Animated map methodology in the Global Calculator

This documentation describes the methodology used in the January 2015 version of the Global Calculator, to generate animations which show the range of climate model output consistent with a user-generated trajectory. These animations are **not** time series; instead, they show a range of plausible maps of temperature change, all of which are consistent with the lever choices.

Individual animation frames

The animations are not directly available from the spreadsheet but are selected based on the temperature range generated by the user pathway.
Pictures corresponding to each selected model run have been provided separately in .png format. An example is shown here:
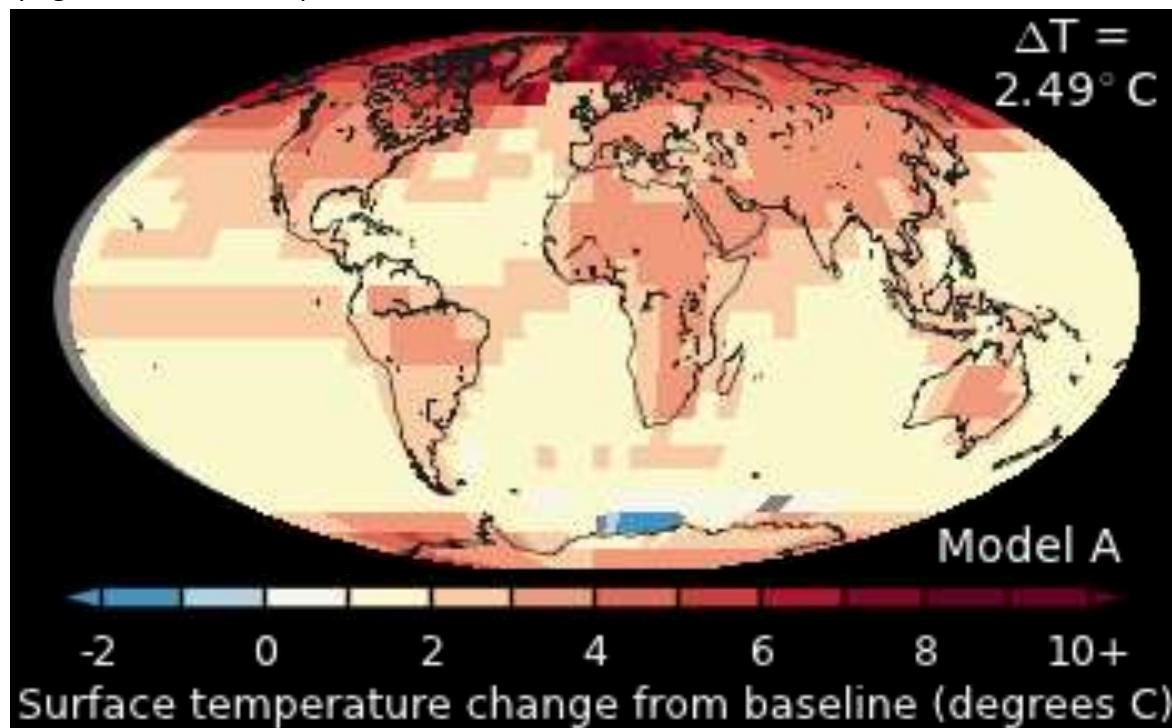

Figure 1: An example animation frame showing regional temperature changes.

In this example, the model used is bcc-csm1;
In this example, the time period shown is 2090-2109 (around central year 2100);
In this example, the scenario is RCP4.5;
All data plotted are regridded from the model native resolution to T15 truncation;
All data are twenty-year average surface temperatures for the grid point, minus the model's own 1861-1880 average at that grid point;
The projection used is a Mollweide equal-area projection.

Areas where the "signal" (change in 20-year average temperature) is less than the "noise" (standard deviation of internal model variability in 20-year average temperature over a long unforced run) have been greyed out to indicate lack of statistical significance. Data on the average internal variability, as used by the IPCC, was kindly provided by Jan Sedlacek of the ETH, Zurich for both temperature and precipitation.

The animation frames are created in the following way:
- Calculate the baseline temperature for each model (1861-1880 average);
- Select experiments to use: only the r1i1p1 runs, for all available models, for all available RCP scenarios (including extensions to 2300 where these have been done) *(note that in the present version only RCP4.5 and 8.5 are used)*;
- For each experiment, for each 20-year period (2010-2019, 2020-2039, 2030-2049, etc), calculate the change in global mean temperature (ΔGMT) at that period relative to the baseline of the model, and the regional changes in temperatures also relative to the model baseline.
- Plot the regional changes on a T15 grid (lower resolution that the original model);
- Grey out areas where the change is "not significant" (is less than the internal variability, as used by the IPCC);
- Save the regional changes as a picture, and note down the corresponding ΔGMT.

A list of the map frames thus created is shown at the end of this document.

Choice of frames for each animation

For each animation, the frames are selected in the following way, given a temperature range of X-Y:
- The range is divided into 8 bins and 2 model runs are chosen within each bin, such that
    - No experiment is repeated (an "experiment" is a model run with the same model and same forcing scenario, eg HadGEM2 RCP8.5). Thus we may not choose two consecutive time steps of the same model run, but we could choose the same model running two different scenarios;
    - The frame chosen is the closest available to 2100. Where many runs are available this will typically be the 2090-2109 time step, but if few are available then another time step may be chosen. This is consistent with the rationale for the IPCC figure SPM-10, on which the method is based.
- If no frame is available with a global mean temperature within the bin, then a blank map is created with a constant temperature change at the centre of the bin, labelled "No data".
- The frames are then arranged in random order and animated.

