Oak Ridge National Laboratory:

Intermodel Comparisons and Community Modeling

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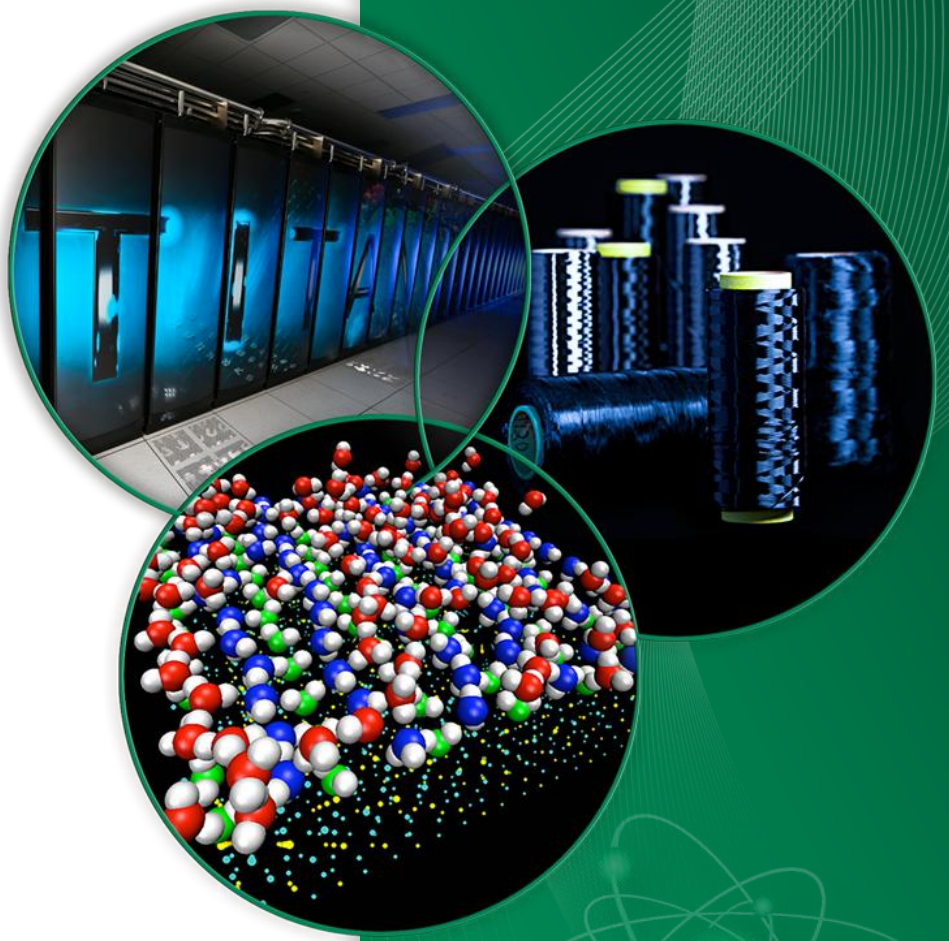


Computational Science at ORNL

- **Computing and Computational Sciences Directorate**
  - Computational Sciences and Engineering Division
  - Computer Science and Mathematics Division
  - Information Technology Division
- National Center for Computational Sciences
- Joint Institute for Computational Science
- Oak Ridge Leadership Computing Facility
- National Institute for Computational Science
- National Climate Computing Research Center
- Oak Ridge Climate Change Science Institute

