The Community Land Model, version 5: Parameter Perturbation Experiment

D. Kennedy [1], Katherine Dagon[1], David M. Lawrence[1]

[1]Climate and Global Dynamics Laboratory, NCAR, Boulder, CO, USA.

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Corresponding author: Daniel Kennedy, djk2120@ucar.edu

Abstract

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1 Introduction

2 Experiment Description

2.1 Model description

The Community Terrestrial System Model (CTSM) is developed by the CESM Land Model Working Group (LMWG) and maintained at the National Center for Atmospheric Research (NCAR). This experiment utilizes the Community Land Model configuration of CTSM, version 5.1 (CLM5.1). The model source code and documentation are available online (`https://github.com/ESCOMP/CTSM`), as is a full model description (Lawrence et al., 2019).

Relative to CLM5.0, version 5.1 includes minor bug fixes, several parameter adjustments, and the implementation of biomass heat storage (Swenson et al., 2019). The PPE experiment required additional code modifications to identify and programmatically vary the full suite of model parameters. The exact model code for this experiment is contained in a development tag (`https://github.com/ESCOMP/CTSM/tree/branch_tags/PPE.n11_ctsm5.1.dev030`). We utilized the full biogeochemistry version of CLM in land-only mode, with the crop model turned off. The component set longname is:

`2000_DATM%GSWP3v1_CLM51%BGC_SICE_SOCN_SROF_SGLC_SWAV_SIAC_SESP`

2.2 Model spin-up

Model spin-up for the equilibration of carbon and nitrogen pools within biogeochemistry-enabled land models can consume up to 98% of computational time (Sun et al., 2023).

(Lu et al., 2020)

2.3 Sparsegrid

(Hoffman et al., 2013)

2.4 Experimental Design

2.5 Forcing Scenarios

Table 1. Forcing Scenarios

Name	Meteorology	CO_2 (ppmv)	N addition	Description
CTL2010	2005-2014	367	-	control experiment
C285	2005-2014	285	-	low CO_2
C867	2005-2014	867	-	high CO_2
AF1855	1851-1860	367	-	pre-industrial climate
AF2095	2091-2100	367	-	late century climate (SSP3-7.0)
NDEP	2005-2014	367	$5g/m^2$	enhanced nitrogen deposition

2.6 Analyses

3 Results

4 Discussion

5 Conclusion

Open Research Section

This section MUST contain a statement that describes where the data supporting the conclusions can be obtained. Data cannot be listed as "Available from authors" or stored solely in supporting information. Citations to archived data should be included in your reference list. Wiley will publish it as a separate section on the paper's page. Examples and complete information are here: https://www.agu.org/Publish with AGU/Publish/Author Resources/Data for Authors

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