The animations created from a series of such images, for a given global mean temperature range, demonstrate that:

a) simulations show considerable diversity, especially for small regions;
b) there is a robust pattern of land warming more than the oceans;
c) there is a robust pattern of the Arctic regions warming more than the equator.

Similarly, animations for global precipitation projections are provided. An example frame is shown here:
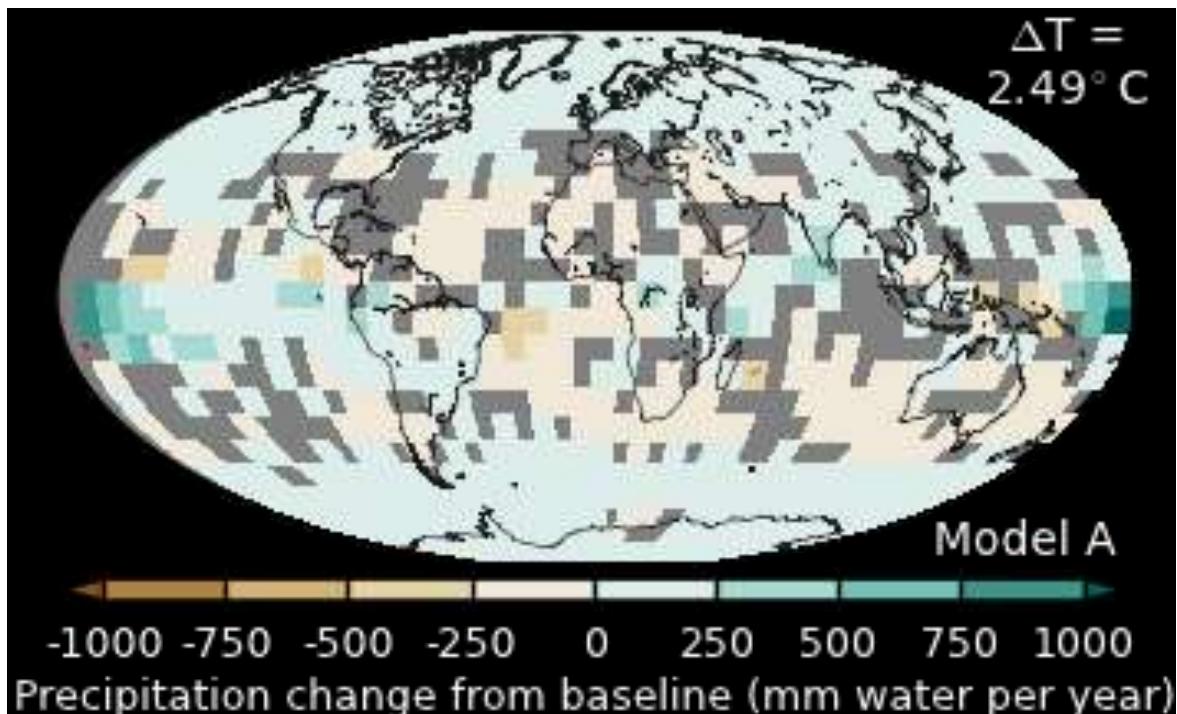
Figure 2: An example animation frame showing regional precipitation changes.

The same formatting is used as for the temperature animation. The same method has been used to grey out areas where the signal is less than the "noise" (internal model variability as provided by the IPCC).

The animations created from a series of such images, for a given global mean temperature range, demonstrate that:
a) simulations show very wide diversity, especially for small regions;
b) there is a robust pattern of greater total change near the equator, but there is not always consensus about the direction of that change;

Interpretation of animations

It should be stressed that **the animations are not time series**. A moving diagram does invite the interpretation as a change over time, and to counter this we have used intermediate grey frames with the text "Another possible outcome is". The interpretation that we hope to encourage is that there are many different state-of-the-art models which give slightly different results for any given region, but that there are robust large-scale patterns of change which can be clearly identified. These robust large-scale patterns are:
- greater warming over land than over ocean;

- greater warming in the Arctic than near the equator;
- greatest absolute precipitation changes in the tropics.

The range of variability within each animation is a function both of:
- differences between the different climate models; and
- the range of global mean temperature generated in the "thermometer" diagram.

List of models used

Each climate model is consistently represented by a letter. This makes it clearer that the acronyms stand for alternative models.

bcc-csm1-1:   'Model A'
CanESM2:   'Model B'
CCSM4:   'Model C'
CNRM-CM5:   'Model D'
CSIRO-Mk3-6-0:   'Model E'
GFDL-CM3:   'Model F'
GFDL-ESM2G: 'Model G'
GFDL-ESM2M: 'Model H'
HadGEM2-CC: 'Model J'
HadGEM2-ES: 'Model K'
inmcm4:   'Model L'
IPSL-CM5A-LR: 'Model M'
IPSL-CM5A-MR: 'Model N'
MIROC-ESM: 'Model P'
MIROC5:   'Model Q'
MRI-CGCM3:   'Model R'
NorESM1-M: 'Model S'
GISS-E2-H: 'Model T'

Model run directory

This is a list of the model/scenario/year animation frames used and the corresponding ΔT. Please contact the Global Calculator team directly if you have any questions, or to request a list of the frames used in each animation (very long file). Note that the very highest pathways at the end of this table go well beyond the temperature range that the Global Calculator can reach, and therefore these maps are never displayed.

