AII

Annex II: Models

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This annex provides information on the numerical models used in this assessment.

AII.1 Regional Climate Models (RCMs) Participating in CORDEX

The Coordinated Regional Climate Downscaling Experiment (CORDEX; Gutowski Jr. et al., 2016) coordinates regional downscaling activities worldwide over a number of defined domains. Regional downscaling is performed using regional climate models (RCMs) run over limited geographical regions, driven at the boundaries by the output from the Coupled Model Intercomparison Project (CMIP) global model simulations. CORDEX relies on the same infrastructure as CMIP to make the multi-model output publicly available in a standardized format: the data is disseminated via the Earth System Grid Federation (ESGF; Williams et al., 2016).

Table AII.1 lists the current CORDEX domains, displaying the different resolutions (from the lowest – 0.44°, to the highest – 0.11°, typically in rotated coordinates), with data available through the ESGF. Figure Atlas.6 provides a geographical map of the domains. Note that 0.44° and 0.22° are the prioritized resolution in the CORDEX and CORDEX-CORE experimental designs, respectively, and only some domains provide information for higher resolution (0.11°); see Atlas, Atlas.1.4.4 and https://cordex.org for further details. Table AII.1 also displays the number of simulations available for the following experiments: 'evaluation' (ERA-Interim driven simulations), and the 'historical', 'RCP2.6', 'RCP4.5' and 'RCP8.5' CMIP5-driven simulations (Taylor et al., 2012). This table illustrates the heterogeneity of information available across the different domains which limits the assessment of some scenarios in some regions.

The RCMs contributing to CORDEX (as available from ESGF) are listed in Table AII.2, including the main references and details on model components relevant for the AR6 WGI assessment.

Finally, Tables AII.3 and AII.4 provide information on the CMIP5 and RCM models used in the different CORDEX domains, respectively (the numbers in each cell indicate the number of available simulations for each scenario). Note that CORDEX information is complex to describe since each particular simulation is produced by a single combination of a CMIP5 boundary forcing, or 'driving model' (or reanalysis for the evaluation experiment) and an RCM model from Table AII.2. These two tables together provide comprehensive information on the GCM/RCM composition of the ensembles available in each domain, which is key to understanding the assessment done in WGI chapters (in particular the regional Chapters 10, 11 and 12, and the Atlas).

Table AII.1 | CORDEX regional domains. Column 1: name of the domain. Column 2: domain code (as in ESGF specification). Column 3: horizontal grid resolutions (11, 22 and 44 for 0.11°, 0.22° and 0.44° resolution in the native projections, and the suffix 'i' indicating regular interpolated domains). Columns 4–8 indicate the number of simulations available at each resolution, for the evaluation, historical, RCP2.6, RCP4.5 and RCP8.5 experiments, respectively, as archived in the ESGF as of 31 January 2021. Note that MED-CORDEX data is stored on a dedicated server (details at www.medcordex.eu) and includes experiments with only atmosphere (the standard for other domains) and atmosphere–ocean coupled regional climate models (denoted by MED and OMED, respectively). See Atlas.1.4.4 for more details on CORDEX and CORDEX-CORE experiments.

CORDEX Domains	Code	Resolutions	Evaluation	Historical	RCP2.6	RCP4.5	RCP8.5
1: South America	SAM	20, 22, 44	1, 2, 5	3, 6, 14	0, 6, 6	3, 0, 12	3, 6, 13
2: Central America	CAM	22, 44	3, 2	9, 15	6, 5	0, 3	9, 14
3: North America	NAM	11, 22, 44	1, 5, 7	0, 17, 13	0, 3, 1	0, 5, 6	0, 17, 13
4: Africa	AFR	22, 44	4, 10	10, 33	9, 13	1, 22	10, 29
5: Europe	EUR	11, 22, 44	14, 2, 15	65, 3, 27	29, 3, 11	26, 0, 21	63, 3, 26
6: South Asia	WAS	22, 44, 44i	3, 3, 0	9, 18, 1	8, 7, 1	0, 18, 1	9, 18, 1
7: East Asia	EAS	22, 44	5, 3	6, 5	6, 0	0, 5	6, 5
8: Central Asia	CAS	22, 44	2, 2	4, 2	4, 0	1, 2	4, 2
9: Australasia	AUS	22, 44, 44i	2, 6, 1	6, 34, 24	6, 0, 0	0, 25, 17	6, 25, 17
10: Antarctica	ANT	22, 44	4, 0	12, 6	2, 0	8, 5	10, 5
11: Arctic	ARC	22, 44, 44i	2, 13, 2	1, 11, 0	0, 1, 0	1, 6, 0	1, 13, 1
12: Mediterranean	MED	11, 22, 44	6, 3, 20	2, 2,13	1, 0, 1	2, 0, 7	1, 2, 12
	OMED	11, 22, 44	5, 4, 9	1, 1, 8	0, 0, 1	1, 0, 4	1, 1, 7
13: Middle East North Africa	MNA	22, 44	1, 2	2, 6	0, 1	0, 6	2, 6
14: South-East Asia	SEA	22	3	12	6	5	11

Table AII.2 | Regional climate models contributing to CORDEX experiments. Salient features of the regional climate models (RCMs) participating in CORDEX scenario experiments (CMIP5-driven). Column 1: sponsoring institution(s). Column 2: name of the model (and versions); subsequent columns for each of the model components with main references. Column 3: atmospheric component with number of vertical levels and main reference. Column 4: aerosols component (interactive or prescribed, with component details when interactive). Column 5: land component (number of levels and component name). Column 6: ocean component (prescribed or interactive, with model details when interactive). Column 7: additional components (lake, urban or river models) and comments on versions and/or different configurations of the same model.

Institution (Country)	Model	Atmosphere	Aerosols	Land	Ocean	Additional Components/Comments
		1) Number of Levels 2) Main References	1) Interactive or Prescribed 2) Component Name (When Interactive)	1) Number of Levels 2) Component Name	1) Interactive or Prescribed 2) Component Name 3) Details	Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
CNRM (France)	ALADIN52_v1 ALADIN53_v1	1) 31 2) Colin et al. (2010)	1) Prescribed; Szopa et al. (2013) dataset for evaluation and GCM forcing for scenario runs, 5 classes, 2D spatial pattern, vertical profile, seasonal cycle, temporal evolution	1) 3 2) ISBA (Noilhan and Mahfouf, 1996)	1) Prescribed SST (ice cover defined by a SST threshold)	LK: no UR: no ALADIN53_v1 is same as ALADIN52_v1 except for the radiation scheme (RRTM for the LW (Mlawer et al., 1997) and FMR-6 bands for the SW (Fouquart and Bonnel, 1980; Morcrette et al., 2008)), for the turbulent air-sea fluxes (ECUME) and for the mixing length based on Lenderink's work
CNRM (France)	ALADIN63_v1 ALADIN63_v2	1) 91 2) Nabat et al. (2020)	1) Prescribed; TACTIC dataset for eval and GCM forcing for scen, 5 classes, 2D spatial pattern, vertical profile, seasonal cycle, temporal evolution	1) 14 2) SURFEX8-ISBA (Decharme et al., 2019) No land-use land cover change is taken into account	1) Prescribed SST (ice cover defined by a SST threshold)	LK: Flake (Le Moigne et al., 2016), pronostic lake ice UR: Urban areas are considered as rock (Daniel et al., 2019) ALADIN63_v1 and ALADIN63_v2 are identical. The v2 label is used to indicate that the runs driven by the CNRM-CM5 GCM use the corrected version of the CNRM-CM5 atmospheric LBCs contrary to ALADIN53_v1
RMIB-UGent (Belgium)	ALARO-0_v1	1) 46 2) Giot et al. (2016); Top et al. (2021)	1) Prescribed	1) 2 2) ISBA (Douville et al., 2000)	1) Prescribed SST	n.a.
CCCma (Canada)	CanRCM4_r2	1) 25 2) Scinocca et al. (2016)	1) Interactive 2) Described in main reference	1) 3 2) CLASS 2.7	1) Prescribed SST	Full atmospheric physics package identical to that used by parent global model, CanAM4, used by CanESM2 for CMIP5. Historical + RCP8.5 large ensemble (50 members) of 'NAM-44' available for large ensemble (50 members) of its parent model, CanESM2

Institution (Country)	Model	Atmosphere	Aerosols	Land	Ocean	Additional Components/Comments
		1) Number of Levels 2) Main References	1) Interactive or Prescribed 2) Component Name (When Interactive)	1) Number of Levels 2) Component Name	1) Interactive or Prescribed 2) Component Name 3) Details	Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
CSIRO (Australia)	CCAM_v1 CCAM-1704_v1	1) 27 2) Hoffmann et al. (2016)	1) Interactive 2) Sulphate, black carbon, organic aerosol, mineral dust and sea salt (Rotstayn and Lohmann, 2002; Rotstayn et al., 2011)	1) 6 2) CABLE (Kowalczyk et al., 2013)	1) Prescribed SST after bias and variance correction (CCAM_V1) or just bias correction (CCAM-1704_v1) No atmospheric nudging	UR: UCLEM (Lipson et al., 2018)
CSIRO (Australia)	CCAM-2008_v1	1) 35 2) Thatcher and McGregor (2009)	1) Interactive 2) Sulphate, black carbon, organic aerosol, mineral dust and sea salt (Rotstayn and Lohmann, 2002; Rotstayn et al., 2011)	1) 6 2) CABLE (Kowalczyk et al., 2013)	1) Prescribed SST	UR: UCLEM (Lipson et al., 2018)
CLM-Community: BTU, CMCC, DWD, ETH, GUF, HZG, JLU, KIT, WEGC ZAMG (Europe)	CCLM4-8-17-CLM3-5_v1	1) 35 2) Di Virgilio et al. (2019)	1) Prescribed	1) 9 2) CLM (Dickinson et al., 2006)	1) Prescribed SST	n.a.
CLM-Community (Europe)	CCLM4-8-17_v1	1) 35 2) Panitz et al. (2014)	1) Prescribed	1) 9 2) Soil-vegetation-atmosphere transfer TERRA-ML (Schrodin and Heise, 2002)	1) Prescribed SST	n.a.
CLM-Community (Europe)	CCLM5-0-2_v1	1) 45 2) Li et al. (2018)	1) Prescribed. Aerosol optical thickness: NASA/GISS (Global Aerosol Climatology Project)	1) 9 2) Multilayer soil model TERRA-ML (Schrodin and Heise, 2002)	1) Prescribed SST	Surface roughness: GLOBE (NOAA/NGDC); Global Land Cover 2000 Project (GLC2000)
CLM-Community: HZG and KIT (Germany)	CCLM5-0-15_v1	1) 57 2) n.a.	1) Prescribed	1) 9 2) TERRA-ML (Schrodin and Heise, 2002)	1) Prescribed SST	LK: Flake (Mironov et al., 2010)
CLM-Community: GUF (Germany)	CCLM5-0-9-NEMOMED12-3-6	1) 40 2) Akhtar et al. (2018)	1) Prescribed; AeroCom global AOD data is used for Aerosol representation (Kinne et al., 2006)	1) 9 2) TERRA-ML (Schrodin and Heise, 2002)	1) Interactive 2) NEMOMED12 ($^1/_{12}$° resolution) is the interactive ocean model component (Beuvier et al., 2012) 3) The CCLM and NEMOMED12 models are coupled via OASIS3-MCT (Valcke, 2013) with a 1-h coupling time	RI: TRIP (Total Runoff Integrating Pathways) is used as the interactive river component for rivers over the Mediterranean basin to feed runoff at the river mouths to the Mediterranean Sea (NEMOMED12)

Institution (Country)	Model	Atmosphere 1) Number of Levels 2) Main References	Aerosols 1) Interactive or Prescribed 2) Component Name (When Interactive)	Land 1) Number of Levels 2) Component Name	Ocean 1) Interactive or Prescribed 2) Component Name 3) Details	Additional Components/Comments Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
CLM-Community: ETH (Switzerland)	COSMO-crCLIM-v1-1_v1	1) 40 (EUR-11), 57 (WAS-22) 2) Leutwyler et al. (2017)	1) Prescribed; AeroCom1 aerosol monthly climatology dataset (Kinne et al., 2006)	1) 9 2) TERRA-ML with a soil hydrology scheme (Schlemmer et al., 2018)	1) Prescribed SST	COSMO-crCLIM is similar to CCLM. Its main characteristics are that it runs on GPUs and includes the soil hydrology scheme of Schlemmer et al. (2018). Other adjustments include changing the upper level damping to only relax the vertical velocity instead of all dynamical fields (Klemp et al., 2008)
OURANOS (Canada)	CRCM5_v1	1) 56 (TOA 10 hPa) 2) Martynov et al. (2013); Šeparović et al. (2013)	1) Prescribed	1) 17 (to 15 m) 2) CLASS3.5c (Verseghy et al., 1993)	1) Prescribed SST and sea ice fraction	LK: Flake
UQAM (Canada)	CRCM5_v1	1) 56 (TOA 10 hPa) 2) Martynov et al. (2013)	1) Prescribed; not varying in time; higher values at the equator, lower at the poles; higher values over land than over the ocean	1) 26 (to 60 m) 2) CLASS3.5+	1) Prescribed SST and sea ice fraction	LK: FLake
INPE (Brazil)	Eta_v1	1) 38 (TOA 25hPa) 2) Chou et al. (2014a, b)	1) Prescribed	1) 4 2) NOAH scheme (Ek et al., 2003), 12 Vegetation types and 9 soil types	1) Prescribed SST	No orography smoothing; no internal or lateral boundary relaxation nudging
DMI (Denmark)	HIRHAM5_v1 HIRHAM5_v2 HIRHAM5_v3	1) 31 2) Bøssing Christensen et al. (2007)	1) Prescribed	1) 5 2) ECHAM5	1) Prescribed SST and sea ice	The different versions v1, v2 and v3 are simulation versions due to necessary re-runs, not different model versions
MOHC (UK)	HadREM3-GA7-05_v1 HadREM3-GA7-05_v2	1) 63 2) Walters et al. (2019)	1) Prescribed. MACv2-SP dataset (Stevens et al., 2017), total aerosol properties, 9 bands. EasyAerosol (Voigt et al., 2014) RCP scenarios	1) 4 2) Walters et al. (2019)	1) Prescribed SST and sea ice from driving GCM/reanalysis	LK: no The 'v2' runs are using CNRM boundary conditions from pressure level 3d data. No differences in the RCM, only a different source of LBCs