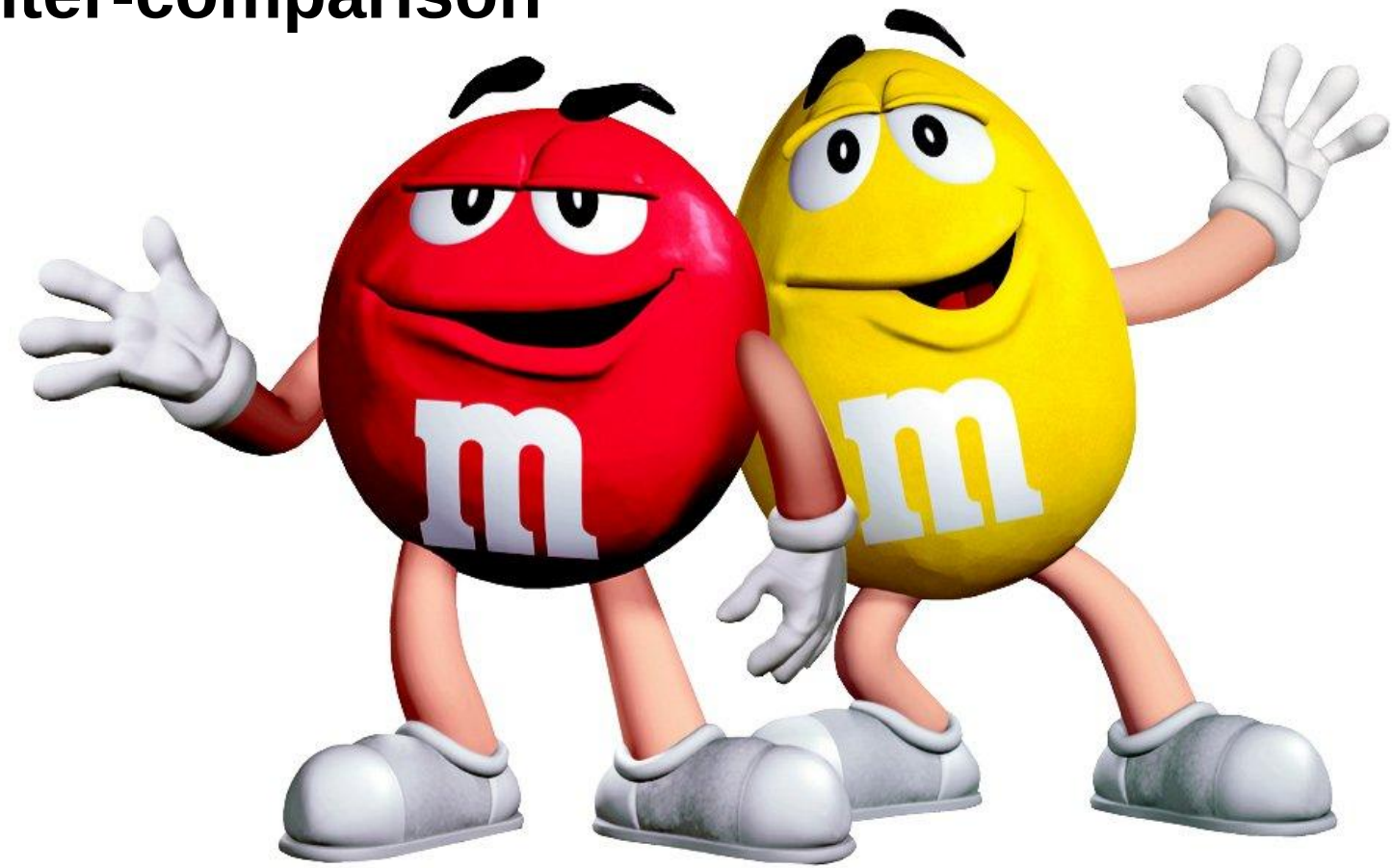
ORNL, home of Titan, the world's most powerful supercomputer for open science

Model Intercomparison (MIP)

- **Model simulation**

Model Intercomparison (MIP)

- **Model simulation**
- **Model inter-comparison**



Multi-Model Intercomparison (MMIP)

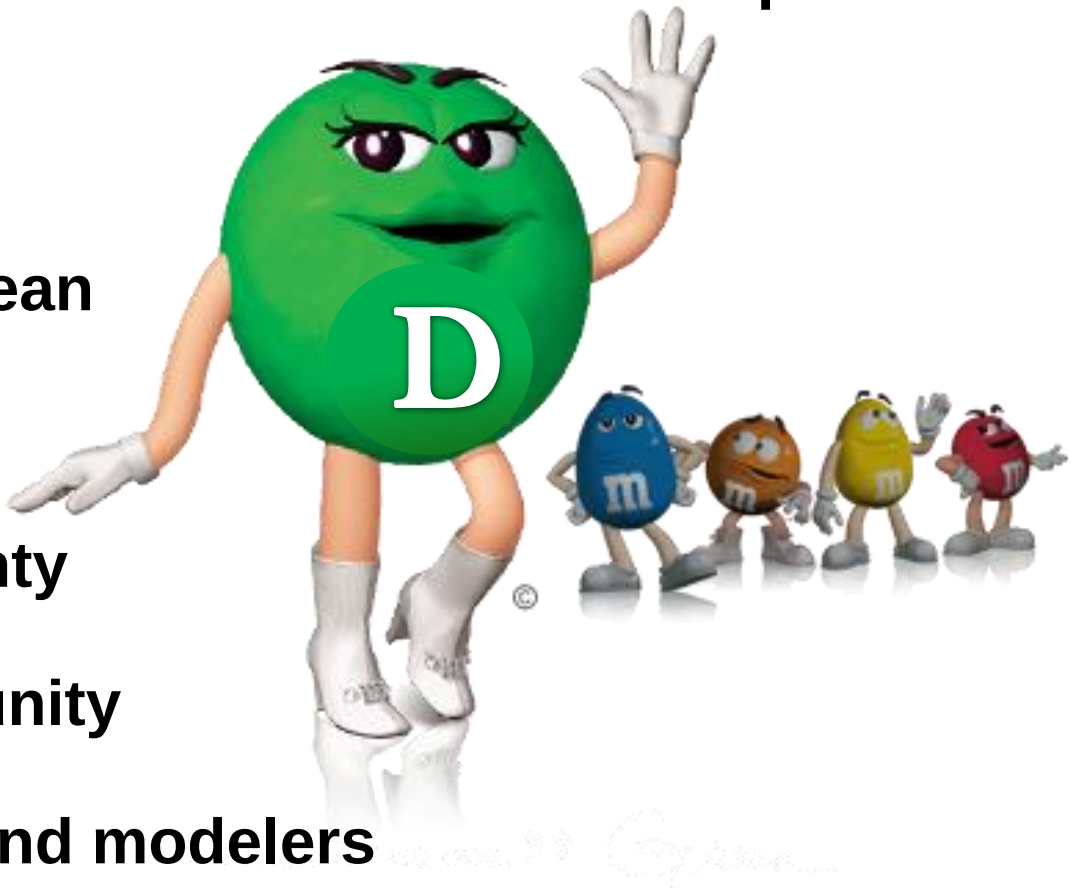
- **Model simulation**
- **Model inter-comparison**