Model	Scenario	Central year	Start of run	End of run	DeltaT
inmcm4	rcp45	2030	200601	210012	1.0188
MRI-CGCM3	rcp45	2030	200601	210012	1.0241
MRI-CGCM3	rcp85	2030	200601	210012	1.0622
GFDL-ESM2G	rcp45	2030	200601	210012	1.1169
inmcm4	rcp45	2040	200601	210012	1.1819

HadGEM2-CC	rcp45	2030	200512	210012	1.1861
MRI-CGCM3	rcp45	2040	200601	210012	1.1868
GFDL-ESM2G	rcp45	2040	200601	210012	1.2258
NorESM1-M	rcp45	2030	200601	230012	1.2265
GFDL-ESM2M	rcp45	2030	200601	210012	1.2289
GFDL-ESM2G	rcp85	2030	200601	210012	1.2379
MIROC5	rcp45	2030	200601	210012	1.2379
CSIRO-Mk3-6-0	rcp45	2030	200601	230012	1.2793
GFDL-ESM2M	rcp85	2030	200601	210012	1.2846
CNRM-CM5	rcp45	2030	200601	230012	1.3187
inmcm4	rcp45	2050	200601	210012	1.3208
MIROC5	rcp85	2030	200601	210012	1.352
NorESM1-M	rcp85	2030	200601	210012	1.357
GFDL-ESM2M	rcp45	2040	200601	210012	1.3746
MRI-CGCM3	rcp45	2050	200601	210012	1.3893
MRI-CGCM3	rcp85	2040	200601	210012	1.4078
GFDL-ESM2G	rcp45	2050	200601	210012	1.4268
NorESM1-M	rcp45	2040	200601	230012	1.4491
inmcm4	rcp45	2060	200601	210012	1.4675
CNRM-CM5	rcp85	2030	200601	210012	1.4691
MIROC5	rcp45	2040	200601	210012	1.4702
HadGEM2-ES	rcp45	2030	200512	209911	1.4738
HadGEM2-CC	rcp45	2040	200512	210012	1.4794
HadGEM2-CC	rcp85	2030	200512	210012	1.4838
GFDL-ESM2M	rcp45	2050	200601	210012	1.4852
GFDL-ESM2G	rcp85	2040	200601	210012	1.4925
MRI-CGCM3	rcp45	2060	200601	210012	1.5349
GFDL-ESM2G	rcp45	2060	200601	210012	1.5428
GFDL-ESM2G	rcp45	2070	200601	210012	1.5539
GFDL-ESM2M	rcp85	2040	200601	210012	1.5563
CNRM-CM5	rcp45	2040	200601	230012	1.5798
GFDL-ESM2G	rcp45	2080	200601	210012	1.5801
GFDL-ESM2G	rcp45	2090	200601	210012	1.5807
NorESM1-M	rcp45	2050	200601	230012	1.616
inmcm4	rcp45	2070	200601	210012	1.6219
GFDL-	rcp45	2060	200601	210012	1.6235

ESM2M					
MIROC5	rcp85	2040	200601	210012	1.6236
MIROC5	rcp45	2050	200601	210012	1.6308
GFDL-CM3	rcp45	2030	200601	210012	1.641
CSIRO-Mk3-6-0	rcp45	2040	200601	230012	1.6432
NorESM1-M	rcp85	2040	200601	210012	1.6507
bcc-csm1-1	rcp45	2030	200601	230012	1.6602
MRI-CGCM3	rcp45	2070	200601	210012	1.6901
GFDL-CM3	rcp85	2030	200601	210012	1.6973
CCSM4	rcp45	2030	200501	229912	1.701
bcc-csm1-1	rcp85	2030	200601	230012	1.715
HadGEM2-ES	rcp85	2030	200512	229912	1.7225
NorESM1-M	rcp45	2060	200601	230012	1.7508
inmcm4	rcp45	2080	200601	210012	1.756
GFDL-ESM2M	rcp45	2090	200601	210012	1.7671
GFDL-ESM2M	rcp45	2070	200601	210012	1.7731
HadGEM2-CC	rcp45	2050	200512	210012	1.7784
MIROC5	rcp45	2060	200601	210012	1.7787
GFDL-ESM2G	rcp85	2050	200601	210012	1.7813
GFDL-ESM2M	rcp45	2080	200601	210012	1.8023
inmcm4	rcp45	2090	200601	210012	1.8063
CNRM-CM5	rcp45	2050	200601	230012	1.8155
CNRM-CM5	rcp85	2040	200601	210012	1.8167
MIROC-ESM	rcp45	2030	200601	230012	1.818
HadGEM2-ES	rcp45	2040	200512	209911	1.8236
MRI-CGCM3	rcp85	2050	200601	210012	1.8327
IPSL-CM5A-MR	rcp45	2030	200601	210012	1.8389
HadGEM2-CC	rcp85	2040	200512	210012	1.861
bcc-csm1-1	rcp45	2040	200601	230012	1.8714
MRI-CGCM3	rcp45	2080	200601	210012	1.8877
GFDL-ESM2M	rcp85	2050	200601	210012	1.8892
CanESM2	rcp45	2030	200601	230012	1.8918
IPSL-CM5A-MR	rcp85	2030	200601	210012	1.8941
IPSL-CM5A-LR	rcp45	2030	200601	230012	1.8979
NorESM1-M	rcp45	2070	200601	230012	1.9083

