CTSM – Numerical Weather Prediction:

Targeting Operational Weather to Climate Applications

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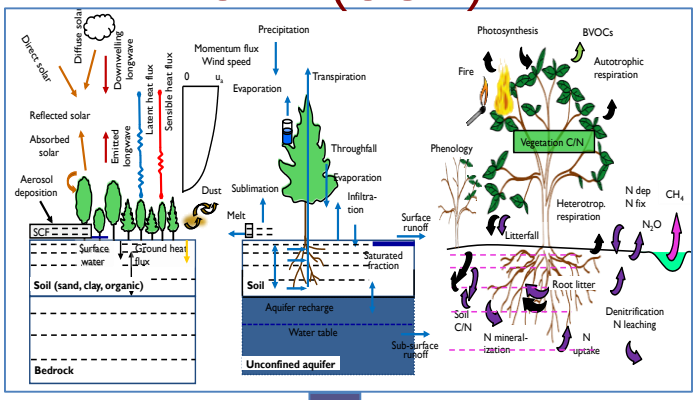
The Community Terrestrial Systems Model

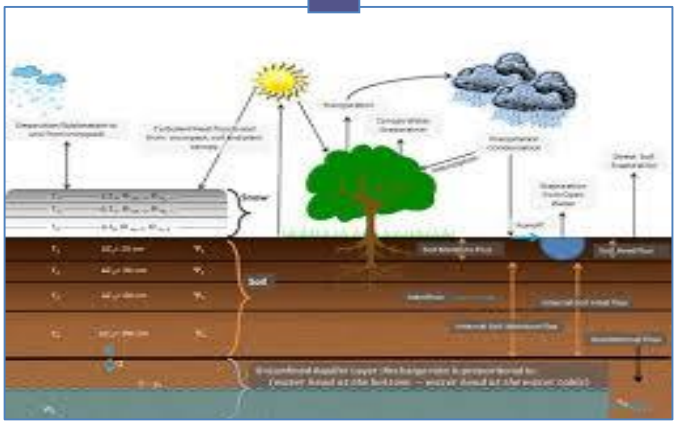
a unified model for research and prediction in climate, weather, water, and ecosystems

CLM (CGD)



- **CLM user community:**
  - climate focus: CESM
  - national and international universities and labs
  - cutting-edge plant hydrodynamics, carbon-nitrogen dynamics, ecosystem demography

CTSM + user communities

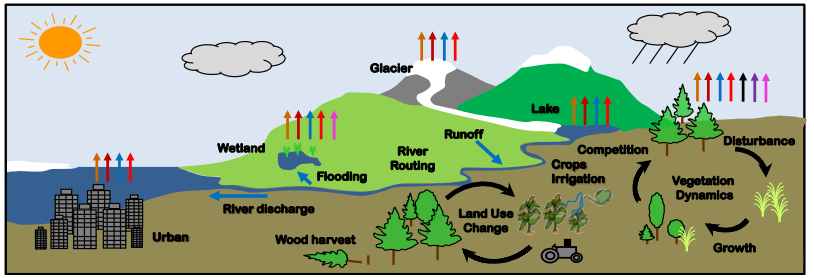


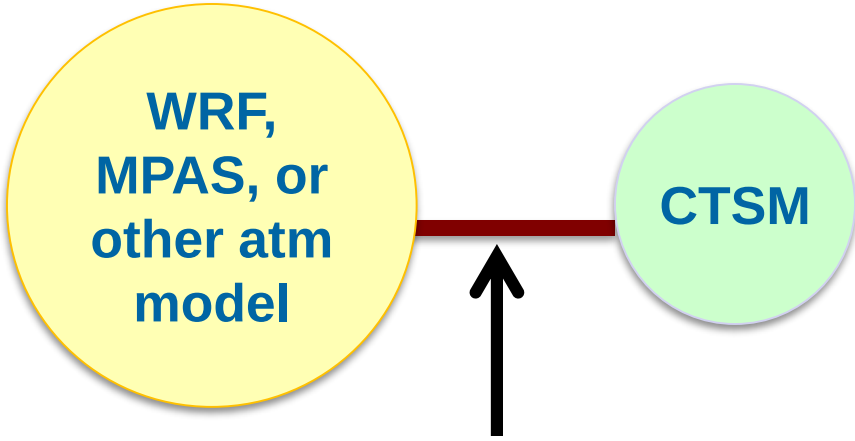
- **Noah-MP user community:**
  - NWP focus: WRF, NOAA NWC/EMC
  - national and international universities and labs
  - higher spatial resolution and temporal coupling frequency