Institution (Country)	Model	Atmosphere	Aerosols	Land	Ocean	Additional Components/Comments
		1) Number of Levels 2) Main References	1) Interactive or Prescribed 2) Component Name (When Interactive)	1) Number of Levels 2) Component Name	1) Interactive or Prescribed 2) Component Name 3) Details	Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
LMD (France)	LMDZ4NEMOMED8_v1 LMDZ4NEMOMED8_v2	1) n.a. 2) L'Hévéder et al. (2013); Vadsaria et al. (2020)	1) Prescribed	1) 2 2) ORCHIDEE	1) Interactive 2) NEMOMED8 (Beuvier et al., 2010) 3) Interactive Mediterranean Sea only; 43 vertical levels with a 6-m thick first level; daily coupling frequency by the OASIS coupler (Valcke, 2013)	RI: Interactive river coupling in v2. No river coupling in v1
ULg (Belgium)	MAR311_v1	1) 24 2) Agosta et al. (2019); Kittel et al. (2021)	1) Prescribed, RCP scenarios	1) 7 2) SISVAT (De Ridder, 1997; De Ridder and Schayes, 1997; Gallée and Duynkerke, 1997; Gallée et al., 2001; Lefebre, 2003)	1) Prescribed SST and SIC (evolution of the snow properties simulated by SISVAT)	SISVAT model: 30 snow/ice layers over the ice sheet and two sub-pixels (rocs and permanent ice-covered area)
UB Belgrade (Serbia)	EBU-POM2c_v1	1) 32 2) Djurdjevic and Rajkovic (2008, 2010); Kržič et al. (2011)	1) Prescribed	1) 4 2) NOAH-LSM (Ek et al., 2003)	1) Interactive 2) POM – Princeton ocean model (30 km, L21, coupling frequency 6 min)	n.a.
ENEA (Italy)	PROTHEUS_v2	1) 18 2) Artale et al. (2010); Soto-Navarro et al. (2020)	1) No active aerosol chemical model	1) 2 2) BATS1e (Dickinson et al., 1993). Air–sea exchanges by Zeng et al. (1998) to improve excessive evaporation from warm ocean surfaces (Pal et al., 2007) in the original BATS package	1) Interactive 2) MITMED8 (1/8° resolution) is the interactive ocean model component (Sannino et al., 2009).	RI: Fully interactive (daily coupling) using the TRIP river routine model.
KNMI (Netherlands)	RACMO21P_v1 RACMO21P_v2	1) 40 2) van Meijgaard et al. (2008)	1) Prescribed (Tegen et al., 1997); 4 classes (land, maritime, dust and urban). Stratospheric and (optionally) volcanic	1) 4 2) Baseline LSM TESSEL (van den Hurk et al., 2000); land-ice tile added for ice-sheet modelling. Multilayer snow-ice-refreezing scheme (Ettema et al., 2010); snow albedo scheme (Kuipers Munneke et al., 2011); snow drift scheme (Lenaerts et al., 2012)	1) Prescribed SST and sea ice concentration; inferred from reanalysis or GCM	Model versions: simulations with RACMO21P_v2 are straight re-runs of RACMO21P_v1 employing the same model system and parameter settings. In ANT-44 simulations, v2 is only used with MOHC-HadGEM2-ES forcing to fix the remapping of SST to the RACMO grid in the v1-simulation

Institution (Country)	Model	Atmosphere 1) Number of Levels 2) Main References	Aerosols 1) Interactive or Prescribed 2) Component Name (When Interactive)	Land 1) Number of Levels 2) Component Name	Ocean 1) Interactive or Prescribed 2) Component Name 3) Details	Additional Components/Comments Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
KNMI (Netherlands)	RACMO22E_v1 RACMO22E_v2	1) 40 2) van Meijgaard et al. (2012)	1) Prescribed; inferred from CAM inventory (except volcanic); historical and RCP pathways (Lamarque et al., 2010, 2011; van Vuuren et al., 2011); also used in evaluation. Sulphate, particulate organic matter black carbon, sea salt, desert dust stratospheric aerosols and volcanic aerosol. Spatial maps and vertical profiles per species. Monthly variations and decadal trends	1) 4 2) HTESSEL (Balsamo et al., 2009)	1) Prescribed SST and sea ice concentration; inferred from reanalysis or GCM	Model versions: simulations with RACMO22E_v2 are straight re-runs of RACMO22E_v1 employing the same model system and parameter settings. Meaning of v2 depends on forcing GCM: i) MOHC-HadGEM2-ES: remapping of GCM-SST to RACMO grid erroneous in v1, corrected in v2 ii) CNRM-CERFACS-CNRM-CM5: atmospheric forcings derived from pressure-level fields, because of error in CNRM-CM5 model-level fields
KNMI (Netherlands)	RACMO22T_v1 RACMO22T_v2	1) 40 2) van Meijgaard et al. (2012)	1) Prescribed, as in RACMO22E	1) 4 2) HTESSEL (Balsamo et al., 2009)	1) Prescribed SST and sea ice concentration; inferred from reanalysis of GCM	Model versions: simulations with RACMO22T_v2 are straight re-runs of RACMO22T_v1 employing the same model system and parameter settings. In AFR-44, v2 is only used with MOHC-HadGEM2-ES forcing to fix the remapping of SST to the RACMO grid in the v1-simulation
SMHI (Sweden)	RCA4_v1 RCA4_v1a RCA4_v2 RCA4_v3 RCA4-SN_v1	1) 40 2) Samuelsson et al. (2015); Strandberg et al. (2015)	1) Prescribed; single integrated class, parametrized aerosol effect on radiation fluxes, spatially uniform, static	1) 3 2) A tile-based scheme with physiography based on ECOCLIMAP (Samuelsson et al., 2015)	1) Prescribed SST and sea ice from daily driving GCMs/reanalysis	LK: Flake (pronostic lake ice; Mironov et al., 2010) Model versions: i) RCA4-v1a is simply a re-run because a restart file to start the scenario experiment was taken from another simulation. ii) RCA4-v2 and RCA4-v3 are slightly tuned versions of RCA4-v1 (some parameters) but parametrizations are the same. RCA-SN indicates spectral nudging

Institution (Country)	Model	Atmosphere	Aerosols	Land	Ocean	Additional Components/Comments
		1) Number of Levels 2) Main References	1) Interactive or Prescribed 2) Component Name (When Interactive)	1) Number of Levels 2) Component Name	1) Interactive or Prescribed 2) Component Name 3) Details	Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
CNRM (France)	RCSM4_v1	1) 31 2) Sevault et al. (2014)	1) Prescribed (Szopa et al., 2013) dataset for evaluation and GCM forcing for scen runs, 5 classes, 2D spatial pattern, vertical profile, seasonal cycle and temporal evolution	1) 3 2) ISBA (Noilhan and Mahfouf, 1996)	1) Interactive 2) NEMOMED8 (Beuvier et al., 2010) 3) Mediterranean Sea only; 43 vertical levels with a 6-m thick first level; daily coupling frequency by the OASIS coupler (Valcke, 2013)	1) Interactive rivers connecting the atmosphere to the ocean 2) TRIP (Oki and Sud, 1998; Decharme et al., 2010) 3) 50-km spatial resolution
GERICS and MPI-CSC (Germany)	REMO2009_v1 REMO2015_v1 REMO2015_v2	1) 27 2) Jacob and Podzun, (1997); Jacob (2001)	1) Prescribed (Tanré et al., 1984)	1) 5 2) A tile-based scheme including annual cycle of albedo (Rechid et al., 2009)	1) Prescribed SST and SIC	REMO2009_v1 and REMO2015_v1 and V2 are essentially the same, just with some technical changes
GERICS-AWI (Germany)	ROM ROM_v1	1) 27 2) Sein et al. (2015)	See above	See above	1) Interactive 2) SST, SIC and SIT are calculated in ocean model MPIOM	1) Interactive rivers connecting the atmosphere to the ocean 2) Hydrological Discharge (HD) model 3) 50-km spatial resolution
MGO (Russia)	RRCM_v1	1) 25 2) Shkolnik and Efimov (2013)	1) Prescribed	1) 4 2) MGO-2	1) Prescribed SST	n.a.
ITU (Turkey)	RegCM4-BATS_v1	1) 18 2) Ruti et al. (2016); Turuncoglu (2019)	1) No active aerosol chemical model	1) 2 2) BATS1e	1) Prescribed; surface layer (Zeng et al., 1998)	In MED-11, Wave Model (WAM) Cycle-4 (4.5.3-MPI) coupled with atmospheric model
ITU (Turkey)	RegESM	1) 18 2) Ruti et al. (2016); Turuncoglu (2019)	See above	See above	1) Interactive 2) ROMS-revision 809; (Haidvogel et al., 2008)	In MED-11, Wave Model (WAM) Cycle-4 (4.5.3-MPI) coupled with atmospheric model
ICTP (Italy) RU-CORE (Thailand)	RegCM4-3_v4	1) 18 2) Giorgi et al. (2012)	1) No active aerosol chemical model	1) 2 2) BATS1e (SAM-44: 1) 10 2) CLM3.5)	1) Prescribed; surface layer (Zeng et al., 1998)	n.a.
ICTP (Italy) BOUN (Turkey)	RegCM4-3_v5	1) 18 2) Ozturk et al. (2017, 2018)	1) No active aerosol chemical model	1) 1 2) BATS1e	1) Prescribed; surface layer (Zeng et al., 1998)	n.a.
ICTP (Italy)	RegCM4-4_v0	1) 18 2) Giorgi et al. (2012)	1) No active aerosol chemical model	1) 2 2) BATS1e	1) Prescribed; surface layer (Zeng et al., 1998)	n.a.

Institution (Country)	Model	Atmosphere 1) Number of Levels 2) Main References	Aerosols 1) Interactive or Prescribed 2) Component Name (When Interactive)	Land 1) Number of Levels 2) Component Name	Ocean 1) Interactive or Prescribed 2) Component Name 3) Details	Additional Components/Comments Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
ICTP (Italy) IITM (India)	RegCM4-4_v5	1) 18 2) Giorgi et al. (2012); Sanjay et al. (2017, 2020)	1) No active aerosol chemical model	1) 10 2) CLM4.5	1) Prescribed; surface layer (Zeng et al., 1998)	UR: CLM4.5
ICTP (Italy)	RegCM4-6_v1	1) 23 2) Giorgi et al. (2012)	1) No active aerosol chemical model	1) 10 2) CLM4.5	1) Prescribed; surface layer (Zeng et al., 1998)	UR: CLM4.5
ICTP (Italy) ORNL (USA)	RegCM4-7_v0	1) 23 2) Giorgi et al. (2012)	1) No active aerosol chemical model	1) 10 2) CLM4.5	1) Prescribed; surface layer (Zeng et al., 1998)	UR: CLM4.5
ICTP (Italy) ISU (USA)	RegCM4_v4-4-rc8	1) 18 2) Giorgi andAnyah (2012); Mearns et al. (2017); Bukovsky and Mearns (2020)	n.a.	1) 3 soil layers 2) BATS	1) Prescribed SST; no sea ice prescribed, atmospheric skin temperature instead	LK: Hostetler et al. (1994)
UB (Serbia)	EBU	1) 32 2) n.a.	Same as EBU-POM2c_v1	Same as EBU-POM2c_v1	1) Prescribed SST	n.a.
UCAN (Spain)	WRF341I_v2	1) 30 2) Skamarock et al. (2008)	1) Prescribed uniform background with vertical profile. Constant in time	1) 4 2) Noah (Chen and Dudhia, 2001)	1) Prescribed SST and sea ice	WRF v3.4.1. 'I' stands for the coordinated physics configuration used within CORDEX. 'v2' refers to the variable GHG input and no leap calendar in scenario (CanESM2) simulations. Otherwise, fully comparable to v1 in ERA-Interim (fixed GHG, standard cal.)
CYI (Cyprus)	WRF351_v1	1) 30 2) Zittis et al. (2014); Zittis and Hadjinicolaou (2017)	1) Prescribed	1) 4 2) Noah (Chen and Dudhia, 2001)	1) Prescribed SST	n.a.
UNSW (Australia)	WRF360J_v1 WRF360K_v1	1) 30 2) Powers et al. (2017); Evans et al. (2021)	1) Prescribed	1) 4 2) Noah (Chen and Dudhia, 2001)	1) Prescribed SST (ice with SST threshold)	n.a.
UNSW (Australia)	WRF360L_v1	1) 30 2) Powers et al. (2017); Di Virgilio et al. (2019)	1) Prescribed	1) 4 2) Noah (Chen and Dudhia, 2001)	1) Prescribed SST (ice with SST threshold)	n.a.
UHOH (Germany)	WRF361H_v1	1) 50 2) Skamarock et al. (2008)	1) Prescribed uniform background with vertical profile. Constant in time	1) 4 2) NOAH (Chen and Dudhia, 2001)	1) Prescribed SST (ice with SST threshold)	n.a.