CCSM4	rcp85	2030	200601	230012	1.9348
MIROC-ESM	rcp85	2030	200601	210012	1.946
MIROC5	rcp45	2070	200601	210012	1.9481
CCSM4	rcp45	2040	200501	229912	1.958
NorESM1-M	rcp85	2050	200601	210012	1.9763
GFDL-CM3	rcp45	2040	200601	210012	1.9889
MIROC5	rcp85	2050	200601	210012	2.0023
NorESM1-M	rcp45	2080	200601	230012	2.0056
MRI-CGCM3	rcp45	2090	200601	210012	2.0213
CNRM-CM5	rcp45	2060	200601	230012	2.0269
CSIRO-Mk3-6-0	rcp45	2050	200601	230012	2.0299
IPSL-CM5A-LR	rcp85	2030	200601	230012	2.0311
HadGEM2-CC	rcp45	2060	200512	210012	2.0387
bcc-csm1-1	rcp45	2050	200601	230012	2.0478
bcc-csm1-1	rcp85	2040	200601	230012	2.058
CanESM2	rcp85	2030	200601	210012	2.0604
MIROC5	rcp45	2080	200601	210012	2.0721
IPSL-CM5A-MR	rcp45	2040	200601	210012	2.0777
CCSM4	rcp45	2050	200501	229912	2.1071
NorESM1-M	rcp45	2090	200601	230012	2.117
GFDL-CM3	rcp85	2040	200601	210012	2.1217
GFDL-ESM2G	rcp85	2060	200601	210012	2.1335
HadGEM2-ES	rcp85	2040	200512	229912	2.1383
MIROC-ESM	rcp45	2040	200601	230012	2.1443
MIROC5	rcp45	2090	200601	210012	2.1463
HadGEM2-ES	rcp45	2050	200512	209911	2.1505
NorESM1-M	rcp45	2100	200601	230012	2.1762
bcc-csm1-1	rcp45	2060	200601	230012	2.1786
CanESM2	rcp45	2040	200601	230012	2.2045
CNRM-CM5	rcp85	2050	200601	210012	2.2046
NorESM1-M	rcp45	2110	200601	230012	2.2063
GFDL-ESM2M	rcp85	2060	200601	210012	2.2092
IPSL-CM5A-LR	rcp45	2040	200601	230012	2.2271
HadGEM2-CC	rcp45	2070	200512	210012	2.2379
CNRM-CM5	rcp45	2070	200601	230012	2.2491
CCSM4	rcp85	2040	200601	230012	2.2543
bcc-csm1-1	rcp45	2070	200601	230012	2.2691
CCSM4	rcp45	2060	200501	229912	2.2757

IPSL-CM5A-MR	rcp45	2050	200601	210012	2.2847
MRI-CGCM3	rcp85	2060	200601	210012	2.2932
NorESM1-M	rcp45	2140	200601	230012	2.3049
NorESM1-M	rcp45	2120	200601	230012	2.306
CSIRO-Mk3-6-0	rcp45	2060	200601	230012	2.3063
NorESM1-M	rcp45	2130	200601	230012	2.3322
NorESM1-M	rcp45	2150	200601	230012	2.3383
GFDL-CM3	rcp45	2050	200601	210012	2.343
IPSL-CM5A-MR	rcp85	2040	200601	210012	2.3575
MIROC-ESM	rcp85	2040	200601	210012	2.3714
HadGEM2-CC	rcp85	2050	200512	210012	2.3766
HadGEM2-CC	rcp45	2080	200512	210012	2.3821
MIROC-ESM	rcp45	2050	200601	230012	2.3914
NorESM1-M	rcp85	2060	200601	210012	2.3942
NorESM1-M	rcp45	2160	200601	230012	2.4033
bcc-csm1-1	rcp45	2080	200601	230012	2.4097
NorESM1-M	rcp45	2180	200601	230012	2.4263
NorESM1-M	rcp45	2170	200601	230012	2.4275
CNRM-CM5	rcp45	2080	200601	230012	2.428
MIROC5	rcp85	2060	200601	210012	2.4286
HadGEM2-ES	rcp45	2060	200512	209911	2.4397
bcc-csm1-1	rcp85	2050	200601	230012	2.4403
CanESM2	rcp45	2050	200601	230012	2.4446
CCSM4	rcp45	2070	200501	229912	2.4501
CSIRO-Mk3-6-0	rcp45	2070	200601	230012	2.4579
bcc-csm1-1	rcp45	2090	200601	230012	2.4592
NorESM1-M	rcp45	2190	200601	230012	2.4618
HadGEM2-CC	rcp45	2090	200512	210012	2.4773
bcc-csm1-1	rcp45	2100	200601	230012	2.4918
CanESM2	rcp85	2040	200601	210012	2.5043
IPSL-CM5A-LR	rcp45	2050	200601	230012	2.5051
CCSM4	rcp45	2080	200501	229912	2.5127
GFDL-ESM2G	rcp85	2070	200601	210012	2.5187
NorESM1-M	rcp45	2200	200601	230012	2.5264
CNRM-CM5	rcp45	2090	200601	230012	2.5331
IPSL-CM5A-LR	rcp85	2040	200601	230012	2.5397

