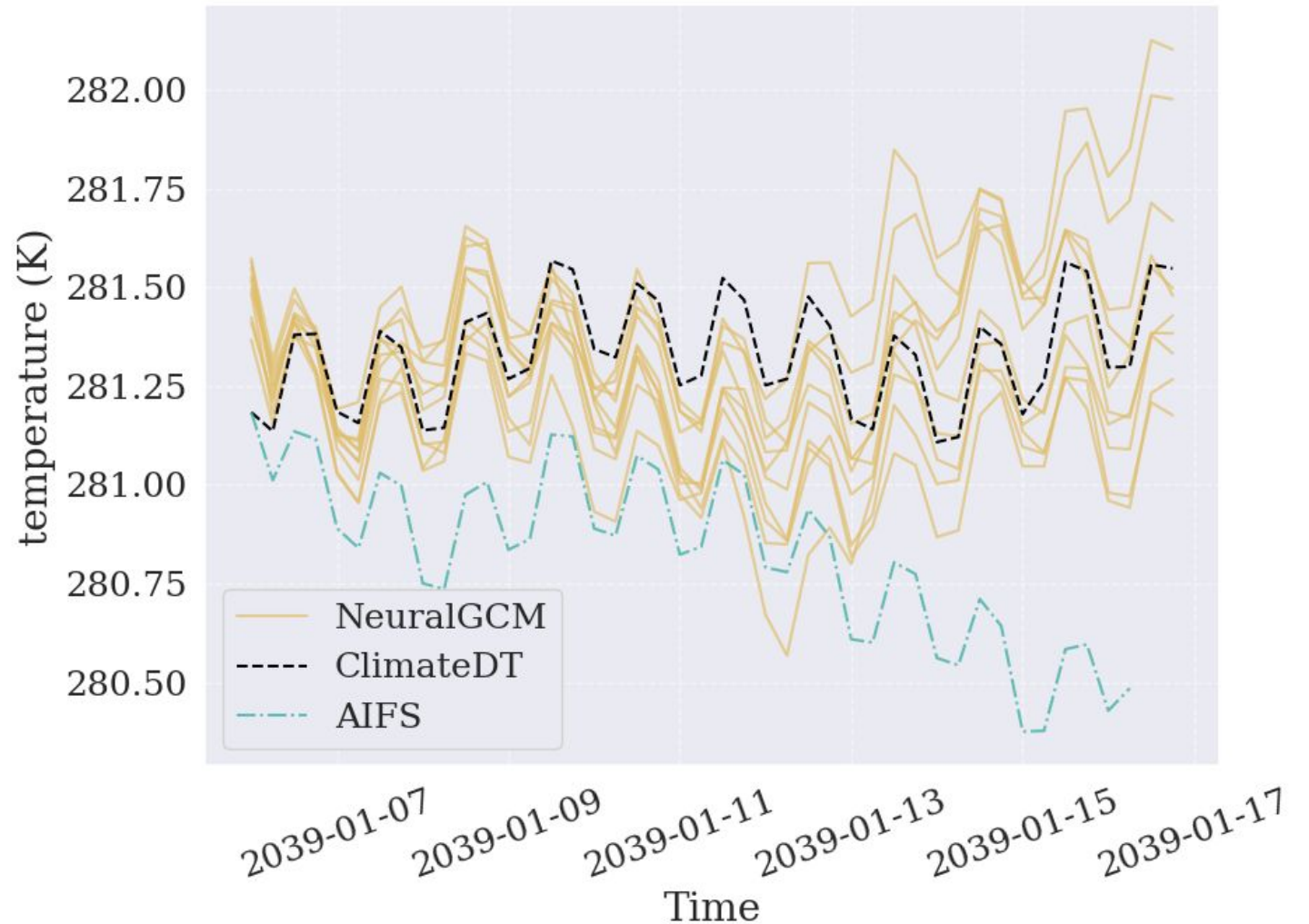
Basic test

conf.yml

```
AI_MODEL: neuralgcm
INITIAL_CONDITIONS: climatedt
EXPERIMENT:
  DATELIST: 20390106
  MEMBERS: 10
  UNIT: day
  LENGTH: 10
```

conf.yml

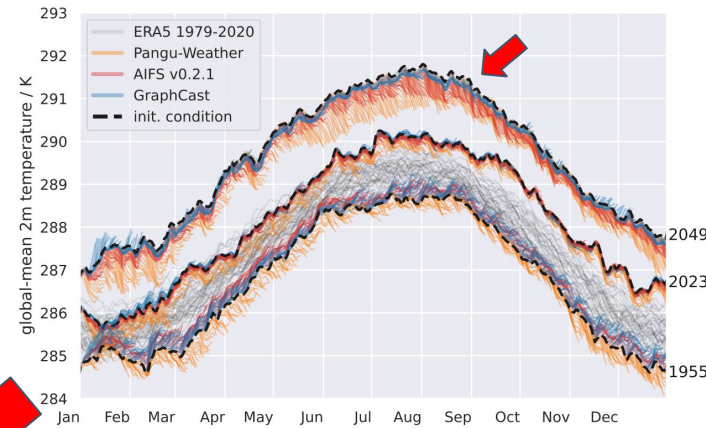
```
AI_MODEL: aifs
INITIAL_CONDITIONS: climatedt
EXPERIMENT:
  DATELIST: 20390106
  MEMBERS: 1
  UNIT: day
  LENGTH: 10
```



