

## UK plans for CMIP6

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With input from numerous others

**UKESM is a UK Met Office and NERC/academia collaboration to develop the next generation of UK Earth system models.**

UKESM1 uses the Met Office coupled model HadGEM3 as its core physical model

2 resolutions are being developed & supported: **UKESM1-HI** and **UKESM1-LO**

UKESM1-HI will be used for priority CMIP6 simulations at a resolution of atmosphere: N216(~60km )L85 (full stratosphere), Ocean: 0.25°L75

UKESM1-LO developed for long simulations, large ensembles and investigating a range of emission scenarios. Resolution (probably): N96(~135km )L85 / 1°L75

**UKESM1 will be the UK community ESM contribution to CMIP6**

# UKESM1 components

## Physical Model: HadGEM3-GC3

Unified Model atmos (GA7), NEMO-ORCA ocean, CICE sea-ice & JULES land surface

## Chemistry/Aerosols

UKCA full stratosphere- troposphere chemistry + (2 moment) GLOMAP-MODE aerosols

\* Simplified version of UKCA chemistry also available employing offline oxidants and full tropospheric sulfur cycle (full UKCA ~4 times cost of simplified scheme). HadGEM3 will use the simplified scheme.

## Terrestrial Biogeochemistry

JULES-C + soil-veg nitrogen + TRIFFID (dynamic veg) + wetlands + wildfires

## Ocean Biogeochemistry

MEDUSA2 (plankton ecosystem model, N, C, O<sub>2</sub> Si, Fe) within NEMO ocean model.

## Interactive Land ice sheets (both Greenland and Antarctic)

BISICLES and ice shelf basal melt description within NEMO.

## Coupler

OASIS3-MCT

For certain MIPs Earth system components will be disabled and UKESM1 collapses back to HadGEM3-GC3 physical coupled climate model.

## Priority MIPs for Met Office/NERC/UK

HI resolution used unless indicated otherwise

\*denotes UKESM1, \*\*denotes HadGEM3 (physical core of UKESM1 only)

### Priority 1: Definite MOHC will run

**CMIP DECK\*** (HI and LO)

**ScenarioMIP\*** (some HI, mainly LO for big ensemble)

**DCPP\*\***

**CFMIP\*\***

**C4MIP\***

**HighResMIP\*\***

**DAMIP\*\***

### Priority 2: Almost certain MOHC will run

**AerchemMIP\***

**LUMIP\***

**RFMIP\***

**GEOMIP\***

**LS3MIP\***

**nonlinMIP\*\***

and data provision for e.g. ISIMIP

CORDEX data still under discussion

High priority for UK NERC community.  
High probability NERC will contribute  
simulations using UKESM1/HadGEM3

**OCMIP\*** (HI and LO ocean components only)

**ISMIP\*** (LO)

**FAFMIP\*\***

**GMMIP\*\***

Other MIPs uncertain at this stage

~ 35-45 000 simulation years: Depends on LO or HI use and chemistry complexity

## Probable CMIP6 timeline for UKESM1/HadGEM3

HadGEM3-GC3 frozen ~summer 2015. Simulations potentially start late 2015.  
(Although some uncertainty due to HPC upgrade near this time)

UKESM1 frozen ~ June 2016. Potential for simulations to start ~ summer 2016.

Ensembles easier to run than long simulations

E and C driven DECK/Historical runs with UKESM1-LO & HI, likely also necessary with (physical) HadGEM3-GC3.

Interest to contribute to AerChemMIP experiments with UKESM1-HI and full chemistry. Likely not possible to make DECK experiments with this configuration, hence only UKESM1-LO possible with full chemistry.

Majority of simulations will be performed in the period 2016- early 2019

Long pre-industrial control runs will start earlier than dates listed above.

CMIP DECK & Nucleus 6 : UKESM1 HI and LO simulation set made ~fall/winter 2016

ScenarioMIP projections ~spring 2017: Large ensemble with UKESM1-LO