GFDL-ESM2M	rcp85	2070	200601	210012	2.5444
IPSL-CM5A-MR	rcp45	2060	200601	210012	2.5574
NorESM1-M	rcp45	2220	200601	230012	2.5625
CCSM4	rcp45	2090	200501	229912	2.5628
bcc-csm1-1	rcp45	2110	200601	230012	2.5631
NorESM1-M	rcp45	2210	200601	230012	2.5688
bcc-csm1-1	rcp45	2120	200601	230012	2.5709
GFDL-CM3	rcp45	2060	200601	210012	2.5778
CNRM-CM5	rcp45	2100	200601	230012	2.5851
NorESM1-M	rcp45	2230	200601	230012	2.591
CSIRO-Mk3-6-0	rcp45	2080	200601	230012	2.593
NorESM1-M	rcp45	2240	200601	230012	2.5942
CNRM-CM5	rcp45	2110	200601	230012	2.6142
CCSM4	rcp85	2050	200601	230012	2.615
NorESM1-M	rcp45	2250	200601	230012	2.6216
GFDL-CM3	rcp85	2050	200601	210012	2.6244
CCSM4	rcp45	2100	200501	229912	2.6315
CNRM-CM5	rcp85	2060	200601	210012	2.6476
bcc-csm1-1	rcp45	2130	200601	230012	2.6507
HadGEM2-ES	rcp85	2050	200512	229912	2.6537
NorESM1-M	rcp45	2270	200601	230012	2.6756
CanESM2	rcp45	2060	200601	230012	2.6758
MIROC-ESM	rcp45	2060	200601	230012	2.6773
CSIRO-Mk3-6-0	rcp45	2090	200601	230012	2.6891
CNRM-CM5	rcp45	2120	200601	230012	2.6925
NorESM1-M	rcp45	2260	200601	230012	2.7007
NorESM1-M	rcp45	2280	200601	230012	2.7014
NorESM1-M	rcp45	2290	200601	230012	2.703
bcc-csm1-1	rcp45	2140	200601	230012	2.7169
MRI-CGCM3	rcp85	2070	200601	210012	2.7178
bcc-csm1-1	rcp45	2150	200601	230012	2.7303
bcc-csm1-1	rcp45	2160	200601	230012	2.7363
CNRM-CM5	rcp45	2150	200601	230012	2.7382
CNRM-CM5	rcp45	2160	200601	230012	2.7425
bcc-csm1-1	rcp45	2170	200601	230012	2.7453
IPSL-CM5A-LR	rcp45	2060	200601	230012	2.7476
CNRM-CM5	rcp45	2130	200601	230012	2.7574
bcc-csm1-1	rcp45	2180	200601	230012	2.7602
CCSM4	rcp45	2110	200501	229912	2.7606
GFDL-CM3	rcp45	2070	200601	210012	2.7624

CNRM-CM5	rcp45	2140	200601	230012	2.7646
CSIRO-Mk3-6-0	rcp45	2100	200601	230012	2.7653
HadGEM2-ES	rcp45	2070	200512	209911	2.7665
CNRM-CM5	rcp45	2170	200601	230012	2.7865
IPSL-CM5A-MR	rcp45	2070	200601	210012	2.8007
bcc-csm1-1	rcp45	2190	200601	230012	2.8026
CNRM-CM5	rcp45	2180	200601	230012	2.8054
CNRM-CM5	rcp45	2210	200601	230012	2.8104
CCSM4	rcp45	2120	200501	229912	2.8245
NorESM1-M	rcp85	2070	200601	210012	2.8301
CNRM-CM5	rcp45	2190	200601	230012	2.8324
MIROC-ESM	rcp85	2050	200601	210012	2.8326
CNRM-CM5	rcp45	2200	200601	230012	2.8371
bcc-csm1-1	rcp45	2210	200601	230012	2.8419
CNRM-CM5	rcp45	2220	200601	230012	2.8419
bcc-csm1-1	rcp45	2200	200601	230012	2.8432
CNRM-CM5	rcp45	2240	200601	230012	2.8548
CCSM4	rcp45	2130	200501	229912	2.8648
CanESM2	rcp45	2070	200601	230012	2.8664
CNRM-CM5	rcp45	2230	200601	230012	2.8686
bcc-csm1-1	rcp45	2220	200601	230012	2.8759
CNRM-CM5	rcp45	2250	200601	230012	2.8769
bcc-csm1-1	rcp45	2240	200601	230012	2.877
MIROC5	rcp85	2070	200601	210012	2.8771
GFDL-ESM2M	rcp85	2080	200601	210012	2.8844
CSIRO-Mk3-6-0	rcp45	2110	200601	230012	2.8865
IPSL-CM5A-MR	rcp85	2050	200601	210012	2.891
bcc-csm1-1	rcp45	2230	200601	230012	2.892
bcc-csm1-1	rcp45	2250	200601	230012	2.9017
CNRM-CM5	rcp45	2260	200601	230012	2.9057
IPSL-CM5A-LR	rcp45	2070	200601	230012	2.9081
GFDL-CM3	rcp45	2080	200601	210012	2.9131
CNRM-CM5	rcp45	2290	200601	230012	2.9136
GFDL-ESM2G	rcp85	2080	200601	210012	2.9189
CCSM4	rcp45	2140	200501	229912	2.9205
CCSM4	rcp45	2160	200501	229912	2.9288
CCSM4	rcp45	2150	200501	229912	2.9331
CNRM-CM5	rcp45	2280	200601	230012	2.9368
CNRM-CM5	rcp45	2270	200601	230012	2.9387