Noah-MP, WRF-Hydro (RAL)

Key challenges

- Parallel development
  - Existing models currently used across multiple projects
  - Initially the effort is diffuse (e.g., individuals developing code for both Noah-MP and CTSM) (propped up by funding)
- Diverse Modeling Problems
  - Climate needs vs. NWP needs
  - Land coupling with other components
- Adoption/coupling
  - Integrate Noah-MP functionality into CTSM to ease transition
  - Development of common test cases to demonstrate performance/capabilities
  - Simplify coupling/ease of use across multiple communities

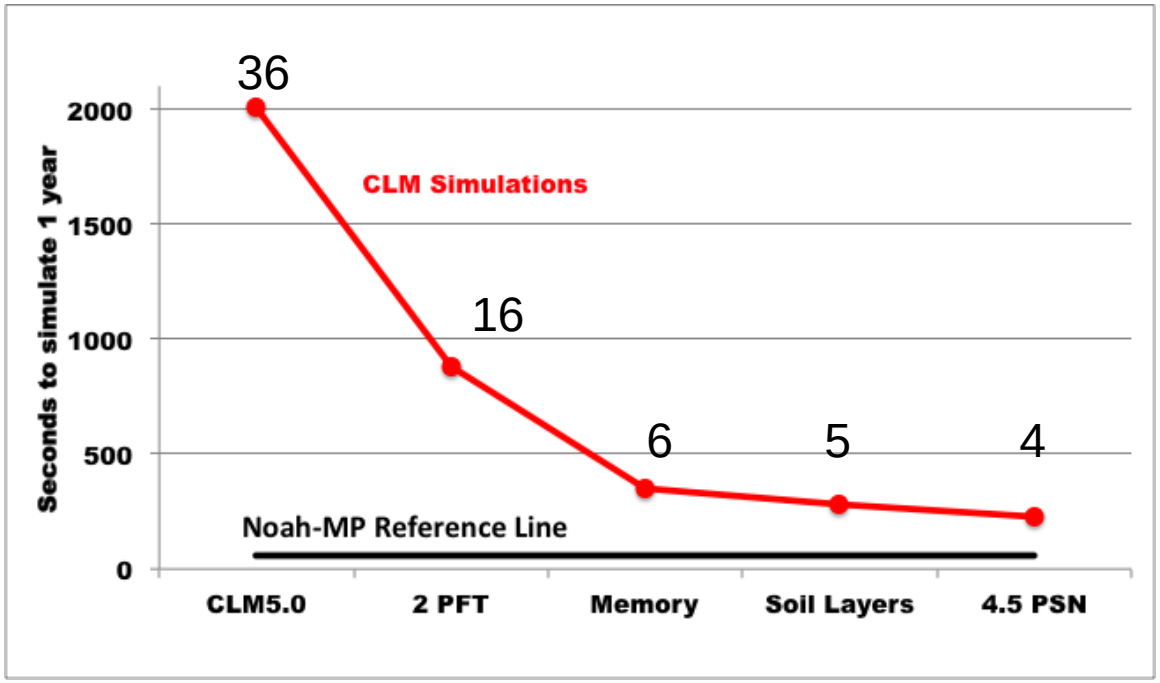




LILAC
Lightweight Infrastructure for Land-Atmosphere Coupling
Funded NSF Infrastructure project

Extension to CTSM-NWP

- Target CTSM users: everyone
- CTSM as a viable option for NOAA operational models (NAM,GFS,CFS,HRRR,NWM), WRF (-Hydro) users, LIS/NLDAS/GLDAS
- Past results show CLM expensive relative to Noah-MP; makes CTSM a hard(er) sell for the resource limited



What is CTSM-NWP?

- Model structure/physics configuration (this is easy)
  - Reduced soil layers – preferably run-time configurable option
  - Reduced sub-grid patches
  - Physics options – satellite phenology, plant hydraulics off
- Model set-up – focus here is ease of use/flexibility
  - nearly every WRF user has a different domain
  - grid resolution from ~30km to ~100s of meters
    - input data flexibility
- Additional topics: initialization, DA, time step/coupling frequency, parameter estimation, iLAMB extensions

CTSM will...

- unify NCAR land modeling efforts
- address climate and NWP needs – transition region
- simplify the coupling and ease of use across multiple communities
- through a modular approach, support a wide array of community contributions
- leverage and expand existing verification efforts
- accelerate the transition of land surface research to operations