NASA Ames Mars Global Climate Model Verification and Validation Plan

[**1. Introduction**](#_keiagskfgai5) **3**

[**2. Related Documents**](#_e6jr8desu55m) **3**

[**3. Verification**](#_kgfcqzdwqej7) **3**

[**4. Validation**](#_cm234vh79sx) **3**

[4.1 Overview](#_cv1ysaka8e2n) 3

[4.2 Validation Test](#_2k2toqtao04u) 3

# 1. Introduction

This document describes the Verification and Validation Plan for the NASA Ames Mars Global Climate Model (GCM). This document defines the scope of the tests. It indicates the items to be tested, identifies the required configuration for each item, describes the process for performing each test, the plan for recording, processing, and archiving the results, and discusses the plan for accepting the results, and appropriate follow-up actions required depending on the results.

# 2. Related Documents

* NASA Ames Mars Global Climate Model Software Requirements Document
* NASA Ames Mars Global Climate Model Software Development Plan

# 3. Verification

* The verification test shall confirm successful implementation of the GCM by confirming successful output creation
* The user shall first clone the NOAA/GFDL AM4 repository (https://github.com/NOAA-GFDL/AM4), then add the NASA Ames Mars GCM as a sub-module inside the ‘src’ directory
* The included scripts shall be executed to apply patches to modify the AM4 source code to interface with the GCM
* NetCDF4 (including HDF4 and HDF5) shall be installed and accessible
* MPI shall be installed and relevant paths shall be defined
* After the patches are successfully applied, a sample compile script shall be created. The ‘platform’ shall be set for the appropriate fortran compiler. ‘Intel’ and ‘gnu’ are supported.
* System modules can be loaded by modifying the bin/loadmods.csh file
* The NETCDF paths shall be set in the compile script
* The model shall be compiled by executing the compile.archives script
* After successful compilation, the model shall be tested using the verify\_model run script
  + PBS settings shall be entered at the top of the run script
  + The workdir variable shall be the path to the run directory which will be created
  + The datadir variable shall be the path the input data files
  + The platform variable shall match the compile platform
  + The layout variable is the 2D CPU layout per cube face. The total number of CPUs shall be layout1\*layout2\*6
* Successful installation of the model shall be verified by comparing the output from the verify\_model execution to the provided documentation/verification.out file

# 4. Validation

## 4.1 Overview

Validation shall be performed by comparison of the default output data to included plots in the ‘analysis/validation’ subdirectory. The same plots shall be generated by the test described. This test shall validate the model performance by running the GCM with default inputs and compare with pre-defined results for various predicted fields.

## 4.2 Validation Test

1. The default run script shall be executed to produce validation output files
2. The Community Analysis Pipeline Python module shall be installed
3. Following successful execution, the validation plots shall be created in the run directory by executing the MarsPlot.py command with the provided input file ‘analysis/validation/Validation.in’
4. If issues are identified at any point during the verification or validation tests and cannot be immediately resolved, public releases shall be rolled back to last known working version
5. This document and related documentation shall be updated to reflect changes to testing or requirements

# 5. Performance Tracking

1. Benchmark testing shall be performed upon every public update according to this plan, and validation tests and plots shall be updated accordingly
2. GitHub comments shall be used to track software issues and address fixes
3. GitHub statistics shall be used to track software usage
4. Community workshops shall be held once every other year in order to gauge community use as well as address community concerns