HadGEM2-ES	rcp45	2090	200512	209911	2.9431
HadGEM2-ES	rcp45	2080	200512	209911	2.9466
bcc-csm1-1	rcp85	2060	200601	230012	2.9526
CCSM4	rcp45	2170	200501	229912	2.9613
CanESM2	rcp85	2050	200601	210012	2.9671
IPSL-CM5A-MR	rcp45	2080	200601	210012	2.9684
MIROC-ESM	rcp45	2070	200601	230012	2.9748
IPSL-CM5A-LR	rcp45	2080	200601	230012	2.9954
bcc-csm1-1	rcp45	2260	200601	230012	2.9972
CCSM4	rcp45	2180	200501	229912	2.999
CSIRO-Mk3-6-0	rcp45	2120	200601	230012	3.0013
CanESM2	rcp45	2080	200601	230012	3.0199
bcc-csm1-1	rcp45	2290	200601	230012	3.0232
CCSM4	rcp45	2190	200501	229912	3.0257
bcc-csm1-1	rcp45	2280	200601	230012	3.0327
IPSL-CM5A-MR	rcp45	2090	200601	210012	3.0428
bcc-csm1-1	rcp45	2270	200601	230012	3.049
GFDL-CM3	rcp45	2090	200601	210012	3.0512
IPSL-CM5A-LR	rcp85	2050	200601	230012	3.0554
CanESM2	rcp45	2090	200601	230012	3.061
CCSM4	rcp85	2060	200601	230012	3.0649
HadGEM2-CC	rcp85	2060	200512	210012	3.0821
MIROC-ESM	rcp45	2080	200601	230012	3.0825
CCSM4	rcp45	2220	200501	229912	3.092
CCSM4	rcp45	2200	200501	229912	3.0948
IPSL-CM5A-LR	rcp45	2090	200601	230012	3.1023
MRI-CGCM3	rcp85	2080	200601	210012	3.1037
CCSM4	rcp45	2210	200501	229912	3.1038
CanESM2	rcp45	2100	200601	230012	3.1049
CNRM-CM5	rcp85	2070	200601	210012	3.1146
CCSM4	rcp45	2250	200501	229912	3.1205
CCSM4	rcp45	2230	200501	229912	3.1275
MIROC-ESM	rcp45	2090	200601	230012	3.1311
CCSM4	rcp45	2260	200501	229912	3.1327
CCSM4	rcp45	2240	200501	229912	3.1371
CSIRO-Mk3-6-0	rcp45	2130	200601	230012	3.1418
CCSM4	rcp45	2270	200501	229912	3.1532

CCSM4	rcp45	2280	200501	229912	3.1584
CCSM4	rcp45	2290	200501	229912	3.1753
MIROC-ESM	rcp45	2100	200601	230012	3.2106
CanESM2	rcp45	2110	200601	230012	3.228
NorESM1-M	rcp85	2080	200601	210012	3.2312
IPSL-CM5A-LR	rcp45	2100	200601	230012	3.2335
MIROC-ESM	rcp45	2110	200601	230012	3.2368
GFDL-CM3	rcp85	2060	200601	210012	3.2449
HadGEM2-ES	rcp85	2060	200512	229912	3.2504
GFDL-ESM2M	rcp85	2090	200601	210012	3.2552
MIROC-ESM	rcp45	2120	200601	230012	3.2639
IPSL-CM5A-LR	rcp45	2120	200601	230012	3.264
CanESM2	rcp45	2120	200601	230012	3.2684
IPSL-CM5A-LR	rcp45	2110	200601	230012	3.2764
IPSL-CM5A-LR	rcp45	2140	200601	230012	3.2795
CSIRO-Mk3-6-0	rcp45	2140	200601	230012	3.2838
IPSL-CM5A-LR	rcp45	2130	200601	230012	3.2856
MIROC-ESM	rcp45	2130	200601	230012	3.3135
CanESM2	rcp45	2130	200601	230012	3.3259
MIROC5	rcp85	2080	200601	210012	3.3283
MIROC-ESM	rcp45	2140	200601	230012	3.3295
MIROC-ESM	rcp45	2150	200601	230012	3.3432
GFDL-ESM2G	rcp85	2090	200601	210012	3.3508
IPSL-CM5A-LR	rcp45	2150	200601	230012	3.3528
CSIRO-Mk3-6-0	rcp45	2150	200601	230012	3.3591
MIROC-ESM	rcp85	2060	200601	210012	3.3653
CanESM2	rcp45	2140	200601	230012	3.3657
MIROC-ESM	rcp45	2160	200601	230012	3.3942
CanESM2	rcp45	2150	200601	230012	3.3965
MIROC-ESM	rcp45	2180	200601	230012	3.4045
MIROC-ESM	rcp45	2170	200601	230012	3.4056
CSIRO-Mk3-6-0	rcp45	2160	200601	230012	3.4069
CanESM2	rcp45	2170	200601	230012	3.4083
CanESM2	rcp45	2180	200601	230012	3.4121
bcc-csm1-1	rcp85	2070	200601	230012	3.4126