Institution (Country)	Model	Atmosphere 1) Number of Levels 2) Main References	Aerosols 1) Interactive or Prescribed 2) Component Name (When Interactive)	Land 1) Number of Levels 2) Component Name	Ocean 1) Interactive or Prescribed 2) Component Name 3) Details	Additional Components/Comments Lake (LK), Urban (UR) or River (RI) Models, etc., Comments on the Different Versions
CRC (France)	WRF381_v1	1) 50 2) DOIs:10.25666/dataosu-2021-03-05-02; 10.25666/dataosu-2021-03-05	1) Prescribed (Tegen et al., 1997)	1) 4 2) Noah_mp (Niu et al., 2011) Modis land categories	1) Prescribed SST (ice with SST threshold) from global model	Allow sub-grid cloud fraction interaction with radiation (Alapaty et al., 2012). The forcing variables have been bias corrected using ERA-Interim fields for 1981–2005, as in Bruyère et al. (2014)
IPSL (France)	WRF381P_v1 WRF381P_v2	1) 31 2) Skamarock et al. (2008)	1) Prescribed aerosols	1) 4	1) Prescribed SST and sea ice (from global model)	n.a.
NCAR and UA (USA)	WRF_v3-5-1	1) 28 2) Skamarock et al. (2008); Mearns et al. (2017); Bukovsky and Mearns, (2020)	1) Prescribed	1) 4 soil levels 2) Noah	1) Prescribed SST, prescribed sea ice for GFDL and MPI-driven simulations, sea ice with an SST threshold for HadGEM-driven simulation	WRF v3.5.1 Spectral nudging used

Table AII.3 | CMIP5 models used for downscaling in the different CORDEX domains. Climate models participating in CMIP5 (rows) used as boundary conditions for the CORDEX regional simulations in the different domains (columns). Each cell indicates the number of simulations available for the historical, RCP2.6, RCP4.5 and RCP8.5 experiments (see the colour legend). Salient features of these models are described in IPCC AR5 Appendix 9.A (model names are taken from Table 9.A.1). Further details on these simulations (e.g., particular GCM-RCM combinations in each cell) are given in the November 2020 list of simulations available in the CORDEX website: https://cordex.org. [a] For the Mediterranean domain, only the coupled atmosphere–ocean simulations are listed. See Table AII.1 for the codes of CORDEX domains.

Historical RCP2.6 RCP4.5 RCP8.5

GCM/Domain	SAM				CAM				NAM				AFR				EUR-11				WAS				EAS				CAS				AUS				ANT				ARC				MED[a]				MNA				SEA			
CanESM2_r1i1p1	3		3	3	3			3	6		5	6	4		4	3					2		2	2									3		3	3	1		1	1	4		3	4												
CNRM-CM5_r1i1p1					2			2	1		1	1	2		2	2	10	5	6	9	2		2	2	1		1	1	1	1	1	1	2		2	2									3	1	2	2	1		1	1	1			
ACCESS1-0_r1i1p1																																	9		5	5	1		1	1																
ACCESS1-3_r1i1p1																																	6		2	2	1			1																
CSIRO-Mk3-6-0_r1i1p1	1		1	1	1			1					1		1	1					2		2	2																																
EC-EARTH_r12i1p1	1	1	1	1	1	1	1	1	1	1	1	1	4	3	3	3	8	5	4	8	2	1	1	2	1		1	1					1		1	1	1	1			2	1	1	2	1			1	2	1	1	2				
EC-EARTH_r1i1p1													2		1	2	4		1	4																	1		1	1													1		1	1
EC-EARTH_r3i1p1									1		1	1	2		1	2	4	1	1	4					1		1	1									1		1	1	1		1	1												
PSL-CM5A-LR_r1i1p1													1	1		1	1	1			1		1	1																													1		1	1
IPSL-CM5A-MR_r1i1p1	1		1	1	1			1					1		1	1	5		2	5	1		1	1																					2		1	2								
MIROC5_r1i1p1	2	1	2	2	1	1		1					2	2	1	2		2			2	2	1	2									2		2	2	1		1	1																
HadGEM2-CC_r1i1p1																																	1		1	1																				
HadGEM2-ES_r1i1p1	5	3	3	5	4	3	1	4	5	1		5	8	6	3	8	9	6	5	9	2	2	1	2	3	2	1	3	2	1	1	2	2	2		2	1	1	1	1									1		1	1	4	2	2	4
HadGEM2-ES_r2i1p1					1			1																																																
MPI-ESM-LR_r1i1p1	3	3	2	3	2	2	1	2	8	1	2	8	6	4	4	5	9	4	3	10	5	5	3	5	2	1	1	2	1	1		1	4	2	2	4					3		1	5	3		1	3					1	1		1
MPI-ESM-LR_r2i1p1													1			1	3	1	1	3																																				
MPI-ESM-LR_r3i1p1													1			1	3			3																																				
MPI-ESM-MR_r1i1p1	2	1		2	2	1		2	2			2	2	1		2					2	1	1	2	1	1		1	1		1	1									1			1	1			1	1		1	1	2	1	1	2
MPI-ESM-MR_r2i1p1					1																																																			
CCSM4_r1i1p1																																	1		1	1																				
CCSM4_r6i1p1																																																	1		1	1				
NorESM1-M_r1i1p1	3	3	1	3	2	2		2	1	1		1	4	4	1	4	8	3	3	8	4	4	1	4	2	2		2	1	1		1	5	2	3	5	2		1	2	1		1	1									2	2		2
GFDL-CM3_r1i1p1																																	1		1	1																				
GFDL-ESM2G_r1i1p1													1	1			1	1																																						
GFDL-ESM2M_r1i1p1	2		1	1	3	1		3	5		1	5	1		1	1					2		2	2									2		2	2	1		1	1					1		1	1	2		1	2				

Table AII.4 | Regional models used for downscaling in the different CORDEX domains. Regional simulations contributed by the different models participating in CORDEX (rows, grouped by model families, see Table AII.2) in the different domains (columns). Each cell indicates the number of simulations available for the historical, RCP2.6, RCP4.5 and RCP8.5 experiments (see the colour legend). Further details on these simulations (e.g., particular GCM-RCM combinations in each cell) are given in the November 2020 list of simulations available in the CORDEX website: https://cordex.org. [a] For the Mediterranean domain, only the coupled atmosphere–ocean simulations are listed. See Table AII.1 for the codes of CORDEX domains.

Historical | RCP2.6 | RCP4.5 | RCP8.5

RCM/Domain	SAM				CAM				NAM				AFR			
	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5
ALADIN63																
ALARO																
CCAM																
CCLM													7	3	4	7
COSMO-crCLIM																
CRCM5					4			4	10		6	10	2		2	
CanRCM4									2		2	2	2		2	2
EBU-POM2c																
Eta	3		3	3												
HIRHAM5									1		1	1	1		1	1
HadREM3-GA7-05																
LMDZ4NEMOMED8																
MAR311																
PROTHEUS																
RACMO													3	2	2	2
RCA4	9	5	9	9	10	5	3	10	2	1	2	2	14	5	10	14
RCSM4																
REMO2009	1	1	1	1									6	6	2	5
REMO2015	3	3		3	3	3		3	3	3		3	3	3		3
ROM																
RRCM																
RegCM4_3	3		1	2	4			3					2			2
RegCM4-4*6*7	3	3		3	3	3		3	6			6	3	3		3
WRF	1		1	1					6			6				

RCM/Domain	EUR-11				WAS				EAS				CAS			
	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5
ALADIN63	5	2	2	5												
ALARO	1	1	1	1									1	1	1	1
CCAM																
CCLM	4	2	4	4					4		4	4				
COSMO-crCLIM	8			8	3	2		3								
CRCM5																
CanRCM4																
EBU-POM2c																
Eta																
HIRHAM5	8	2	3	8					1		1	1				
HadREM3-GA7-05	5	2		4												
LMDZ4NEMOMED8																
MAR311																
PROTHEUS																
RACMO	8	5	4	8												
RCA4	11	5	7	11	10	5	10	10								
RCSM4																
REMO2009	2	2	2	2	2	2	2	2								
REMO2015	6	7	3	4	3	3		3	3	3		3	3	3		3
ROM																
RRCM																
RegCM4_3													2		2	2
RegCM4-4*6*7	3	2		3	9	3	6	9	3	3		3				
WRF	5		1	6												

RCM/Domain	AUS				ANT				ARC				MED[a]			
	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5
ALADIN63																
ALARO																
CCAM	18		17	17	6		5	5								
CCLM	7	3	4	7									2		1	2
COSMO-crCLIM																
CRCM5									2			2				
CanRCM4									2		2	2				
EBU-POM2c													1			1
Eta																
HIRHAM5					1		1	1	1		1	3				
HadREM3-GA7-05																
LMDZ4NEMOMED8													4		1	4
MAR311					2			2								
PROTHEUS													1		1	
RACMO					3	2	2	2								
RCA4									8	1	4	8				
RCSM4													1	1	1	1
REMO2009																
REMO2015	3	3		3												
ROM													2		1	2
RRCM									1			1				
RegCM4_3																
RegCM4-4*6*7																
WRF	14		6	6												

RCM/Domain	MNA				SEA			
	Historical	RCP2.6	RCP4.5	RCP8.5	Historical	RCP2.6	RCP4.5	RCP8.5
ALADIN63								
ALARO								
CCAM								
CCLM								
COSMO-crCLIM								
CRCM5								
CanRCM4								
EBU-POM2c								
Eta								
HIRHAM5								
HadREM3-GA7-05								
LMDZ4NEMOMED8								
MAR311								
PROTHEUS								
RACMO								
RCA4	5	1	3	5	1		1	1
RCSM4								
REMO2009								
REMO2015					3	3		3
ROM								
RRCM								
RegCM4_3	2		2	2	5		4	4
RegCM4-4*6*7					3	3		3
WRF	1		1	1				

AII.2 Earth System Models and General Circulation Models for Climate Projections

Detailed and structured information about climate models, simulations and their conformance to common experimental protocols is not only important for scientific interpretation but, under increased scrutiny from society, it is also demanded of climate science that purports to be mature, credible, open, transparent and reproducible (Guilyardi et al., 2013). Scientific publications remain an essential way of documenting models but remain largely scattered and not easily accessible by the growing community of users of model output. To address these challenges, the Earth System Documentation (ES-DOC) project offers an ecosystem of tools and services in support of Earth system modelling documentation creation, analysis and dissemination. ES-DOC is coordinated with other community efforts such as the Coupled Model Intercomparison Project (CMIP) via the World Climate Research Programme work group on Climate Modelling (WGCM) and its Infrastructure Panel WIP (Balaji et al., 2018).

The objective of CMIP is to better understand past, present and future global climate changes arising from natural, unforced variability or in response to changes in radiative forcing in a multi-model context (Chapter 1, Section 1.5.4). This understanding includes assessments of model performance during the historical period (Chapter 3) and quantifications of the causes of the spread in future projections (Chapters 4 and 7). Idealized experiments are also used to increase understanding of the model responses. In addition to these long time scale responses, experiments are performed to investigate the predictability of the climate system on various time and space scales, as well as making predictions from initialized climate states. The different activities (MIP) endorsed by CMIP6 are listed in Chapter 1, Table 1.3 (Eyring et al., 2016). A set of common experiments, the DECK (Diagnostic, Evaluation and Characterization of Klima) and CMIP historical simulations (1850–2014), were introduced that will maintain continuity with previous CMIP phases and help document basic and evolving characteristics of models. ScenarioMIP is the framework for future climate projections (O'Neill et al., 2016). The infrastructure panel of the World Climate Research Programme coordinates framework developments and defines data standards for CMIP. A key aspect is the dissemination of the data via the Earth System Grid Federation (ESGF; Williams et al., 2016; Petrie et al., 2021).

A new online service, ES-DOC, provides information about all aspects of CMIP6. Building on the Common Information Model concepts and standards (Lawrence et al., 2012), a number of documents are created for the CMIP6 Project, as illustrated at https://es-doc.org/cmip6/. These include documents to describe experiments, ensemble simulations, models, conformance to the numerical requirements of the CMIP6 protocol (see Pascoe et al., 2020 for CMIP6 experiments) and other important aspects of the CMIP6 model archive. These different documents are either produced automatically or provided in a standard way by modelling groups. Hundreds of clearly structured properties are harvested and stored on a database to be used by clients and portals (e.g., https://search.es-doc.org/ and https://explore.es-doc.org/). Another entry point to the database is provided by the one-stop-shop 'further_info_url' global attribute in each CMIP6 netCDF data file. ES-DOC also includes the CMIP6 errata system (https://errata.es-doc.org), which tracks issues with the model data and the potential corrections made. ES-DOC includes information at the model level and the experiment level.

Model datasets shared on ESGF are characterized by their institution, model, experiment, variable and ensemble member (the different types of ensemble strategies are introduced in Chapter 1, Section 1.4). Each ensemble member is designated by a label of four letters, each associated with a number: 'r' for realization, 'i' for initialization, 'p' for physics, and 'f' for forcing. For example, Table Atlas.SM.2 lists the ensemble member label of each CMIP6 dataset used in the Atlas. In the future, ES-DOC will document in more detail how each individual member differs from the other members of a given ensemble.

