FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE

CLIMATE COMPUTING

Comparing Land Surface Models During the São Paulo February 2023 Flood

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Introduction

Goal: Investigate the accuracy of land surface models (LSM) based on data from the São Paulo flood event that occurred from February 18th – 23rd of 2023 by comparing the commonly used Noah LSM with two other LSMs.

Background: With the rise of global temperatures, natural disasters appear more frequently. Understanding the accuracy of models that monitor these events is necessary to improve predictability, especially in cases like this.

Methods

Control: WRF Noah LSM

Test Cases: CESM Community Land Model (CLM) and the 5-layer Thermal Diffusion Model (TDM)

Variables shown at 00Z 19 Feb 2023:

- Control total precipitation and the difference between control and tests
- Temperature and sea level pressure

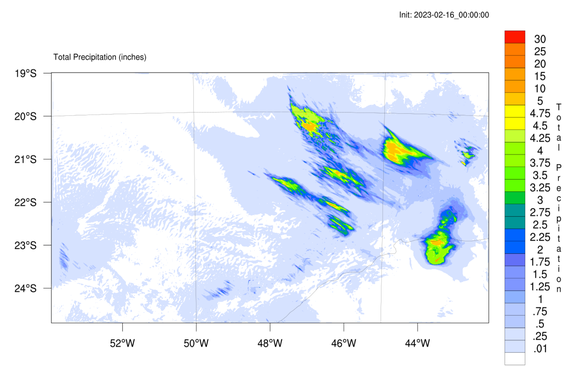
Discussion

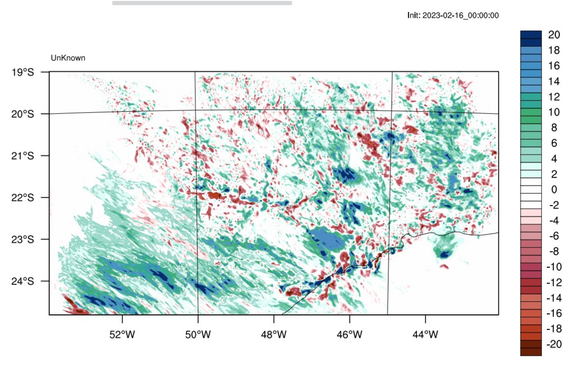
During the event, over 30 inches of rain was recorded within a 24-hour period over terrain susceptible to dangerous landslides.

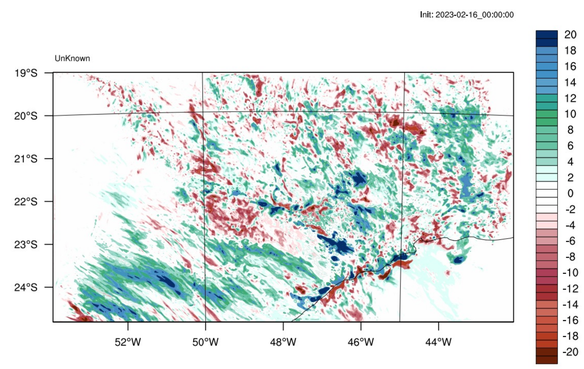
The 5-layer TDM: Overall, there appear to be less extreme negative differences in precipitation from the control.

The Community Land Model has a larger range of values over smaller areas than the control, potentially indicating a difference in terrain.

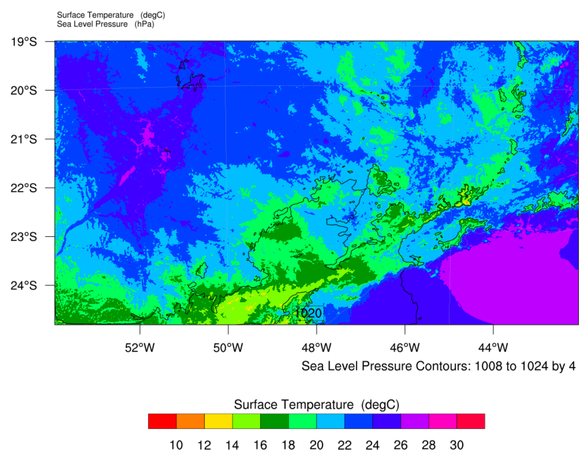
Total Precipitation



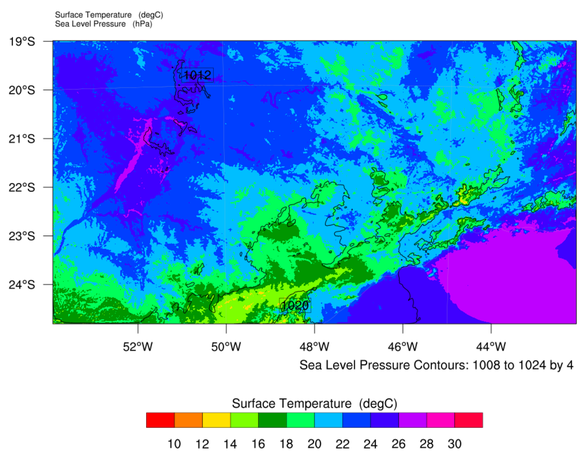




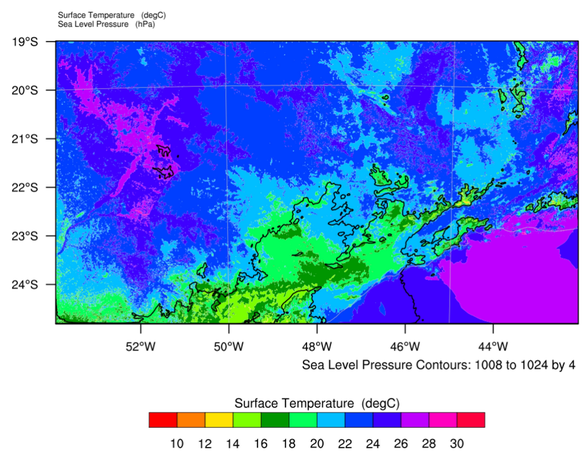
Noah LSM



5-Layer TDM



CESM CLM



Surface Conditions

Tools and Data

- WRF-ARW version 4.5.2
- ERA5 forcing data
- Ran simulations at a 1 km resolution using the "tropical" suite of physics parametrization as a base
- Grid points: 1200 x 650

Future Work

- Conduct the same study across different regions globally to further investigate the accuracy of these LSM's
- Consider other tests to find the best LSMs to handle complicated terrain
- Use an additional LSM such as the RUC

Acknowledgments

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