Basic test

conf.yml

```
AI_MODEL: neuralgcm
INITIAL_CONDITIONS: climatedt
EXPERIMENT:
  DATELIST: 203901
  MEMBERS: 10
  UNIT: day
  LENGTH: 10
```



conf.yml

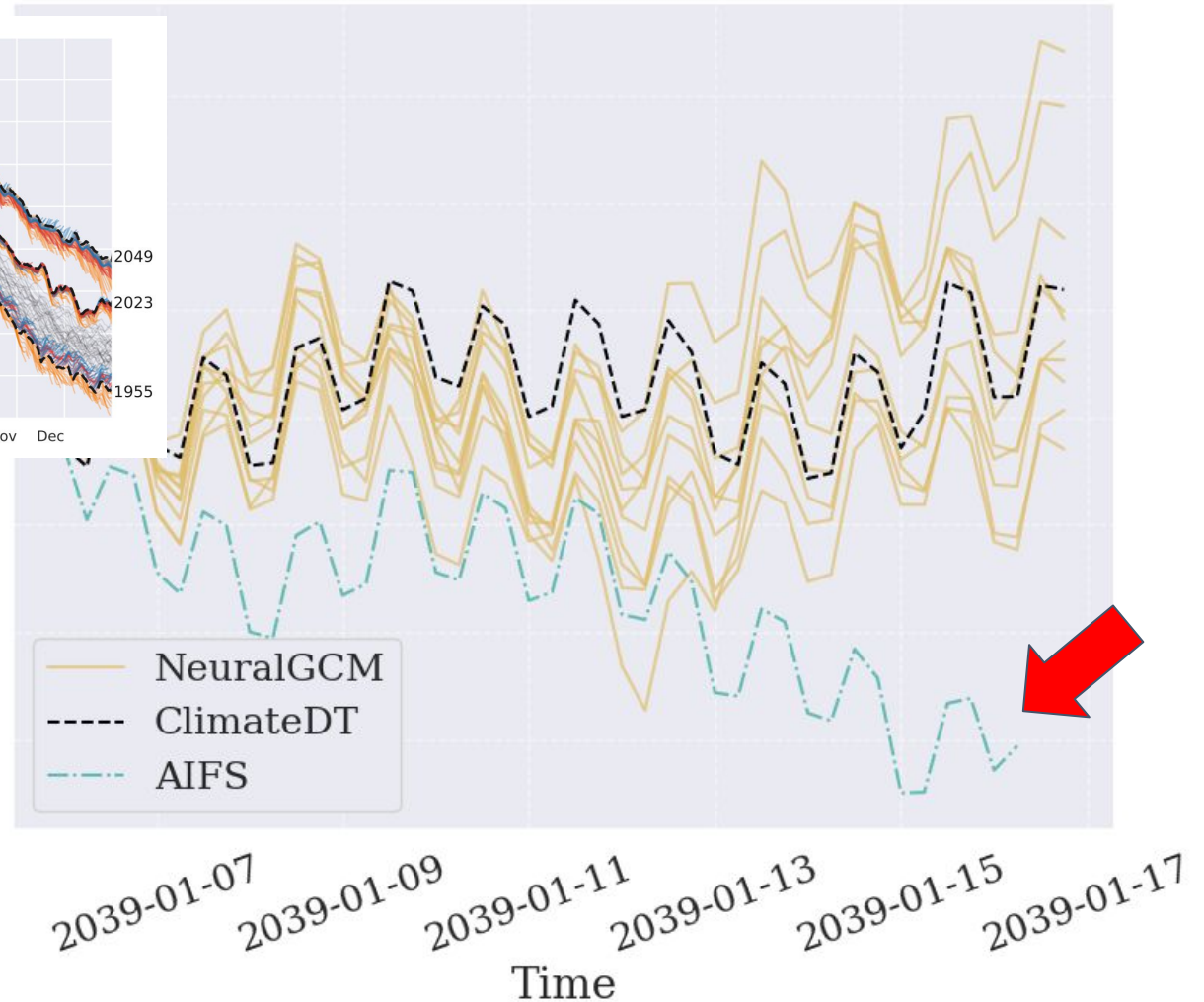
```
AI_MODEL: aifs
INITIAL_CONDITIONS: climatedt
EXPERIMENT:
  DATELIST: 20390106
  MEMBERS: 1
  UNIT: day
  LENGTH: 10
```

