Environmental computing as a technical concept

Matti Heikkurinen\textsuperscript{1} and Dieter Kranzlmüller\textsuperscript{1,2}

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\textsuperscript{1}Ludwig-Maximilians-Universität (LMU), Munich, Germany
\textsuperscript{2}Leibniz Supercomputing Centre (LRZ), Garching, Germany
1. More accurate simulations effectively
2. Combine simulations in a more flexible manner
3. To understand what simulations tell (and don‘t tell)
• Details matter
  • 500m vs. 5km radius of peak rainfall: boat vs. umbrella to work
  • Golf ball: dimples double the drive length
    • Climate change is reshaping and –sizing both „the ball“ and „the dimples“

Source: DoWs for DRIHM and DRIHM2US
Granularity - interacting „boxes of air“

Avg humidity, speed, direction

1/2 edge length: space requirement x 8
time step 1/2 of original

Computational requirements x 16!
• The hypothetical „500m -> 50m: factor of 10,000 increase in requirements
  • „More hardware“: straightforward as long as „air boxes“ fit in memory, and
  • Input data quality is sufficient, and
  • You don‘t run into trouble with rounding errors
Even with enough useful computing capacity, you can still run into a wall.
Why we need multi-model systems

- **Floods:** complex interplay between
  - Topography (and changes in topography – landslides, sediments)
  - Soil type and saturation
  - Human activity
- **Similar situations also in**
  - Seismic activity and its impacts
  - Using environmental modelling as input for other models
    - Epidemiology
    - Agriculture
    - ...
- **Plugging in new model components**
  - Compare model with whole system behaviour
• Multi-model system may mask errors
  • One of the components failing might still give (roughly) correct result
• Interface issues
  • Misinterpreting the data between models
  • Accessing HPC (efficiently!)
• Performance
  • Different models may be optimised for different kind of software and hardware infrastructures
• Documented interfaces
  • And common agreements on how they are documented
• Documented behaviour
  • Parameter ranges where predictions are accurate
  • System requirements
• Data (with documented structure)
Modularity, predictable system-level behaviour?