The key new model developments since AR5 are summarized in Chapter 1, Section 1.3.5, and model results are assessed in multiple chapters of this report. In this annex, Table AII.5 presents the main features of the CMIP6 coupled models, in a format comparable with AR5 Table 9.A.1 for CMIP5 (Flato et al., 2013). At the date of March 2021, 136 models had registered for CMIP6, including the 23 CMIP6-endorsed MIPs (Chapter 1, Table 1.3). For conciseness, Table AII.5 documents only the coupled models used in the CMIP6 'DECK' experiments and ScenarioMIP, excluding atmosphere-only and ocean-only components (AMIP and OMIP), radiative transfer models (RFMIP), and other MIPs. Registered coupled models that have not submitted data in time to be used in this report are not included. The high-resolution models used for HighResMIP (Haarsma et al., 2016) are listed in Table AII.6, and ice-sheet models are documented in Section AII.3. The citation information for all CMIP6 model datasets is compiled in Section AII.4, Table AII.10.

Table AII.5 | Coupled climate and Earth system models participating in CMIP6 DECK, historical simulation and ScenarioMIP. Salient features of the coupled general circulation models (GCMs) and Earth system models (ESMs) participating in the CMIP6 DECK, historical simulation and ScenarioMIP. Column 1: sponsoring institution(s). Column 2: names of model configurations. Column 3: main reference(s); subsequent columns for each of the model components, with names and main component reference(s). In addition, there are standard entries for the atmosphere component: horizontal grid resolution, number of vertical levels, grid top; and for the ocean component: horizontal grid resolution, number of vertical levels and vertical coordinate type. The horizontal resolution (rounded to 10km) is the square root of the surface area of the Earth divided by the number of grid points, or the area of the ocean surface divided by the number of surface ocean grid points, for the atmosphere and ocean, respectively. When reported in hPa, the atmosphere top heights are converted into km assuming standard atmosphere (ISO 2533:1975, 1975). Aerosols are either prescribed or computed from emissions (emissions-driven). For land carbon, a list of active processes is provided among: active land carbon cycle (Land carbon), active nitrogen cycle (N cycle), prognostic biogeography of vegetation (Prog. veg.), carbon included in a permafrost pool (Permafrost), and dynamic fires (Fires). A blank entry indicates that information was not available. The information contained in the table is consistent with version 6.2.55.10 of the CMIP6 Controlled Vocabularies (https://github.com/WCRP-CMIP/CMIP6_CVs).

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions-driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
AS-RCEC Research Center for Environmental Changes, Academia Sinica Taiwan, China	TaiESM1.0	W.-L. Lee et al. (2020)	1) TaiAM1 2) 100 km, 30 L 3) Top 43 km	1) SNAP 2) Emissions-driven 3) Chen et al. (2013)	None	1) POP2 2) 60 km, 60 L 3) z	1) CICE4	1) CLM4.0 with modified surface solar radiation 2) Lee et al. (2013)	Land carbon N cycle Fires	None
AWI Alfred Wegener Institute Germany	AWI-CM-1-1-LR AWI-CM-1-1-MR AWI-ESM-1-1-LR	Sidorenko et al. (2015) Semmler et al. (2020)	1) ECHAM6.3.04p1 2) LR: 170 km, 47 L; MR: 80 km, 95 L 3) Top 80 km	2) Prescribed MACv2-SP 3) Stevens et al. (2017)	None	1) FESOM1.4 2) LR: 50 km, 46 L MR: 20km, 46 L 3) z	1) FESOM1.4	1) JSBACH 3.20	AWI-CM: none AWI-ESM: Land carbon N cycle Prog. veg. Fires	None
BCC Beijing Climate Centre, China	BCC-CSM2-MR	Wu et al. (2019)	1) AGCM3 2) 100 km, 46 L 3) Top 45 km	2) Prescribed MACv2-SP 3) Stevens et al. (2017)	None	1) MOM4 2) 80 km, 40 L 3) z	1) SIS1	1) BCC_AVIM2 2) Li et al. (2019b)	None	None
BCC	BCC-ESM1	Wu et al. (2020)	1) AGCM3 2) 250 km, 26 L 3) Top 42 km	2) Emissions-driven	1) BCC-AGCM3-Chem 2) Interactive 3) Wu et al. (2020)	1) MOM4 2) 80 km, 40 L 3) z	1) SIS1	1) BCC_AVIM2 2) Li et al. (2019b)	Land carbon	None
CAMS Chinese Academy of Meteorological Sciences China	CAMS-CSM1-0	Rong et al. (2018)	1) ECHAM5_CAMS 2) 100 km, 31 L 3) Top 31.2 km	2) Prescribed MACv2-SP 3) Stevens et al. (2017)	None	1) MOM4 2) 90 km, 50 L 3) z	1) SIS1	1) CoLM	None	None

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions-driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
CAS Chinese Academy of Sciences China	FGOALS-f3-L	He et al. (2020)	1) FAMIL2.2 2) 90 km, 32 L 4) Top 42.1 km (He et al., 2019)	2) Prescribed 3) He et al. (2019)	None	1) LICOM3.0, 2) 80 km, 30 L 3) z 4) P. Lin et al. (2020)	1) CICE4.0	1) CLM4.0/CAS-LSM 2) Xie et al. (2018)	None	None
CAS	FGOALS-g3	Li et al. (2020)	1) GAMIL3 2) 190 km, 26 L 3) Top 42 km	2) Prescribed 3) Li et al. (2020)	None	1) LICOM3.0, 2) 80 km, 30 L 3) z 4) P. Lin et al. (2020)	1) CICE4.0	1) CLM4.0/CAS-LSM 2) Xie et al. (2018)	None	None
CCCMa Canadian Centre for Climate Modelling and Analysis Canada	CanESM5 CanESM5-CanOE	Swart et al. (2019a)	1) CanAM5 2) 250 km, 49 L 3) Top 48 km	2) Emissions-driven 3) von Salzen et al. (2013)	2) Specified oxidants, interactive sulphur 3) von Salzen et al. (2013)	1) NEMO3.4.1 2) 70 km, 45 L 3) z	1) LIM2	1) Physics, CLASS3.6 Biogeochemistry, CTEM1.2 2) Verseghy (2000); Arora and Boer (2010)	Land carbon	CanESM5: CMOC CanESM5-CanOE: CanOE
CCCR-IITM Centre for Climate Change Research, Indian Institute of Tropical Meteorology India	IITM-ESM	Swapna et al. (2018)	1) IITM-GFS 2) 170 km, 64 L 3) Top 61 km	2) Prescribed MAC-v2 3) Stevens et al., (2017); Fiedler et al. (2019a)	None	1) MOM4p1 2) 90 km, 50 L 3) z	1) SISv1.0	1) NOAH LSMv2.7.1	None	TOPAZv2.0
CMCC Centro Euro-Mediterraneo sui Cambiamenti Climatici Italy	CMCC-CM2-SR5 CMCC-ESM2	Cherchi et al. (2019)	1) CAM5.3 2) 100 km, 30 L 3) Top 43 km	1) MAM3 2) Emissions-driven 3) Liu et al. (2012)	2) Specified oxidants based on MOZART simulations	1) NEMO3.6 2) 70 km, 50 L 3) z	1) CICE4.0	1) CLM4.5 2) Oleson et al. (2013)	Land cardon N cycle Permafrost Fires	CM2-SR5: None ESM2: BFM5.2
CNRM Centre National de Recherches Météorologiques and CERFACS Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique France	CNRM-CM6-1 CNRM-CM6-1-HR	Voldoire et al. (2019); Saint-Martin et al. (2021)	1) Arpege 6.3; 2) CM6-1: 140 km, 91 L; CM6-1-HR: 50km, 91 L 3) Top 78 km 4) Roehrig et al. (2020)	1) TACTIC_v2 2) Prescribed 3) Michou et al. (2020)	1) OZL_V2 2) Linear ozone	1) NEMO3.6 2) CM6-1: 70 km, 75L CM6-1-HR: 20 km, 75 L 3) z	1) Gelato 6.1	1) ISBA-CTRIP 2) Voldoire et al. (2017); Decharme et al. (2019)	None	None

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions- driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
CNRM and CERFACS	CNRM-ESM2-1	Séférian et al. (2019)	1) Arpege 6.3; 2) 140 km, 91 L; 3) Top 78 km	1) TACTIC_v2 2) Emissions-driven 3) Michou et al. (2020)	1) REPROBUS-C-V2 2) Stratosphere only (above 560 hPa)	1) NEMO3.6 2) 70 km, 75 L 3) z	1) Gelato 6.1	1) ISBA-CTRIP 2) Delire et al. (2020)	Land carbon Fires	Pisces 2.s (Aumont et al., 2015; Séférian et al., 2020)
CSIRO Commonwealth Scientific and Industrial Research Organisation Australia	ACCESS-ESM1-5	Ziehn et al. (2020a)	1) HadGAM2 r1.1 2) 140 km, 38 L 3) Top 39 km	1) CLASSIC (v1.0) 2) Emissions-driven 3) Bellouin et al. (2011)	2) Specified oxidants for aerosols	1) ACCESS-OM2 GFDL-MOM5 2) 70 km, 50 L 3) z 4) Kiss et al. (2020)	1) CICE4.1	1) CABLE2.4 2) Ziehn et al. (2020a)	Land carbon N cycle	Wombat1.0
CSIRO-ARCCSS CSIRO and Austr. Res. Council Centre of Excellence for Climate System Science Australia	ACCESS-CM2	Bi et al. (2020)	1) HadGEM3- GA7.1 2) 140 km, 85 L 3) Top 85 km	1) UKCA- GLOMAP-mode 2) Emissions-driven 3) Mulcahy et al. (2020)	2) Specified oxidants for aerosols	ACCESS-OM2 GFDL-MOM5 2) 70 km, 50 L 3) z 4) Kiss et al. (2020)	1) CICE5.1.2 2) Ridley et al. (2018b)	1) CABLE2.5 2) Bi et al. (2020)	None	None
E3SM National Laboratories Consortium USA	E3SM 1.0 E3SM-1-1 E3SM-1-1-ECA	Golaz et al. (2019)	1) E3M v1.0 2) 100 km, 72 L; 3) Top 66 km 4) Rasch et al. (2019)	1) MAM4 2) Emissions-driven 3) H. Wang et al. (2020)	2) Specified oxidants for aerosols; linear interactive stratospheric ozone (LINOZ v2)	1) MPAS- Ocean v6.0 2) 40 km, 60 L 3) z* 4) Petersen et al. (2019)	1) MPAS- Seaice v6.0	1) ELM v1.0, based on CLM4.5 2) E3SM-1.0: Golaz et al. (2019) E3SM-1.1: Burrows et al. (2020)	ES3M 1.0: None ES3M1.1: Land carbon N cycle Fires	None
EC-Earth Consortium Europe	EC-Earth3 EC-Earth3-LR Options: AerChem, Veg	Döscher et al. (2021)	1) IFS cy36r4 2) EC-Earth3: 80 km, 91 L; EC-Earth3-LR: 120 km, 62 L 3) EC-Earth3: Top 80 km EC-Earth3-LR: Top 36 km	EC-Earth3 2) Prescribed, MACv2-SP AerChem: 1) TM5 2) EmissionS- driven 3) van Noije et al. (2014, 2021)	EC-Earth3 None AerChem: 1) TM5 2) Interactive 3) van Noije et al. (2014, 2021)	NEMO3.6 2) 70 km, 75 L 3) z	1) LIM3 2) Rousset et al. (2015)	EC-Earth3: 1) H-TESSEL 2) Balsamo et al. (2009) Veg: 1) H-TESSEL and LPJ-GUESS 2) Smith et al. (2014)	EC-Earth3: None Veg: N cycle Prog. veg. Fires	None
EC-Earth	EC-Earth3-CC	Döscher et al. (2021)	1) IFS cy36r4 2) 80 km, 91 L; 3) Top 80 km	2) Prescribed, MACv2-SP	None	NEMO3.6 2) 70 km, 75 L 3) z	1) LIM3 2) Rousset et al. (2015)	1) H-TESSEL and LPJ-GUESS 2) Smith et al. (2014)	Land carbon N cycle Prog. veg. Fires	PISCES v2

