

ONLINE

Simulation 1

High-resolution GEOS-5
Cubed-sphere c360 ($\approx 0.25^\circ \times 0.3125^\circ$)

Replace convection with
GEOS-Chem algorithm using 3 h
archived convective mass fluxes

Simulation 2

GEOS-5 with GEOS-Chem convection
Cubed-sphere c360

Simulation 5

Coarse-resolution GEOS-5
with GEOS-Chem convection
Cubed-sphere c48

Custom cubed-
sphere (c48)
meteorological
archive

Simulation 6

High-performance GEOS-Chem
Cubed-sphere c48

Convert c48
meteorological archive to
rectilinear $2^\circ \times 2.5^\circ$

Simulation 7

GEOS-Chem driven by c48 meteorology
Rectilinear $2^\circ \times 2.5^\circ$

Replace archived convective
mass fluxes with convective
mass fluxes produced by RAS

**Sensitivity simulation
using RAS**

Rectilinear $2^\circ \times 2.5^\circ$

OFFLINE

Use operational meteorological archive:

- 3 h winds and convective mass fluxes
- 1 h mixing depths
- $0.25^\circ \times 0.3125^\circ$ rectilinear grid

Simulation 3

High-resolution GEOS-Chem
Rectilinear $0.25^\circ \times 0.3125^\circ$

Degrade resolution to
 $2^\circ \times 2.5^\circ$

Simulation 4

Coarse-resolution GEOS-Chem
Rectilinear $2^\circ \times 2.5^\circ$

Replace spatially
averaged mixing
depths with
maximum mixing
depth from high-
resolution
meteorology

**Sensitivity simulation
using RAS**

Rectilinear $2^\circ \times 2.5^\circ$

**Sensitivity simulation using RAS
and maximum mixing depths**

Rectilinear $2^\circ \times 2.5^\circ$