AgMIP The Agricultural Model Intercomparison and Improvement Project

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

SWAT Models in a National Intercomparison of Soil Carbon and Nitrogen Dynamics




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IN THE CITY OF NEW YORK

AgMIP Executive Team
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Getting Underway

1. **Selection of AgMIP**
2. **Paperwork…**
3. **Resolving collaborators**
4. **Goals:**
   - *Intercomparisons*
   - *Improvements*

Issues: Data, Locations, Crops

Protocol discussions

- What will be standardized
- Scale-dependent protocols
- Modeling scenarios
- Calibration and validation

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Collaborators

APEX
Agricultural Policy Environmental eXtender model

EPIC
Environmental Policy Integrated Climate model

Century 100 DayCent

APSIM
AGRICULTURAL PRODUCTION SYSTEMS SIMULATOR

DSSAT

SWAT+

DNDC

The SALUS Model

Terrestrial-Aquatic Sciences Convergence (TASC)

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Update

- ❑ **Subawards**
- ❑ **How work with others**
- ❑ **First-year workshop**
- ✓ Jan 12-14, NYC & Online
- ❑ **Potential data providers**

- ❑ All modeling group meetings
- ❑ AGU meetings
- ✓ Dec 15-19, New Orleans

First-year Review + Protocol Paper

- ✓ Review of previous model **intercomparison and ensemble** efforts
- ✓ Identify modeling and dataset **gaps**
- ✓ Summary of major SOC and N_2O **models**
- ✓ Model intercomparison and ensemble **protocols** at the small and large scales

First-year Review + Protocol Paper

- ✓ **Model** input and output variables, including depth, time step, and resolution
- ✓ **Model** capacity in simulating different management and weather scenarios
- ✓ **Model** spin-up, calibration guidance, and uncertainty analysis methods
- ✓ **Datasets** suited for model inputs at the small and large scales
- ✓ **Datasets** suited for model calibration and validation at the small and large scales

Protocols: standardization

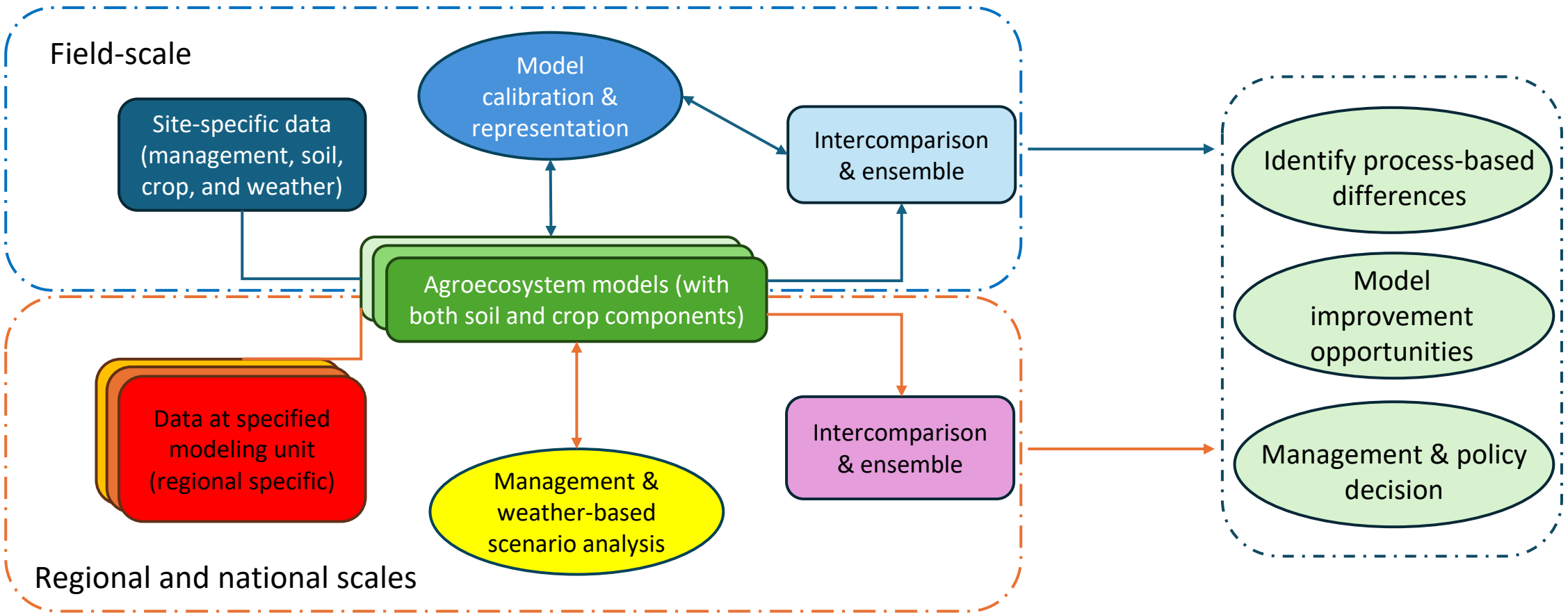
What can be standardized?