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions-driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
FIO-QNLM First Institute of Oceanography and Pilot National Laboratory for Marine Science and Technology (Qingdao), China	FIO-ESM-2-0	Bao et al. (2020)	1) CAM5 2) 100km, 26 L 3) Top 43 km	2) Prescribed, MACv2-SP (Stevens et al., 2017)	None	POP-W with MASNUM surface wave model 2) 60 km, 60 L 3) z 4) Qiao et al. (2013)	1) CICE4.0 2) Hunke and Lipscomp (2010)	1) CLM4.0 2) Lawrence et al. (2011)	Land carbon N cycle	BEC
HAMMOZ-Consortium Switzerland, Germany, UK, Finland	MPI-ESM-1-2-HAM	Neubauer et al. (2019a)	1) ECHAM6.3 2) 170 km, 47 L 3) Top 80 km	1) HAM2.3 2) Emissions-driven 3) Tegen et al. (2019)	2) Specified oxidants, sulphur chemistry 3) Feichter et al. (1996); Inness et al. (2013)	1) MPIOM 1.63 2) 100 km, 40 L 3) z	2) Notz et al. (2013)	1) JSBACH3.20 2) Reick et al. (2021)	Land carbon N cycle Prog. veg. Fires	HAMOCC6
INM Institute for Numerical Mathematics Russian Federation	INM-CM4-8 INM-CM5-0	INM-CM4-8: (Volodin et al., 2018) INM-CM5-0: (Volodin et al., 2017)	CM4: 1) INM-AM4-8 2) 150 km, 21 L 3) Top 31 km CM5: 1) INM-AM5.0 2) 150 km, 73 L 3) Top 61 km	1) INM-AER1 2) Emissions-driven 3) Volodin and Kostrykin (2016)	None	INM-OM5 2) CM4: 70 km, 40 L CM5: 30 km, 40 L 3) Sigma 4) Zalesny et al. (2010)	1) INM-ICE1 2) Yakovlev (2009)	INM-LND1	Land carbon	None
IPSL Institut Pierre-Simon Laplace France	IPSL-CM6A-LR	Boucher et al. (2020g)	1) LMDZ NPv6 2) 160 km, 79 L 3) Top 80 km 4) (Hourdin et al., 2020)	2) Prescribed 3) Lurton et al. (2020)	2) Specified oxidants for aerosols	1) NEMO 3.6 2) 70 km, 75 L 3) z	1) NEMO-LIM3 2) Rousset et al. (2015)	ORCHIDEE (v2.0, Water/carbon/energy mode)	None	PISCES
IPSL	IPSL-CM5A2-INCA		1) LMDZ APv5 2) 240 km, 79 L, 3) Top 80 km 4) (Hourdin et al., 2020)	1) INCA 2) Emissions-driven	1) INCA 2) Interactive 3) Hauglustaine et al. (2014)	1) NEMO 3.6 2) 150 km, 30 L 3) z	1) NEMO-LIM3 2) Rousset et al. (2015)	ORCHIDEE (IPSLCM5A2.1, Water/carbon/energy mode)	Land carbon	PISCES
KIOST Korea Institute of Ocean Science & Technology Republic of Korea	KIOST-ESM	Pak et al. (2021)	1) GFDL-AM2.0 2) 190 km, 32 L 3) Top 43 km 4) Anderson et al. (2004)	1) GFDL-AM2.0 2) Emissions-driven 3) Anderson et al. (2004)	None	1) GFDL-MOM5.0 2) 90 km, 52 L 3) z	1) GFDL-SIS	GFDL-LM3.0 (Milly et al., 2014)	Land carbon N cycle Prog. veg.	TOPAZ2

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions-driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
MIROC Consortium JAMSTEC, AORI, NIES, R-CCS Japan	MIROC-ES2L MIROC-ES2H MIROC6	ES2L: Hajima et al. (2020a) ES2H: Kawamiya et al. (2020) MIROC6: Tatebe et al. (2019)	ES2L: 1) CCSR AGCM 2) 250 km, 40 L 3) Top 40 km ES2H, MIROC6: 1) CCSR AGCM 2) 120 km, 81 L; 3) Top 80 km	1) SPRINTARS 2) Emissions-driven 3) Takemura et al. (2000, 2005, 2009)	ES2L, MIROC6: 2) Prescribed oxidants ES2H: 1) CHASER 2) Interactive 3) Sudo et al. (2002a b); Morgenstern et al. (2017)	1) COCO4.9 2) 80 km, 63 L 3) z	1) COCO4.9	MIROC6: MATSIRO6.0 (Takata et al., 2003; Nitta et al., 2014, 2017) ES2L & ES2H: MATSIRO6.0 with visit-e1.0 (Hajima et al., 2020a)	MIROC6: None ES2L & ES2H Land carbon N cycle	OECO v2.0
MOHC Met Office Hadley Centre UK	HADGEM3-GC31-LL HADGEM3-GC31-MM	Kuhlbrodt et al. (2018); Williams et al. (2018) Sellar et al. (2019)	1) MetUM-HadGEM3-GA7.1 2) LL: 140 km, 85 L MM: 60 km, 85 L 3) Top 85 km	1) UK-GLOMAP 2) Emissions-driven 3) Mulcahy et al. (2020)	None	1) NEMO-HadGEM3-GO6.0 2) LL: 70 km, 75 L MM: 20 km, 75 L 3) z	1) CICE HadGEM3-GSI8 2) Ridley et al. (2018b)	JULES-HadGEM3-GL7.1	None	None
MOHC	UK-ESM1.0-LL	Sellar et al. (2019)	1) MetUM-HadGEM3-GA7.1 2) 140 km, 85 L 3) Top 85 km	1) UK-GLOMAP 2) Emissions-driven 3) Mulcahy et al. (2020)	1) UKCA-StratTrop 3) Archibald et al. (2020)	1) NEMO-HadGEM3-GO6.0 2) 70 km, 75 L 3) z	1) CICE HadGEM3-GSI8 2) Ridley et al. (2018b)	JULES-HadGEM3-GL7.1 (Sellar et al., 2019; Wiltshire et al., 2021)	Land carbon N cycle Prog. veg.	MEDUSA2
MPI-M Max Planck Institute for Meteorology Germany	MPI-ESM1-2-LR MPI-ESM1-2-HR	MPI-ESM (Mauritsen et al., 2019) MPI-ESM1-2-HR (Müller et al., 2018)	1) ECHAM6.3 2) LR: 170 km, 47 L HR: 80 km 95 L 3) Top 80 km	2) Prescribed MACv2-SP	None	1) MPIOM 1.63 2) LR: 100 km, 40 L HR: 40 km, 40 L 3) z	2) Notz et al. (2013)	1) JSBACH3.20 2) Reick et al. (2021)	LR: Land carbon N cycle Prog. veg. Fires HR: None	HAMOCC6
MRI Meteorological Research Institute Japan	MRI-ESM-2.0	MRI-ESM-2.0 (Mizuta et al., 2012; Yukimoto et al., 2019a)	1) MRI-AGCM3.5 2) 100 km, 80 L 3) Top 80 km	1) MASINGAR mk-2r4c 2) Emissions-driven 3) Yukimoto et al. (2019a); Oshima et al. (2020)	1) MRI-CCM2.1 2) Interactive 3) Deushi and Shibata (2011)	1) MRI.COM4.4 2) 60 km, 61 L 3) z 4) Tsujino et al. (2017)	1) MRI.COM4.4 2) Tsujino et al. (2017)	1) HAL 1.0 and MRI-LCCM2 2) Obata and Shibata (2012); Yukimoto et al. (2012); Obata and Adachi (2019)	Land carbon Prog. veg. Fires	MRI.COM4.4 (Nakano et al., 2015)

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions-driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
NASA-GISS Goddard Institute for Space Studies USA	GISS-E2-1-G GISS-E2-1-H GISS-E2.1-G-CC GISS-E2-2-G	Kelley et al. (2020) GISS-E2-2-G: Rind et al. (2020)	GISS-E2-1: 1) GISS-E2.1 2) 200 km, 40L 3) Top 66 km GISS-E2-2-G: 1) GISS-E2-2 2) 200km, 102L 3) Top 88 km	Varies with physics version p1 p3 OMA, p5 MATRIX 3) Bauer et al. (2020)	Varies with physics version p1 None, p3, p5 GPUCCINI, interactive 3) Shindell et al. (2006)	GISS-E2-1-G, GISS-E2-2-G: 1) GISS ocean 2) 100 km, 40 L 3) z GISS-E2-1-H: 1) HYCOM 2) 70 km, 32 L 3) Hybrid	1) GISS-SI	1) GISS-LSM	None	GISS-E2-1-G-CC: NOBM Others: None
NCAR National Center for Atmospheric Research USA	CESM2 CESM2-FV2 CESM2-WACCM CESM2-WACCM-FV2	Danabasoglu et al. (2020)	1) CAM6 2) CESM2: 100 km FV2 variants: 190 km 3) CESM2: 32 L, Top 42 km WACCM variants: 70 L, Top 80 km.	1) MAM4 2) Emissions-driven 3) Liu et al. (2016)	CESM2: 2) Prescribed oxidants WACM variants: 2) Interactive 3) Emmons et al. (2020)	1) POP2 2) 60 km, 60 L 3) z	1) CICE5.1, (Hunke et al., 2015) 2) CISM2.1, (Lipscomb et al., 2019)	1) CLM5 2) Lawrence et al. (2019)	Land carbon N cycle Permafrost Fires	MARBL, Moore et. al, 2013
NCC NorESM Climate Modelling Consortium Norway	NorCPM1 NorESM1-F	NorESM1-F: Guo et al. (2019a)	1) CAM4 2) 190 km, 26 L 3) Top 43 km	NorCPM1: 1) OsloAero4.1 2) Emissions-driven NorESM1-F: 2) Prescribed	NorCPM1: 1) OsloAero4.1 2) Prescribed oxidants for aerosols NorESM1-F: None	1) MICOM1.1 2) 60 km, 53 L 3) Isopycnal	1) CICE4	1) CLM4	Land carbon N cycle Fires	HAMOCC5.1 (Tjiputra et al., 2013; Schwinger et al., 2016)
NCC	NorESM2-LM NorESM2-MM	NorESM2: Seland et al. (2020)	1) CAM6-Nor 2) NorESM2-LM: 190 km, 32 L NorESM2-MM: 100km, 32 L 3) Top 40 km	1) OsloAero6 2) Emissions-driven 3) Kirkevåg et al. (2018); Seland et al. (2020)	1) OsloAero6 2) Prescribed oxidants, interactive sulphur chemistry, SOA precursor chemistry	1) BLOM1.0 2) 60 km, 70 L 3) Isopycnal	1) CICE5.1	1) CLM5	Land carbon N cycle Permafrost Fires	iHAMOCC (Tjiputra et al., 2020)
NIMS-KMA National Institute of Meteorological Sciences, Korea Meteorological Administration Republic of Korea	KACE-1-0-G	J. Lee et al. (2020)	1) MetUM-HadGEM3-GA7.1 2) 140 km, 85 L 3) Top 85 km	1) UKCA-GLOMAP-mode 2) Emissions-driven	2) Specified oxidants for aerosols	1) MOM4p1 2) 90 km, 50 L 3) z	1) CICE-HadGEM3-GSI8	1) JULES-HadGEM3-GL7.1	None	None

Institution Full Country or Region Name	Models	Main References	Atmosphere 1) Component Name 2) Resolution (km) and Number of Levels (L) 3) Top 4) References	Aerosol 1) Component Name 2) Emissions-driven or Prescribed 3) References	Atmospheric Chemistry 1) Component Name 2) Details 3) References	Ocean 1) Component Name 2) Horizontal Resolution and Number of Levels 3) Vertical Grid 4) References	Cryosphere 1) Sea Ice 2) Land Ice	Land 1) Component Name 2) Reference	Land Carbon Active Processes	Ocean Interactive Biogeochemistry 1) Component Name 2) Reference
NOAA-GFDL National Oceanic and Atmospheric Administration, Geophysical Fluid Dynamics Laboratory USA	GFDL-CM4	Held et al. (2019)	1) GFDL-AM4.0.1 2) 100 km, 33 L 3) Top 48 km 4) (Zhao et al., 2018c, 2018d)	1) GFDL-AM4.0.1 2) Emissions-driven 3) Zhao et al. (2018c, d)	1) GFDL-AM4.0.1 2) Specified oxidants, fast chemistry, aerosol only	1) GFDL-OM4p25 (GFDL-MOM6) 2) 20 km, 75 L 3) Hybrid; 4) Adcroft et al. (2019)	1) GFDL-SIM4p25 (GFDL-SIS2.0); 2) Adcroft et al. (2019)	1) GFDL-LM4.0.1 1) Zhao et al. (2018c, d)	Land carbon Prog. veg. Fires	GFDL-BLINGv2 (Dunne et al., 2020a)
NOAA-GFDL	GFDL-ESM4	Dunne et al. (2020b)	1) GFDL-AM4.1; 2) 100 km, 49 L 3) Top 80 km 4) Horowitz et al. (2020)	1) GFDL-AM4.1 2) Emissions-driven 3) Horowitz et al. (2020)	1) GFDL-ATMCHEM4.1 2) Interactive 3) Horowitz et al. (2020)	GFDL-OM4p5 (GFDL-MOM6); 2) 40 km, 75 L 3) Hybrid 4) Adcroft et al. (2019)	1) GFDL-SIM4p5 (GFDL-SIS2.0); 2) Adcroft et al. (2019)	1) GFDL-LM4.1	Land carbon Prog. veg. Fires	GFDL-COBALTv2 (Stock et al., 2020)
NUIST Nanjing University of Information Science and Technology China	NESM3	Cao et al. (2018)	1) ECHAM v6.3 2) 170 km, 47 L 3) Top 48 km	2) Prescribed	None	1) NEMO v3.4 2) 70 km, 46 L 3) z	1) CICE 4.1	1) JSBACH v3.1	Land carbon Prog. veg.	None
SNU Seoul National University Republic of Korea	SAM0-UNICON	Park et al. (2019)	1) CAM5.3 with UNICON 2) 100 km 30 L 3) Top 43 km	1) MAM3 2) Emissions-driven 3) Liu et al. (2012)	None	1) POP2 2) 60 km, 60 L 3) z	1) CICE4.0	1) CLM 4.0	Land carbon N cycle Fires	None
THU Department of Earth System Science China	CIESM	Y. Lin et al. (2020)	1) CIESM-AM 2) 100 km, 30 L 3) Top 42 km	2) Prescribed MACv2-SP 3) Stevens et al. (2017)	None	1) CIESM-OM 2) 60 km, 46 L 3) z	1) CICE4	1) CIESM-LM (modified CLM4.0)	None	None
University of Arizona USA	MCM-UA-1-0	Delworth et al. (2002)	1) Manabe R30L14 2) 260 km, 14 L 3) Top 29 km	None	None	1) MOM1.0 2) 190 km, 18 L 3) z	1) Thermo-dynamic simplified sea ice	1) Manabe bucket scheme 2) Manabe (1969)	None	None

Table AII.6 | High-resolution coupled models participating in HighResMIP. Full names of the institutions are found in Table AII.5. The horizontal resolution (rounded to 10 km when larger than 10 km) is the square root of the number of grid points divided by the surface area of the Earth, or the number of surface ocean grid points divided by the area of the ocean surface, for the atmosphere and ocean respectively. When reported in hPa, the atmosphere top heights are converted into kilometres assuming standard atmosphere (ISO 2533:1975, 1975).

