# Scalability

- **Need to work efficiently at low to intermediate resolutions**
  - Lot of workload, climate, assimilation, ensembles, research experimentation

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# I/O

- **Major issue for climate and NWP.**

- **Everybody wants a different format or structure**

- **Dissemination an issue, move analysis to where the data is rather than move data.**

- **Number of files, especially from ensembles**

- **Data placement and I/O hierarchies becoming important.**

- **Shared projects, CDI-PIO, XIOS, ADIOS, SSDalloc**

# Numerical techniques and power requirements

- **Moving data costs power**

- **Power efficiency CPUs vs GPUs**
  - **different node configurations? Flexibility**
  - **Is NWP application specific enough to drive a configuration, advantage over general sites?**

- **Domain Specific Languages (DSL)**
  - **Able to optimize for power, gain optimizations not able to get otherwise and optimise power to solution**

- **Reproducibility more important than accuracy**
  - **E.g. transcendentals last bit not important but reproducibility**
  - **32bit vs 64bit**

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# Conclusions/General

- **1a is the opportunity of exa-scale computing power fundamentally changing the way we do NWP?**

  - **Likely 2030+ timescale**

  - **There is time to change and we probably need to, get our requirements into co-design.**

  - **Finding kernels. Higher order methods? Working with computer scientists**

- **1b common denominators**

  - **Many between climate and NWP (prediction and assimilation)**

  - **Complex workflows**

  - **Coupled models**

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