Multi-Model Intercomparison (MMIP)

- Information gained from intercomparison benefits model development
- Robust model results
  - Tendency of multi-model mean to converge on observations
- Identifies inter-model uncertainty/variability
  - Differences in model formulations a surrogate for structural uncertainty
- A structure for community involvement

MultiModel-Data Intercomparison (MMDIP) --- adding data to the mix

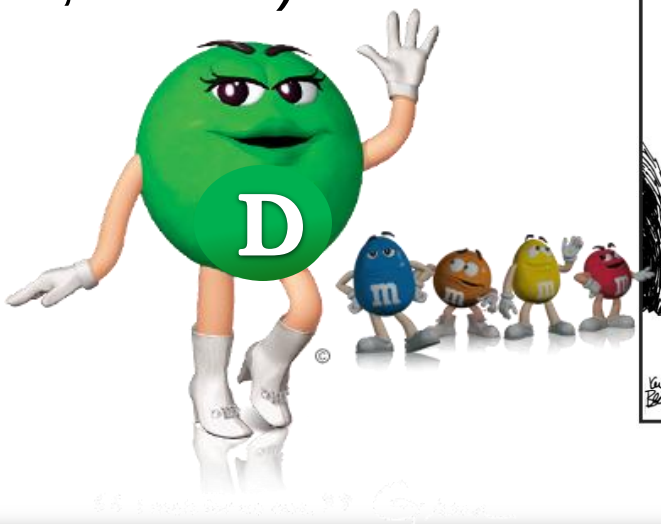
- Information gained from intercomparison of benchmark performance benefits model development
- Robust model results
  - Comparison of (individual results) and multi-model mean with observations
- Identifies inter-model uncertainty
  - relative to uncertainty in data
- A structure for community involvement
  - observationalists and modelers



Elements of MMDIP

- **Common model inputs**
  - Boundary conditions
  - Forcings (historical and future)
  - Perhaps parameter values
- **A formal, structured protocol for**
  - Use of model inputs
  - Simulation experiments/exercises
    - Initialization/spin-up
    - Perturbation experiments
  - Output variables (units, format)
- **Benchmarks**
- **Data team**
- **Analysis team**
  - Independent of modeling teams
- **Leadership team**
- **Resources**

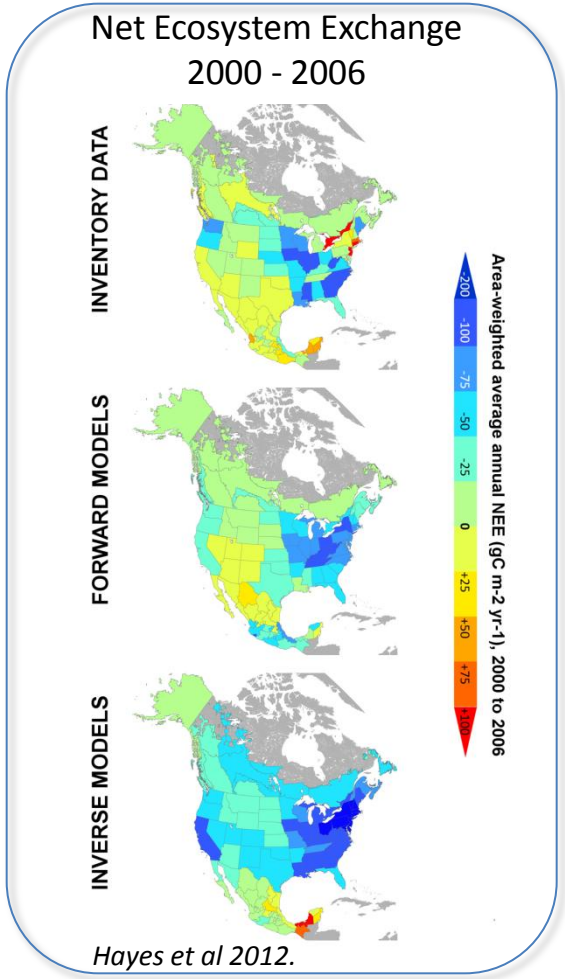
Neanderthal ideas.