Institution	Model	Reference	Atmosphere Top *(km)*	Atmosphere Resolution *Horizontal (km), Number of Vertical Levels*	Ocean Resolution *Horizontal (km), Number of Vertical Levels*
AWI	AWI-CM-1-1-HR	Sein et al. (2017, 2018)	80 km	80 km, N = 95	20 km, N = 46
BCC	BCC-CSM2-HR	Wu et al. (2021)	66 km	40 km, N =5 6	20 km, N = 40
CAS	FGOALS-f3-H		42 km	20 km, N = 32	8 km, N = 55
CMCC	CMCC-CM2-HR4	Scoccimarro et al. (2020b); Bellucci et al. (2021)	43 km	100 km, N = 26	20 km, N = 50
	CMCC-CM2-VHR4		43 km	20 km, N = 26	20 km, N = 50
CNRM	CNRM-CM6-1-HR	Saint-Martin et al. (2021)	78 km	50 km, N = 91	20 km, N = 75
EC-Earth	EC-Earth3P-HR	Haarsma et al. (2020)	80 km	40 km, N = 91	20 km, N = 75
ECMWF	ECMWF-IFS-MR	Roberts et al. (2018b)	80 km	60 km, N = 91	20 km, N = 75
	ECMWF-IFS-HR		80 km	30 km, N = 91	20 km, N = 75
INM	INM-CM5-H		61 km	50 km, N = 73	10 km, N = 40
MOHC	HadGEM3-GC31-MH	Roberts et al. (2019)	85 km	60 km, N = 85	7 km, N = 75
	HadGEM3-GC31-HM		85 km	30 km, N = 85	20 km, N = 75
	HadGEM3-GC31-HH		85 km	30 km, N = 85	7 km, N = 75
MPI	MPI-ESM1-2-HR	Gutjahr et al. (2019)	80 km	80 km, N = 95	40 km, N = 40
	MPI-ESM1-2-XR		80 km	40 km, N = 95	40 km, N = 40
NCAR	CESM1-CAM5-SE-HR	Small et al. (2014); Meehl et al. (2019); Chang et al. (2020)	42 km	30 km, N = 30	8 km, N = 62
NOAA-GFDL	GFDL-CM4C192	Zhao (2020)	48 km	50 km, N = 33	20 km, N = 75

AII.3 Models Used in Ice Sheet and Glacier Model Intercomparison Studies

Ice sheet and glacier models are used to assess the contribution of ice sheets and glaciers to future sea level rise as described in Section 9.6.3. New to AR6, the projections of the future sea level contribution from ice sheets and glaciers comes from the ensemble of model intercomparison studies (Sections 9.4.1.2, 9.4.2.2 and 9.5.1.3, and Box 9.3). The tables here describe the models used for Greenland ISMIP6 (Table AII.7), Antarctica ISMIP6 and LARMIP-2 (Table AII.8) and GlacierMIP (Table AII.9).

More specific information on the model capabilities and parameter choices used for each ice sheet and glacier MIP are presented in the following papers: ISMIP6 initMIP-Greenland (Goelzer et al., 2018), ISMIP6 projection-Greenland (Goelzer et al., 2020), ISMIP6 initMIP-Antarctica (Seroussi et al., 2019), ISMIP6 Antarctica projection (Seroussi et al., 2020), LARMIP-2 Antarctica projections (Levermann et al., 2020) and GlacierMIP (Hock et al., 2019; Marzeion et al., 2020).

Table AII.7 | Models used in Greenland model intercomparison studies (initMIP and/or ISMIP6 projections).

Institution Full Country Name	Model	Reference	Resolution (min to max; km)	MIP Activity
AWI Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, and University of Bremen Germany	AWI-ISSM	Larour et al. (2012); Rückamp et al. (2020)	0.75–7.5 km	initMIP ISMIP6
BGC Bristol Glaciology Center UK	BGC-BISICLES	Cornford et al. (2013); Lee et al. (2015)	1.2–4.8 km	initMIP ISMIP6
DMI Danish Meteorological Institute Denmark	DMI-PISM	Bueler and Brown (2009); Aschwanden et al. (2016)	5 km	initMIP

https://doi.org/10.1017/9781009157896.016

Institution Full Country Name	Model	Reference	Resolution (min to max; km)	MIP Activity
GSFC Goddard Space Flight Center NASA USA	GSFC-ISSM	Larour et al. (2012)	0.5–25 km	ISMIP6
IGE Institut des Géosciences de L'Environnement France	IGE-ELMER	Gillet-Chaulet et al. (2012)	1–4.5 km	initMIP
ILTSPIK Institute of Low Temperature Science Japan Potsdam Institute for Climate Impact Research Germany	ILTSPIK-SICOPOLIS	Greve and Blatter (2016); Greve and SICOPOLIS Developer Team (2019); Greve et al. (2020)	5 km	initMIP ISMIP6
IMAU Institute for Marine and Atmospheric Research Netherlands	IMAUICE	de Boer et al. (2014)	8–16 km	initMIP ISMIP6
JPL Jet Propulsion Laboratory USA	JPL-ISSM	Larour et al. (2012); Seroussi et al. (2013)	0.25–15 km	initMIP ISMIP6
JPL Jet Propulsion Laboratory USA	JPL-ISSMPALEO	Larour et al. (2012); Cuzzone et al. (2018)	3–30 km	initMIP ISMIP6
LSCE Laboratoire des Sciences du Climat et de l'Environnement France	LSCE-GRISLI	Quiquet et al. (2018)	5 km	initMIP ISMIP6
MIROC Japan Agency for Marine-Earth Science and Technology The University of Tokyo Japan	MIROC-IcIES	Saito et al. (2016)	10 km	initMIP
MPIM Max Planck Institute for Meteorology Germany	MPIM-PISM	Bueler and Brown (2009); Aschwanden et al. (2016)	5 km	initMIP
MUN Memorial University of Newfoundland Canada	MUN-GSM	Tarasov and Peltier (1999, 2003)	5–14 km	ISMIP6
NCAR National Center for Atmospheric Research USA	NCAR-CISM	Lipscomb et al. (2019)	4 km	initMIP ISMIP6
UAF University of Alaska Fairbanks USA	UAF-PISM	Bueler and Brown (2009); Aschwanden et al. (2016)	0.9 km	initMIP ISMIP6
UCIJPL University of California Irvine Jet Propulsion Laboratory USA	UCIJPL-ISSM	Morlighem et al. (2010); Larour et al. (2012)	0.2–30 km	initMIP ISMIP6
ULB Université Libre de Bruxelles Belgium	ULB-FETISH	Pattyn (2017)	10 km	initMIP
VUB Vrije Universiteit Brussel Belgium	VUB-GISM	Huybrechts (2002); Fürst et al. (2015)	5 km	initMIP ISMIP6
VUW Victoria University of Wellington New Zealand	VUW-PISM	Bueler and Brown (2009); Golledge et al. (2019)	2 km	initMIP ISMIP6

Table AII.8 | Models used in Antarctica model intercomparison studies (initMIP and/or ISMIP6 projections and/or LARMIP-2 projections).

Institution Full Country Name	Model	Reference	Resolution (min to max) (km)	MIP Activity
AWI Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, and University of Bremen Germany	AWI-PISM	Bueler and Brown (2009); Winkelmann et al. (2011)	8–16 km	initMIP ISMIP6 LARMIP-2
LBL Lawrence Berkeley National Laboratory USA Swansea University UK	LBL-BISICLES	Cornford et al. (2013, 2015)	0.5–8 km	initMIP ISMIP6 LARMIP-2
DOE Los Alamos National Laboratory USA	DOE-MALI	Hoffman et al. (2018)	2–20 km	initMIP ISMIP6 LARMIP-2
DMI Danish Meteorological Institute Denmark	DMI-PISM	Bueler and Brown (2009)	5–16 km	initMIP LARMIP-2
IGE Institut des Géosciences de L'Environnement France	IGE-ELMER	Gillet-Chaulet et al. (2012)	1–4.5 km	initMIP
ILTSPIK Institute of Low Temperature Science Japan Potsdam Institute for Climate Impact Research Germany	ILTSPIK-SICOPOLIS	Greve and Blatter (2016); Greve and SICOPOLIS Developer Team (2019); Greve et al. (2020)	8 km	initMIP ISMIP6 LARMIP-2
IMAU Institute for Marine and Atmospheric Research Netherlands	IMAUICE	de Boer et al. (2014)	32 km	initMIP ISMIP6 LARMIP-2
JPL Jet Propulsion Laboratory USA	JPL-ISSM	Larour et al. (2012); Seroussi et al. (2013)	2–50 km	initMIP ISMIP6 LARMIP-2
LSCE Laboratoire des Sciences du Climat et de l'Environnement France	LSCE-GRISLI	Quiquet et al. (2018)	16 km	initMIP ISMIP6 LARMIP-2
NCAR National Center for Atmospheric Research USA	NCAR-CISM	Lipscomb et al. (2019)	4 km	initMIP ISMIP6 LARMIP-2
PIK Potsdam Institute for Climate Impact Research Germany	PIK-PISM	Winkelmann et al. (2011)	4–8 km	initMIP ISMIP6 LARMIP-2
PSU Pennsylvania State University USA	PSUICE3D	Pollard and DeConto (2012); Pollard et al. (2015)	16 km	initMIP LARMIP-2
UCIJPL University of California Irvine Jet Propulsion Laboratory USA	UCIJPL-ISSM	Morlighem et al. (2010); L arour et al. (2012)	3–50 km	initMIP ISMIP6 LARMIP-2
ULB Université Libre de Bruxelles Belgium	ULB-FETISH	Pattyn (2017)	16–32 km	initMIP ISMIP6 LARMIP-2
UNN University of Northumbria UK	UNN-UA	Gudmundsson et al. (2012)	1–40 km	LARMIP-2
UTAS University of Tasmania, Australia University of Lapland, Finland CSC-IT Center for Science, Finland	UTAS-ELMER	Gillet-Chaulet et al. (2016)	4–40 km	ISMIP6
VUB Vrije Universiteit Brussel Belgium	VUB-AISPALEO	Huybrechts (2002)	20 km	initMIP ISMIP6 LARMIP-2
VUW Victoria University of Wellington New Zealand	VUW-PISM	Bueler and Brown (2009); Golledge et al. (2019)	16 km	initMIP ISMIP6 LARMIP-2

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Table AII.9 | Models used in the GlacierMIP2 model intercomparison.

Institution Full Name, Country	Model Name	Reference	Resolution	Domain (Global/ Regional)
Nagoya University, Japan	GLIMB	Sakai and Fujita (2017)	0.5° grid and 50 m elevation bands for mass balance, each glacier for geometry change	Global
ETH Zurich, Switzerland University of Fribourg, Switzerland University of Alaska Fairbanks, USA Uppsala University, Sweden	GloGEM	Huss and Hock (2015)	Each glacier, 10 m elevation bands	Global
University of British Columbia, Canada University of Alaska Fairbanks, USA Scott Polar Research Institute, UK Trent University, Canada	RAD2014	Radić et al. (2014)	Each glacier, 20–25 m elevation bands	Global
Utrecht University, Netherlands ETH Zurich, Switzerland	WAL2001	Van de Wal and Wild (2001)	Each glacier	Global
University of Exeter, UK University of Bristol, UK University of Reading, UK Met Office, UK University of Fribourg, Switzerland ETH Zurich, Switzerland University of Crete, Greece University of Exeter, UK	JULES	Shannon et al. (2019)	0.5° grid, 250 m elevation bands	Global except Antarctica
University of Innsbruck, Austria	MAR2012	Marzeion et al. (2012)	Each glacier, considering elevation range	Global except Antarctica
University of Innsbruck, Austria University of Bremen, Germany University of Grenoble Alpes, France ETH Zurich, Switzerland WSL, Switzerland University of Natural Resources and Life Sciences, Austria University of Canterbury, New Zealand	OGGM	Maussion et al. (2019)	Each glacier, 20–400 m spacing of grid points on flow line	Global except Antarctica
Utrecht University, Netherlands FutureWater, Netherlands ICIMOD, Nepal	KRA2017	Kraaijenbrink et al. (2017)	Each glacier, variable elevation bands	High Mountain Asia
University of Alaska Fairbanks, USA University of Washington, USA	PyGEM	Rounce et al. (2020)	Each glacier, 20 am elevation bands	High Mountain Asia
Victoria University of Wellington, New Zealand	AND2012	Anderson and Mackintosh (2012)	100 m	New Zealand
ETH Zurich, Switzerland WSL, Switzerland University of Fribourg, Switzerland	GloGEMflow	Zekollari et al. (2019)	Each glacier, 10–202 m spacing of grid points on flow line	Central Europe

AII.4 Coupled Model Intercomparison Project Model Datasets Used in the Report

Table AII.10 | List of CMIP Phase 6 (CMIP6) model datasets used in this report.