IPSL-CM5A-LR	rcp45	2180	200601	230012	3.4145
CanESM2	rcp45	2160	200601	230012	3.4323
IPSL-CM5A-LR	rcp45	2170	200601	230012	3.4362
CanESM2	rcp45	2190	200601	230012	3.4584
IPSL-CM5A-LR	rcp45	2160	200601	230012	3.46
MIROC-ESM	rcp45	2190	200601	230012	3.4633
IPSL-CM5A-LR	rcp45	2190	200601	230012	3.4671
CanESM2	rcp45	2200	200601	230012	3.4778
IPSL-CM5A-MR	rcp85	2060	200601	210012	3.4853
CanESM2	rcp85	2060	200601	210012	3.4919
CSIRO-Mk3-6-0	rcp45	2170	200601	230012	3.4974
CanESM2	rcp45	2210	200601	230012	3.4982
MIROC-ESM	rcp45	2200	200601	230012	3.5099
IPSL-CM5A-LR	rcp45	2230	200601	230012	3.5099
CanESM2	rcp45	2220	200601	230012	3.5321
MIROC-ESM	rcp45	2210	200601	230012	3.5397
IPSL-CM5A-LR	rcp45	2220	200601	230012	3.5447
IPSL-CM5A-LR	rcp45	2200	200601	230012	3.5515
CanESM2	rcp45	2260	200601	230012	3.5566
CanESM2	rcp45	2230	200601	230012	3.5599
CanESM2	rcp45	2250	200601	230012	3.5637
MIROC-ESM	rcp45	2220	200601	230012	3.5651
CCSM4	rcp85	2070	200601	230012	3.5705
MRI-CGCM3	rcp85	2090	200601	210012	3.5707
IPSL-CM5A-LR	rcp85	2060	200601	230012	3.5737
CanESM2	rcp45	2290	200601	230012	3.5833
CanESM2	rcp45	2240	200601	230012	3.5887
MIROC-ESM	rcp45	2230	200601	230012	3.5924
CNRM-CM5	rcp85	2080	200601	210012	3.6047
IPSL-CM5A-LR	rcp45	2210	200601	230012	3.6179
CanESM2	rcp45	2270	200601	230012	3.619
MIROC-ESM	rcp45	2240	200601	230012	3.6382
MIROC-ESM	rcp45	2250	200601	230012	3.6383
CanESM2	rcp45	2280	200601	230012	3.6393

MIROC-ESM	rcp45	2260	200601	230012	3.6466
CSIRO-Mk3-6-0	rcp45	2180	200601	230012	3.6496
IPSL-CM5A-LR	rcp45	2240	200601	230012	3.6567
NorESM1-M	rcp85	2090	200601	210012	3.6633
MIROC-ESM	rcp45	2270	200601	230012	3.6868
IPSL-CM5A-LR	rcp45	2280	200601	230012	3.7114
MIROC-ESM	rcp45	2280	200601	230012	3.7316
IPSL-CM5A-LR	rcp45	2250	200601	230012	3.7341
HadGEM2-CC	rcp85	2070	200512	210012	3.739
MIROC5	rcp85	2090	200601	210012	3.7439
IPSL-CM5A-LR	rcp45	2270	200601	230012	3.75
IPSL-CM5A-LR	rcp45	2260	200601	230012	3.7527
CSIRO-Mk3-6-0	rcp45	2190	200601	230012	3.7585
bcc-csm1-1	rcp85	2080	200601	230012	3.7726
MIROC-ESM	rcp45	2290	200601	230012	3.7764
IPSL-CM5A-LR	rcp45	2290	200601	230012	3.7771
CSIRO-Mk3-6-0	rcp45	2200	200601	230012	3.8238
HadGEM2-ES	rcp85	2070	200512	229912	3.8354
GFDL-CM3	rcp85	2070	200601	210012	3.8472
CSIRO-Mk3-6-0	rcp45	2210	200601	230012	3.9269
CSIRO-Mk3-6-0	rcp45	2230	200601	230012	3.9376
MIROC-ESM	rcp85	2070	200601	210012	3.9626
CSIRO-Mk3-6-0	rcp45	2220	200601	230012	3.9773
CSIRO-Mk3-6-0	rcp45	2240	200601	230012	4.0216
CanESM2	rcp85	2070	200601	210012	4.0335
CCSM4	rcp85	2080	200601	230012	4.0537
CNRM-CM5	rcp85	2090	200601	210012	4.1084
IPSL-CM5A-MR	rcp85	2070	200601	210012	4.1324
IPSL-CM5A-LR	rcp85	2070	200601	230012	4.1698
CSIRO-Mk3-	rcp45	2250	200601	230012	4.1813

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CSIRO-Mk3-6-0	rcp45	2260	200601	230012	4.1829
CSIRO-Mk3-6-0	rcp45	2270	200601	230012	4.1956
HadGEM2-CC	rcp85	2080	200512	210012	4.1987
bcc-csm1-1	rcp85	2090	200601	230012	4.2255
CSIRO-Mk3-6-0	rcp45	2280	200601	230012	4.2633
CSIRO-Mk3-6-0	rcp45	2290	200601	230012	4.3643
GFDL-CM3	rcp85	2080	200601	210012	4.4203
HadGEM2-ES	rcp85	2080	200512	229912	4.4674
CCSM4	rcp85	2090	200601	230012	4.5138
CanESM2	rcp85	2080	200601	210012	4.6368
MIROC-ESM	rcp85	2080	200601	210012	4.6498
IPSL-CM5A-MR	rcp85	2080	200601	210012	4.6651
bcc-csm1-1	rcp85	2100	200601	230012	4.6975
HadGEM2-CC	rcp85	2090	200512	210012	4.7373
IPSL-CM5A-LR	rcp85	2080	200601	230012	4.7801
CCSM4	rcp85	2100	200601	230012	4.9007
GFDL-CM3	rcp85	2090	200601	210012	4.964
HadGEM2-ES	rcp85	2090	200512	229912	5.0262
bcc-csm1-1	rcp85	2110	200601	230012	5.0884
IPSL-CM5A-MR	rcp85	2090	200601	210012	5.1392
CanESM2	rcp85	2090	200601	210012	5.2133
CCSM4	rcp85	2110	200601	230012	5.2529
MIROC-ESM	rcp85	2090	200601	210012	5.2995
IPSL-CM5A-LR	rcp85	2090	200601	230012	5.3863
bcc-csm1-1	rcp85	2120	200601	230012	5.4853
HadGEM2-ES	rcp85	2100	200512	229912	5.5391
CCSM4	rcp85	2120	200601	230012	5.6219
bcc-csm1-1	rcp85	2130	200601	230012	5.8457
IPSL-CM5A-LR	rcp85	2100	200601	230012	5.9522
CCSM4	rcp85	2130	200601	230012	6.0413
HadGEM2-ES	rcp85	2110	200512	229912	6.1325
bcc-csm1-1	rcp85	2140	200601	230012	6.1354
CCSM4	rcp85	2140	200601	230012	6.3862

