# Simple Land Model Software as a New Component for CESM

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# SLIM Science developed by Dr. Marysa Lague

- Dr. Marysa Lague developed a simple land model called SLIM (Simple Land Interface Model)
- Based on the CLM5.0 code
- To study land-atmosphere interactions.
- There are papers and presentations on her work
- Here we will concentrate on SLIM becoming a component of CESM.

# Why SLIM?

Terrestrial science…

- Simple model interface to understand basic land-atmosphere interaction
- Allows you to change basic surface properties without it being connected to complex surface physics
- Idealized experiments to understand these interactions

Atmosphere science…

- Paleo work?
- Upper atmosphere CESM where land surface not critical
- Other planets?

# What is SLIM?

Simple land model that can be used to replace CTSM to understand land atmosphere interactions without the same complexity that an ecosystem model has

No exchange of dry-deposition, B-VOC's or $CO_2$ from land surface

No connection to river model

No connection to glacier model

No impact of solar angle on land albedo , only driven by ATM SW

"Soil" is a simple bucket model with only a few layers

It's essentially a land model similar to what was used 50 years ago

# SLIM surface dataset

- The SLIM surface dataset is characterized by:
- 23 surface characteristics (CTSM has over 80…)
- No subgrid heterogeneity, only description over the gridcell
- Commonly these come from CLM simulations (average 1850, average 2000)
- Includes: albedos, roughness, emissivity, snow-mask, dust-emission, simple “soil” description

# Starting Point of SLIM – CTSM Code Base

Problem! – CTSM is large and most of it not needed for a simple land model

- 440k lines of source code
- Unneeded externals, namelist items, XML options, lot's of unneeded complexity
- Removing that complexity hasn't been easy (because of CTSM complexity)

Solution! – Put SLIM on a diet and exercise regimen. Slim SLIM down!

# Exercise Montage for SLIM

- First tag –
  - 190k lines
  - 7 XML variables
  - Over 400 namelist options

# Working towards a leaner version of SLIM

- Latest tag:
  - 41k lines (the expected BMI)
  - 2 XML variables
  - Dozen namelist items
- Working on updating to CESM2.3
- Have a working simpler namelist build based on python

# Developing Process for SLIM

- Personal Repository → ESCOMP repository
- Single Contributor → Multiple contributors
- Develop a testlist to ensure correct answers
- Develop tag naming convention
- Add as an option to cime
- Workout process for being a component of CESM
- And process for it to be in CESM development tags

# Summary

- SLIM is available: https://github.com/ESCOMP/SimpleLand
- We are finishing up the work with it
- We plan on having it generally available for use in the spring
- We plan for it to be part of CESM tags when that happens
- Possibly will be part of CAM tags as well

Thank you!