Institute: Model	Activity ID	Dataset citation and DOI
AER:LBLRTM-12-8	RFMIP	Mlawer and Pernak (2019), DOI:10.22033/ESGF/CMIP6.2003
AER:RRTMG-LW-4-91	RFMIP	Mlawer and Pernak (2020a), DOI:10.22033/ESGF/CMIP6.9961
AER:RRTMG-SW-4-02	RFMIP	Mlawer and Pernak (2020b), DOI:10.22033/ESGF/CMIP6.9963
AS-RCEC:HiRAM-SIT-HR	HighResMIP	Tu (2020a), DOI:10.22033/ESGF/CMIP6.13301
AS-RCEC:HiRAM-SIT-LR	HighResMIP	Tu (2020b), DOI:10.22033/ESGF/CMIP6.13303
AS-RCEC:TaiESM1	AerChemMIP	Tsai et al. (2020), DOI:10.22033/ESGF/CMIP6.9682
AS-RCEC:TaiESM1	CFMIP	Shiu et al. (2020), DOI:10.22033/ESGF/CMIP6.9683
AS-RCEC:TaiESM1	CMIP	Lee and Liang (2019), DOI:10.22033/ESGF/CMIP6.9684

Institute: Model	Activity ID	Dataset citation and DOI
AS-RCEC:TaiESM1	GMMIP	Y.-C. Wang et al. (2020), DOI:10.22033/ESGF/CMIP6.9685
AS-RCEC:TaiESM1	PAMIP	Hong et al. (2020), DOI:10.22033/ESGF/CMIP6.15214
AS-RCEC:TaiESM1	ScenarioMIP	Lee and Liang (2020), DOI:10.22033/ESGF/CMIP6.9688
AWI:AWI-CM-1-1-HR	HighResMIP	Semmler et al. (2017a), DOI:10.22033/ESGF/CMIP6.1202
AWI:AWI-CM-1-1-LR	HighResMIP	Semmler et al. (2017b), DOI:10.22033/ESGF/CMIP6.1209
AWI:AWI-CM-1-1-MR	CMIP	Semmler et al. (2018), DOI:10.22033/ESGF/CMIP6.359
AWI:AWI-CM-1-1-MR	PAMIP	Semmler et al. (2019a), DOI:10.22033/ESGF/CMIP6.12021
AWI:AWI-CM-1-1-MR	ScenarioMIP	Semmler et al. (2019b), DOI:10.22033/ESGF/CMIP6.376
AWI:AWI-ESM-1-1-LR	CMIP	Danek et al. (2020), DOI:10.22033/ESGF/CMIP6.9301
AWI:AWI-ESM-1-1-LR	PMIP	Shi et al. (2020), DOI:10.22033/ESGF/CMIP6.9302
BCC:BCC-CSM2-HR	HighResMIP	Jie et al. (2020), DOI:10.22033/ESGF/CMIP6.1722
BCC:BCC-CSM2-MR	C4MIP	F. Zhang et al. (2019), DOI:10.22033/ESGF/CMIP6.1723
BCC:BCC-CSM2-MR	CFMIP	L. Zhang et al. (2019), DOI:10.22033/ESGF/CMIP6.1724
BCC:BCC-CSM2-MR	CMIP	Xin et al. (2018), DOI:10.22033/ESGF/CMIP6.1725
BCC:BCC-CSM2-MR	DAMIP	Xin et al. (2019a), DOI:10.22033/ESGF/CMIP6.1726
BCC:BCC-CSM2-MR	DCPP	Fang et al. (2019), DOI:10.22033/ESGF/CMIP6.1727
BCC:BCC-CSM2-MR	GMMIP	J. Zhang et al. (2019a), DOI:10.22033/ESGF/CMIP6.1728
BCC:BCC-CSM2-MR	LS3MIP	Li et al. (2019a), DOI:10.22033/ESGF/CMIP6.1729
BCC:BCC-CSM2-MR	LUMIP	Y. Zhang et al. (2019), DOI:10.22033/ESGF/CMIP6.1730
BCC:BCC-CSM2-MR	ScenarioMIP	Xin et al. (2019b), DOI:10.22033/ESGF/CMIP6.1732
BCC:BCC-ESM1	AerChemMIP	J. Zhang et al. (2019b), DOI:10.22033/ESGF/CMIP6.1733
BCC:BCC-ESM1	CMIP	Zhang et al. (2018), DOI:10.22033/ESGF/CMIP6.1734
CAMS:CAMS-CSM1-0	CMIP	Rong (2019a), DOI:10.22033/ESGF/CMIP6.1399
CAMS:CAMS-CSM1-0	GMMIP	Chinese Academy of Meteorological Sciences (CAMS) (2019), DOI:10.22033/ESGF/CMIP6.11002
CAMS:CAMS-CSM1-0	HighResMIP	Rong (2020), DOI:10.22033/ESGF/CMIP6.11003
CAMS:CAMS-CSM1-0	ScenarioMIP	Rong (2019b), DOI:10.22033/ESGF/CMIP6.11004
CAS:CAS-ESM2-0	CMIP	Chai (2020a), DOI:10.22033/ESGF/CMIP6.1944
CAS:CAS-ESM2-0	FAFMIP	Chai (2020b), DOI:10.22033/ESGF/CMIP6.1948
CAS:CAS-ESM2-0	OMIP	Chai (2020c), DOI:10.22033/ESGF/CMIP6.1954
CAS:FGOALS-f3-H	HighResMIP	Bao and He (2019a), DOI:10.22033/ESGF/CMIP6.2041
CAS:FGOALS-f3-H	OMIP	Lin (2020a), DOI:10.22033/ESGF/CMIP6.13261
CAS:FGOALS-f3-L	CMIP	Yu (2018), DOI:10.22033/ESGF/CMIP6.1782
CAS:FGOALS-f3-L	GMMIP	He and Bao (2019a), DOI:10.22033/ESGF/CMIP6.2043
CAS:FGOALS-f3-L	HighResMIP	Bao and He (2019b), DOI:10.22033/ESGF/CMIP6.12001
CAS:FGOALS-f3-L	OMIP	Lin (2019), DOI:10.22033/ESGF/CMIP6.2044
CAS:FGOALS-f3-L	PAMIP	He and Bao (2019b), DOI:10.22033/ESGF/CMIP6.11497
CAS:FGOALS-f3-L	PMIP	Zheng and He (2019), DOI:10.22033/ESGF/CMIP6.12002
CAS:FGOALS-f3-L	ScenarioMIP	Yu (2019), DOI:10.22033/ESGF/CMIP6.2046
CAS:FGOALS-g3	CMIP	Li (2019a), DOI:10.22033/ESGF/CMIP6.1783
CAS:FGOALS-g3	DAMIP	Li (2020a), DOI:10.22033/ESGF/CMIP6.2048
CAS:FGOALS-g3	FAFMIP	Lin (2020b), DOI:10.22033/ESGF/CMIP6.2050
CAS:FGOALS-g3	GMMIP	Li (2020b), DOI:10.22033/ESGF/CMIP6.2051
CAS:FGOALS-g3	LS3MIP	Jia et al. (2020), DOI:10.22033/ESGF/CMIP6.2052
CAS:FGOALS-g3	PMIP	Zheng and Dong (2019), DOI:10.22033/ESGF/CMIP6.2054
CAS:FGOALS-g3	ScenarioMIP	Li (2019b), DOI:10.22033/ESGF/CMIP6.2056

Institute: Model	Activity ID	Dataset citation and DOI
CCCR-IITM:IITM-ESM	CMIP	Gopinathan et al. (2019a), DOI:10.22033/ESGF/CMIP6.44
CCCR-IITM:IITM-ESM	GMMIP	Gopinathan et al. (2019b), DOI:10.22033/ESGF/CMIP6.825
CCCR-IITM:IITM-ESM	ScenarioMIP	Panickal and Narayanasetti (2020), DOI:10.22033/ESGF/CMIP6.14741
CCCma:CanESM5	C4MIP	Swart et al. (2019b), DOI:10.22033/ESGF/CMIP6.1301
CCCma:CanESM5	CDRMIP	Swart et al. (2019c), DOI:10.22033/ESGF/CMIP6.10201
CCCma:CanESM5	CFMIP	Cole et al. (2019d), DOI:10.22033/ESGF/CMIP6.1302
CCCma:CanESM5	CMIP	Swart et al. (2019d), DOI:10.22033/ESGF/CMIP6.1303
CCCma:CanESM5	DAMIP	Swart et al. (2019e), DOI:10.22033/ESGF/CMIP6.1305
CCCma:CanESM5	DCPP	Sospedra-Alfonso et al. (2019), DOI:10.22033/ESGF/CMIP6.1306
CCCma:CanESM5	FAFMIP	Swart et al. (2019f), DOI:10.22033/ESGF/CMIP6.1308
CCCma:CanESM5	GMMIP	Swart et al. (2019g), DOI:10.22033/ESGF/CMIP6.1309
CCCma:CanESM5	GeoMIP	Cole et al. (2019c), DOI:10.22033/ESGF/CMIP6.1310
CCCma:CanESM5	LUMIP	Swart et al. (2019h), DOI:10.22033/ESGF/CMIP6.1313
CCCma:CanESM5	OMIP	Swart et al. (2019i), DOI:10.22033/ESGF/CMIP6.1314
CCCma:CanESM5	PAMIP	Sigmond et al. (2019), DOI:10.22033/ESGF/CMIP6.13942
CCCma:CanESM5	RFMIP	Cole et al. (2019a), DOI:10.22033/ESGF/CMIP6.1315
CCCma:CanESM5	ScenarioMIP	Swart et al. (2019j), DOI:10.22033/ESGF/CMIP6.1317
CCCma:CanESM5	VolMIP	Cole et al. (2019b), DOI:10.22033/ESGF/CMIP6.10202
CCCma:CanESM5-CanOE	C4MIP	Swart et al. (2019k), DOI:10.22033/ESGF/CMIP6.10203
CCCma:CanESM5-CanOE	CDRMIP	Swart et al. (2019l), DOI:10.22033/ESGF/CMIP6.10204
CCCma:CanESM5-CanOE	CMIP	Swart et al. (2019m), DOI:10.22033/ESGF/CMIP6.10205
CCCma:CanESM5-CanOE	OMIP	Swart et al. (2019n), DOI:10.22033/ESGF/CMIP6.10206
CCCma:CanESM5-CanOE	ScenarioMIP	Swart et al. (2019o), DOI:10.22033/ESGF/CMIP6.10207
CMCC:CMCC-CM2-HR4	CMIP	Scoccimarro et al. (2020a), DOI:10.22033/ESGF/CMIP6.1358
CMCC:CMCC-CM2-HR4	HighResMIP	Scoccimarro et al. (2017a), DOI:10.22033/ESGF/CMIP6.1359
CMCC:CMCC-CM2-HR4	OMIP	Fogli et al. (2020a), DOI:10.22033/ESGF/CMIP6.13161
CMCC:CMCC-CM2-SR5	CMIP	Lovato and Peano (2020a), DOI:10.22033/ESGF/CMIP6.1362
CMCC:CMCC-CM2-SR5	DCPP	Nicolì and Bellucci (2020), DOI:10.22033/ESGF/CMIP6.1363
CMCC:CMCC-CM2-SR5	OMIP	Fogli et al. (2020b), DOI:10.22033/ESGF/CMIP6.13162
CMCC:CMCC-CM2-SR5	ScenarioMIP	Lovato and Peano (2020b), DOI:10.22033/ESGF/CMIP6.1365
CMCC:CMCC-CM2-VHR4	HighResMIP	Scoccimarro et al. (2017b), DOI:10.22033/ESGF/CMIP6.1367
CMCC:CMCC-ESM2	C4MIP	Lovato et al. (2021a), DOI:10.22033/ESGF/CMIP6.13163
CMCC:CMCC-ESM2	CMIP	Lovato et al. (2021b), DOI:10.22033/ESGF/CMIP6.13164
CMCC:CMCC-ESM2	LS3MIP	Peano et al. (2020a), DOI:10.22033/ESGF/CMIP6.13165
CMCC:CMCC-ESM2	LUMIP	Peano et al. (2020b), DOI:10.22033/ESGF/CMIP6.13166
CMCC:CMCC-ESM2	OMIP	Lovato and Butenschön (2021), DOI:10.22033/ESGF/CMIP6.13167
CMCC:CMCC-ESM2	ScenarioMIP	Lovato et al. (2021c), DOI:10.22033/ESGF/CMIP6.13168
CMCC:CMCC-ESM2-SR5	LS3MIP	Peano et al. (2019), DOI:10.22033/ESGF/CMIP6.1372
CMCC:CMCC-ESM2-SR5	LUMIP	Peano and Lovato (2019), DOI:10.22033/ESGF/CMIP6.1373
CNRM-CERFACS:CNRM-CM6-1	CFMIP	Voldoire (2019a), DOI:10.22033/ESGF/CMIP6.1374
CNRM-CERFACS:CNRM-CM6-1	CMIP	Voldoire (2018), DOI:10.22033/ESGF/CMIP6.1375
CNRM-CERFACS:CNRM-CM6-1	DAMIP	Voldoire (2019b), DOI:10.22033/ESGF/CMIP6.1376
CNRM-CERFACS:CNRM-CM6-1	DCPP	Voldoire (2019c), DOI:10.22033/ESGF/CMIP6.1377
CNRM-CERFACS:CNRM-CM6-1	GMMIP	Voldoire (2019d), DOI:10.22033/ESGF/CMIP6.1379
CNRM-CERFACS:CNRM-CM6-1	HighResMIP	Voldoire (2019e), DOI:10.22033/ESGF/CMIP6.1925