Goal: Provide data management support for modeling and synthesis activities

Activities:

1. Coordinate data management activities with NACP synthesis and model intercomparisons;
2. Prepare and distribute model input data;
3. Provide data management support for model outputs;
4. Provide tools for accessing, subsetting and visualization;
5. Provide data packages to evaluate model output



Cook, RB *et al*. 1992. Environ Pollut. 77(2-3):235-42

Vegetation Ecosystem Modeling and Analysis Project VEMAP https://daac.ornl.gov/VEMAP/vemap.shtml

Multi-scale Synthesis and Terrestrial Model Intercomparison Project – MsTMIP http://nacp.ornl.gov/MsTMIP.shtml

MAST-DC: http://nacp.ornl.gov/index.shtml

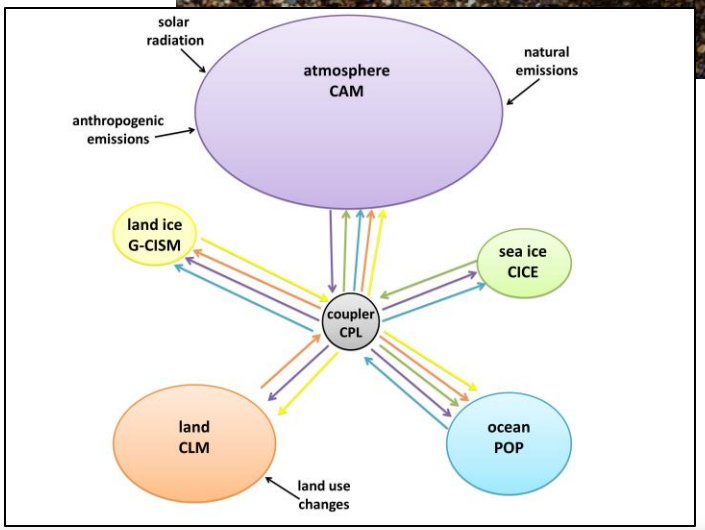
A *community effort* run out of the National Center Atmospheric Research (NCAR)

Long-term goals (http://www.sesm.ucar.edu)

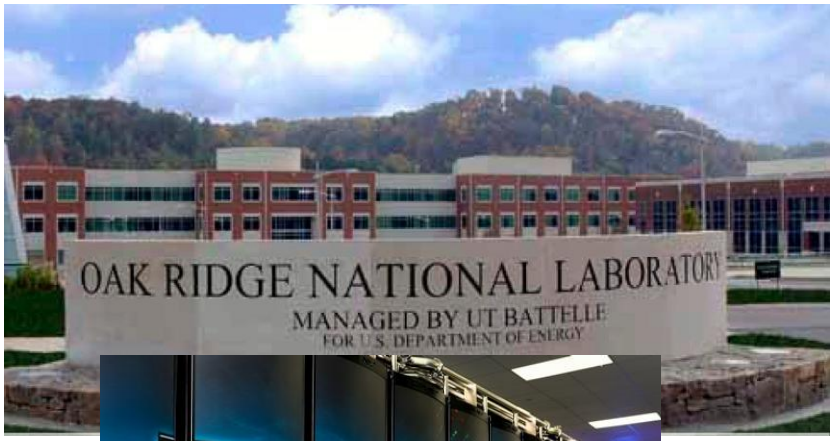
- to develop and to work continually to improve a comprehensive CESM that is at the forefront of international efforts in modeling the climate system, including the ***best possible component models coupled together in a balanced, harmonious modeling framework***;
- to make the model readily available to, and usable by, the climate research community, and to ***actively engage the community in the ongoing process of model development***;
- to use the CESM to ***address important scientific questions*** about the climate system, including global change and interdecadal and interannual variability; and
- to ***use appropriate versions*** of the CESM for calculations ***in support of*** national and international ***policy***

Community modeling

- Not just open-source, not just open access
- Joint, community development of single community model
- Involves
  - Experiments (MIPs, others)
  - Governance
    - Science steering, advisory
    - Working groups (CESM: 12)
  - Code releases
  - Community Events
    - Workshops, training



In summary, ORNL has



- Experience and expertise
- Capacity and capability

in

- Multimodel-Data intercomparison

- Community modeling

Either or both of which
could inform or contribute to the structure, organization and operation of collaborative CBP-KSS modeling activities