tempe

281.00

280.75

280.50



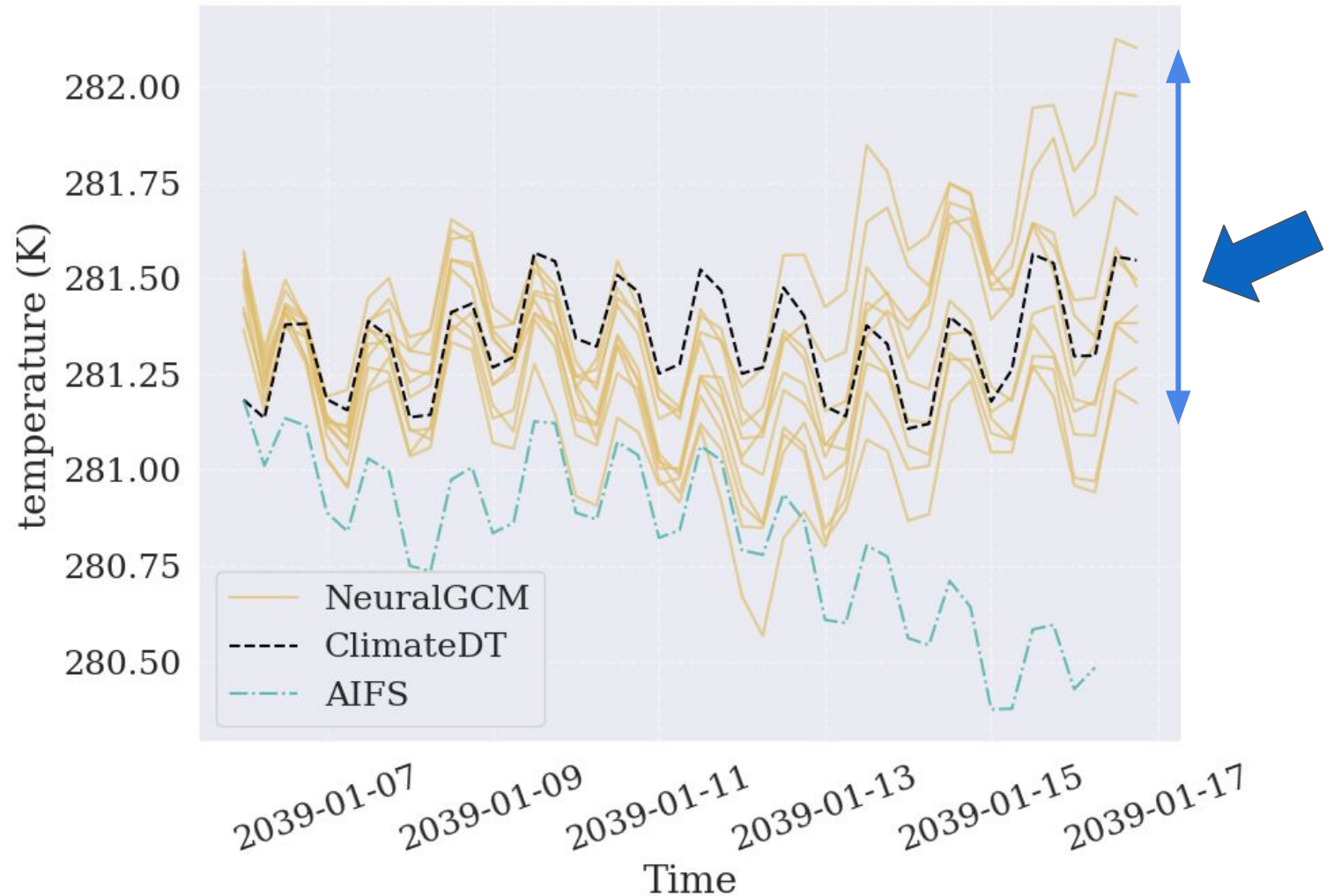
Basic test

```
conf.yml

AI_MODEL: neuralgcm
INITIAL_CONDITIONS: climatedt
EXPERIMENT:
  DATELIST: 20390106
  MEMBERS: 10
  UNIT: day
  LENGTH: 10
```

```
conf.yml

AI_MODEL: aifs
INITIAL_CONDITIONS: climatedt
EXPERIMENT:
  DATELIST: 20390106
  MEMBERS: 1
  UNIT: day
  LENGTH: 10
```

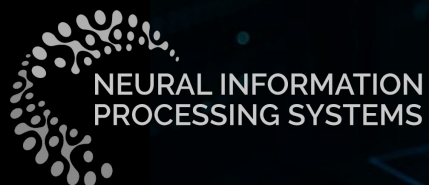


Take-home message

Our framework enables integration of AI models with high-resolution climate projections, allowing to easily perform a variety of experiments in a reproducible way

Thank you!

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