- Input datasets, output variables, and resolutions
- Scenarios for modeling
- Model calibration guidance
- Model intercomparison, ensemble, and inter-model uncertainty analysis
- Required documentation of model structure, parameters, calibration, and improvement

What cannot yet be standardized?

- Model spin-up length and algorithms
- Model calibration algorithms and methods
- Default params & params for adjustments
- Up-scaling methods at the broader scale?
- Intra-model uncertainty analysis methods
- Specific aspects for model improvement
- Computer platform and coding language
- Open-source status

Model activities and outcomes at different scales



Protocols: scales and scenarios

Field-scale calibration, validation, intercomparison, and ensemble using site-based info

- **Scenarios of highest interest:**

✓ Varying nitrogen input rates
✓ Organic vs. synthetic fertilizer inputs
✓ Different types of synthetic fertilizers
✓ Different tillage practices (include residue treatment)
✓ Irrigation vs. rainfed systems
✓ Tile-drainage vs. undrained conditions
✓ Continuous corn vs. corn-soy rotation vs. rotations including wheats and/or cover crops
✓ Multiple levels of grazing intensity
✓ Wet vs. dry years

- **Additional scenarios of interest:**

✓ Different timing for fertilizer applications
✓ Different manure types
✓ Transition into organic or grass-based systems
✓ Rotational vs. continuous grazing
✓ Hay and pasture
✓ Crop-livestock integrated systems
✓ Warm vs. cool years

Regional and national scale verification, intercomparison, and ensemble analysis

- Crop production and rotation scenarios (*region-specific*)
- water management scenarios (*region-specific*)
- N management scenarios
- Tillage management scenarios
- Grazing intensity scenarios
- Weather scenarios

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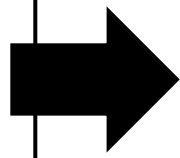

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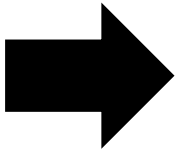

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Protocols: calibration and validation

- Divide dataset into calibration and validation sets by **space and/or time** at the site-scale?
- Use of **“optional”** (versus mandatory) model input variables? What about **mandatory** variables for some but not others (e.g., just required by 1 group)
- Having a **“blank” model run** prior to calibration?
- Treat **calibration sites** differently based on data availability (and potentially quality)?

Protocols: calibration and validation

- What **datasets** will be provided for model calibration other than yield, SOC, and N_2O?

✓ Phenological observations (e.g., Anthesis, maturity, and harvesting dates)

✓ Remote sensing or flux tower-based data (e.g., GPP/NPP and vegetation indices)

✓ Other potential observations: Soil moisture and hydraulic properties? Soil temperature? Anything else?

- Simulation **period** for regional and national?

Discussion