IPSL-CM5A-LR	rcp85	2110	200601	230012	6.4109
bcc-csm1-1	rcp85	2150	200601	230012	6.4497
CCSM4	rcp85	2150	200601	230012	6.6679
HadGEM2-ES	rcp85	2120	200512	229912	6.6704
bcc-csm1-1	rcp85	2160	200601	230012	6.7804
IPSL-CM5A-LR	rcp85	2120	200601	230012	6.9292
CCSM4	rcp85	2160	200601	230012	6.9701
bcc-csm1-1	rcp85	2170	200601	230012	7.1257
HadGEM2-ES	rcp85	2130	200512	229912	7.2002
CCSM4	rcp85	2170	200601	230012	7.2551
bcc-csm1-1	rcp85	2180	200601	230012	7.4384
IPSL-CM5A-LR	rcp85	2130	200601	230012	7.4441
CCSM4	rcp85	2180	200601	230012	7.5729
bcc-csm1-1	rcp85	2190	200601	230012	7.7061
HadGEM2-ES	rcp85	2140	200512	229912	7.7087
CCSM4	rcp85	2190	200601	230012	7.852
IPSL-CM5A-LR	rcp85	2140	200601	230012	7.8616
bcc-csm1-1	rcp85	2200	200601	230012	7.9408
HadGEM2-ES	rcp85	2150	200512	229912	8.0395
CCSM4	rcp85	2200	200601	230012	8.1081
bcc-csm1-1	rcp85	2210	200601	230012	8.1386
bcc-csm1-1	rcp85	2220	200601	230012	8.3086
IPSL-CM5A-LR	rcp85	2150	200601	230012	8.358
CCSM4	rcp85	2210	200601	230012	8.3633
HadGEM2-ES	rcp85	2160	200512	229912	8.4089
bcc-csm1-1	rcp85	2230	200601	230012	8.4552
CCSM4	rcp85	2220	200601	230012	8.5745
bcc-csm1-1	rcp85	2240	200601	230012	8.5959
bcc-csm1-1	rcp85	2250	200601	230012	8.686
CCSM4	rcp85	2230	200601	230012	8.7274
bcc-csm1-1	rcp85	2260	200601	230012	8.7517
bcc-csm1-1	rcp85	2270	200601	230012	8.8106
bcc-csm1-1	rcp85	2280	200601	230012	8.8557
CCSM4	rcp85	2240	200601	230012	8.8758
IPSL-CM5A-LR	rcp85	2160	200601	230012	8.8789
HadGEM2-ES	rcp85	2170	200512	229912	8.9159
bcc-csm1-1	rcp85	2290	200601	230012	8.9393
CCSM4	rcp85	2250	200601	230012	9.0037
CCSM4	rcp85	2260	200601	230012	9.0842

CCSM4	rcp85	2270	200601	230012	9.1803
CCSM4	rcp85	2280	200601	230012	9.2814
HadGEM2-ES	rcp85	2180	200512	229912	9.2979
IPSL-CM5A-LR	rcp85	2170	200601	230012	9.3156
CCSM4	rcp85	2290	200601	230012	9.362
HadGEM2-ES	rcp85	2190	200512	229912	9.5593
IPSL-CM5A-LR	rcp85	2180	200601	230012	9.6822
HadGEM2-ES	rcp85	2200	200512	229912	9.8664
IPSL-CM5A-LR	rcp85	2190	200601	230012	10.058
HadGEM2-ES	rcp85	2210	200512	229912	10.16
HadGEM2-ES	rcp85	2220	200512	229912	10.38
IPSL-CM5A-LR	rcp85	2200	200601	230012	10.454
HadGEM2-ES	rcp85	2230	200512	229912	10.615
IPSL-CM5A-LR	rcp85	2210	200601	230012	10.796
HadGEM2-ES	rcp85	2240	200512	229912	10.841
HadGEM2-ES	rcp85	2250	200512	229912	11.041
IPSL-CM5A-LR	rcp85	2220	200601	230012	11.093
HadGEM2-ES	rcp85	2260	200512	229912	11.165
HadGEM2-ES	rcp85	2270	200512	229912	11.2
HadGEM2-ES	rcp85	2280	200512	229912	11.213
HadGEM2-ES	rcp85	2290	200512	229912	11.293
IPSL-CM5A-LR	rcp85	2230	200601	230012	11.4
IPSL-CM5A-LR	rcp85	2240	200601	230012	11.681
IPSL-CM5A-LR	rcp85	2250	200601	230012	11.942
IPSL-CM5A-LR	rcp85	2260	200601	230012	12.175
IPSL-CM5A-LR	rcp85	2270	200601	230012	12.342
IPSL-CM5A-LR	rcp85	2280	200601	230012	12.454
IPSL-CM5A-LR	rcp85	2290	200601	230012	12.568