Institute: Model	Activity ID	Dataset citation and DOI
CNRM-CERFACS:CNRM-CM6-1	LS3MIP	Voldoire (2019f), DOI:10.22033/ESGF/CMIP6.1381
CNRM-CERFACS:CNRM-CM6-1	OMIP	Voldoire (2019g), DOI:10.22033/ESGF/CMIP6.10336
CNRM-CERFACS:CNRM-CM6-1	PAMIP	Voldoire (2021a), DOI:10.22033/ESGF/CMIP6.9561
CNRM-CERFACS:CNRM-CM6-1	PMIP	Voldoire (2020), DOI:10.22033/ESGF/CMIP6.1382
CNRM-CERFACS:CNRM-CM6-1	RFMIP	Voldoire (2019h), DOI:10.22033/ESGF/CMIP6.1383
CNRM-CERFACS:CNRM-CM6-1	ScenarioMIP	Voldoire (2019i), DOI:10.22033/ESGF/CMIP6.1384
CNRM-CERFACS:CNRM-CM6-1-HR	CMIP	Voldoire (2019j), DOI:10.22033/ESGF/CMIP6.1385
CNRM-CERFACS:CNRM-CM6-1-HR	GMMIP	Voldoire (2019k), DOI:10.22033/ESGF/CMIP6.13921
CNRM-CERFACS:CNRM-CM6-1-HR	HighResMIP	Voldoire (2019l), DOI:10.22033/ESGF/CMIP6.1387
CNRM-CERFACS:CNRM-CM6-1-HR	OMIP	Voldoire (2021b), DOI:10.22033/ESGF/CMIP6.10337
CNRM-CERFACS:CNRM-CM6-1-HR	ScenarioMIP	Voldoire (2019m), DOI:10.22033/ESGF/CMIP6.1388
CNRM-CERFACS:CNRM-ESM2-1	AerChemMIP	Séférian (2019a), DOI:10.22033/ESGF/CMIP6.1389
CNRM-CERFACS:CNRM-ESM2-1	C4MIP	Séférian (2018a), DOI:10.22033/ESGF/CMIP6.1390
CNRM-CERFACS:CNRM-ESM2-1	CDRMIP	Séférian (2021), DOI:10.22033/ESGF/CMIP6.9562
CNRM-CERFACS:CNRM-ESM2-1	CMIP	Séférian (2018b), DOI:10.22033/ESGF/CMIP6.1391
CNRM-CERFACS:CNRM-ESM2-1	GMMIP	Séférian (2019c), DOI:10.22033/ESGF/CMIP6.13922
CNRM-CERFACS:CNRM-ESM2-1	GeoMIP	Séférian (2019b), DOI:10.22033/ESGF/CMIP6.1392
CNRM-CERFACS:CNRM-ESM2-1	LS3MIP	Séférian (2019d), DOI:10.22033/ESGF/CMIP6.9564
CNRM-CERFACS:CNRM-ESM2-1	LUMIP	Séférian (2019e), DOI:10.22033/ESGF/CMIP6.1393
CNRM-CERFACS:CNRM-ESM2-1	OMIP	Séférian (2019f), DOI:10.22033/ESGF/CMIP6.1394
CNRM-CERFACS:CNRM-ESM2-1	RFMIP	Séférian (2019g), DOI:10.22033/ESGF/CMIP6.9565
CNRM-CERFACS:CNRM-ESM2-1	ScenarioMIP	Séférian (2019h), DOI:10.22033/ESGF/CMIP6.1395
CSIRO-ARCCSS:ACCESS-CM2	CMIP	Dix et al. (2019a), DOI:10.22033/ESGF/CMIP6.2281
CSIRO-ARCCSS:ACCESS-CM2	FAFMIP	Savita et al. (2019), DOI:10.22033/ESGF/CMIP6.2282
CSIRO-ARCCSS:ACCESS-CM2	RFMIP	Dix et al. (2020), DOI:10.22033/ESGF/CMIP6.2284
CSIRO-ARCCSS:ACCESS-CM2	ScenarioMIP	Dix et al. (2019b), DOI:10.22033/ESGF/CMIP6.2285
CSIRO:ACCESS-ESM1-5	C4MIP	Ziehn et al. (2019a), DOI:10.22033/ESGF/CMIP6.2286
CSIRO:ACCESS-ESM1-5	CDRMIP	Ziehn et al. (2019b), DOI:10.22033/ESGF/CMIP6.2287
CSIRO:ACCESS-ESM1-5	CMIP	Ziehn et al. (2019c), DOI:10.22033/ESGF/CMIP6.2288
CSIRO:ACCESS-ESM1-5	DAMIP	Ziehn et al. (2020b), DOI:10.22033/ESGF/CMIP6.14362
CSIRO:ACCESS-ESM1-5	PMIP	Yeung et al. (2019), DOI:10.22033/ESGF/CMIP6.13701
CSIRO:ACCESS-ESM1-5	RFMIP	Ziehn et al. (2020c), DOI:10.22033/ESGF/CMIP6.2290
CSIRO:ACCESS-ESM1-5	ScenarioMIP	Ziehn et al. (2019d), DOI:10.22033/ESGF/CMIP6.2291
DKRZ:MPI-ESM1-2-HR	ScenarioMIP	Schupfner et al. (2019), DOI:10.22033/ESGF/CMIP6.2450
DWD:MPI-ESM1-2-HR	ScenarioMIP	Steger et al. (2019), DOI:10.22033/ESGF/CMIP6.1869
E3SM-Project:E3SM-1-0	CMIP	Bader et al. (2019a), DOI:10.22033/ESGF/CMIP6.2294
E3SM-Project:E3SM-1-1	C4MIP	Bader et al. (2019b), DOI:10.22033/ESGF/CMIP6.11441
E3SM-Project:E3SM-1-1	CMIP	Bader et al. (2019c), DOI:10.22033/ESGF/CMIP6.11442
E3SM-Project:E3SM-1-1	ScenarioMIP	Bader et al. (2020a), DOI:10.22033/ESGF/CMIP6.15103
E3SM-Project:E3SM-1-1-ECA	C4MIP	Bader et al. (2020b), DOI:10.22033/ESGF/CMIP6.11443
E3SM-Project:E3SM-1-1-ECA	CMIP	Bader et al. (2019d), DOI:10.22033/ESGF/CMIP6.11444
EC-Earth-Consortium:EC-Earth3	CMIP	EC-Earth Consortium (EC-Earth) (2019a), DOI:10.22033/ESGF/CMIP6.181
EC-Earth-Consortium:EC-Earth3	DAMIP	EC-Earth Consortium (EC-Earth) (2020a), DOI:10.22033/ESGF/CMIP6.14701
EC-Earth-Consortium:EC-Earth3	DCPP	EC-Earth Consortium (EC-Earth) (2019b), DOI:10.22033/ESGF/CMIP6.227
EC-Earth-Consortium:EC-Earth3	LS3MIP	EC-Earth Consortium (EC-Earth) (2020b), DOI:10.22033/ESGF/CMIP6.218

Institute: Model	Activity ID	Dataset citation and DOI
EC-Earth-Consortium:EC-Earth3	OMIP	EC-Earth Consortium (EC-Earth) (2020c), DOI:10.22033/ESGF/CMIP6.14702
EC-Earth-Consortium:EC-Earth3	RFMIP	EC-Earth Consortium (EC-Earth) (2020d), DOI:10.22033/ESGF/CMIP6.242
EC-Earth-Consortium:EC-Earth3	ScenarioMIP	EC-Earth Consortium (EC-Earth) (2019c), DOI:10.22033/ESGF/CMIP6.251
EC-Earth-Consortium:EC-Earth3-AerChem	AerChemMIP	EC-Earth Consortium (EC-Earth) (2020e), DOI:10.22033/ESGF/CMIP6.699
EC-Earth-Consortium:EC-Earth3-AerChem	CMIP	EC-Earth Consortium (EC-Earth) (2020f), DOI:10.22033/ESGF/CMIP6.639
EC-Earth-Consortium:EC-Earth3-AerChem	RFMIP	EC-Earth Consortium (EC-Earth) (2020g), DOI:10.22033/ESGF/CMIP6.15326
EC-Earth-Consortium:EC-Earth3-AerChem	ScenarioMIP	EC-Earth Consortium (EC-Earth) (2020h), DOI:10.22033/ESGF/CMIP6.724
EC-Earth-Consortium:EC-Earth3-CC	C4MIP	EC-Earth Consortium (EC-Earth) (2020i), DOI:10.22033/ESGF/CMIP6.650
EC-Earth-Consortium:EC-Earth3-CC	CMIP	EC-Earth Consortium (EC-Earth) (2020j), DOI:10.22033/ESGF/CMIP6.640
EC-Earth-Consortium:EC-Earth3-CC	ScenarioMIP	EC-Earth Consortium (EC-Earth) (2021), DOI:10.22033/ESGF/CMIP6.15327
EC-Earth-Consortium:EC-Earth3-LR	CMIP	EC-Earth Consortium (EC-Earth) (2019d), DOI:10.22033/ESGF/CMIP6.202
EC-Earth-Consortium:EC-Earth3-LR	PMIP	EC-Earth Consortium (EC-Earth) (2020k), DOI:10.22033/ESGF/CMIP6.247
EC-Earth-Consortium:EC-Earth3-Veg	CMIP	EC-Earth Consortium (EC-Earth) (2019f), DOI:10.22033/ESGF/CMIP6.642
EC-Earth-Consortium:EC-Earth3-Veg	LS3MIP	EC-Earth Consortium (EC-Earth) (2020m), DOI:10.22033/ESGF/CMIP6.672
EC-Earth-Consortium:EC-Earth3-Veg	LUMIP	EC-Earth Consortium (EC-Earth) (2020n), DOI:10.22033/ESGF/CMIP6.692
EC-Earth-Consortium:EC-Earth3-Veg	ScenarioMIP	EC-Earth Consortium (EC-Earth) (2019g), DOI:10.22033/ESGF/CMIP6.727
EC-Earth-Consortium:EC-Earth3-Veg-LR	CMIP	EC-Earth Consortium (EC-Earth) (2020o), DOI:10.22033/ESGF/CMIP6.643
EC-Earth-Consortium:EC-Earth3-Veg-LR	PMIP	EC-Earth Consortium (EC-Earth) (2020p), DOI:10.22033/ESGF/CMIP6.718
EC-Earth-Consortium:EC-Earth3-Veg-LR	ScenarioMIP	EC-Earth Consortium (EC-Earth) (2020q), DOI:10.22033/ESGF/CMIP6.728
EC-Earth-Consortium:EC-Earth3P	HighResMIP	EC-Earth Consortium (EC-Earth) (2019e), DOI:10.22033/ESGF/CMIP6.2322
EC-Earth-Consortium:EC-Earth3P-HR	HighResMIP	EC-Earth Consortium (EC-Earth) (2018), DOI:10.22033/ESGF/CMIP6.2323
EC-Earth-Consortium:EC-Earth3P-VHR	CMIP	EC-Earth Consortium (EC-Earth) (2020i), DOI:10.22033/ESGF/CMIP6.2326
ECMWF:ECMWF-IFS-HR	HighResMIP	Roberts et al. (2017a), DOI:10.22033/ESGF/CMIP6.2461
ECMWF:ECMWF-IFS-LR	HighResMIP	Roberts et al. (2017b), DOI:10.22033/ESGF/CMIP6.2463
ECMWF:ECMWF-IFS-MR	HighResMIP	Roberts et al. (2018a), DOI:10.22033/ESGF/CMIP6.2465
FIO-QLNM:FIO-ESM-2-0	CMIP	Song et al. (2019a), DOI:10.22033/ESGF/CMIP6.9047
FIO-QLNM:FIO-ESM-2-0	GMMIP	Song et al. (2019b), DOI:10.22033/ESGF/CMIP6.9049
FIO-QLNM:FIO-ESM-2-0	ScenarioMIP	Song et al. (2019c), DOI:10.22033/ESGF/CMIP6.9051
HAMMOZ-Consortium:MPI-ESM-1-2-HAM	AerChemMIP	Neubauer et al. (2019b), DOI:10.22033/ESGF/CMIP6.1621
HAMMOZ-Consortium:MPI-ESM-1-2-HAM	CMIP	Neubauer et al. (2019c), DOI:10.22033/ESGF/CMIP6.1622
HAMMOZ-Consortium:MPI-ESM-1-2-HAM	RFMIP	Neubauer et al. (2019d), DOI:10.22033/ESGF/CMIP6.14724
INM:INM-CM4-8	CMIP	Volodin et al. (2019a), DOI:10.22033/ESGF/CMIP6.1422
INM:INM-CM4-8	PMIP	Volodin et al. (2019b), DOI:10.22033/ESGF/CMIP6.2295
INM:INM-CM4-8	ScenarioMIP	Volodin et al. (2019c), DOI:10.22033/ESGF/CMIP6.12321
INM:INM-CM5-0	CMIP	Volodin et al. (2019d), DOI:10.22033/ESGF/CMIP6.1423
INM:INM-CM5-0	ScenarioMIP	Volodin et al. (2019e), DOI:10.22033/ESGF/CMIP6.12322
INM:INM-CM5-H	HighResMIP	Volodin et al. (2019f), DOI:10.22033/ESGF/CMIP6.14041
IPSL:4AOP-v1-5	RFMIP	Boucher et al. (2020e), DOI:10.22033/ESGF/CMIP6.12340
IPSL:IPSL-CM5A2-INCA	CMIP	Boucher et al. (2020a), DOI:10.22033/ESGF/CMIP6.13642
IPSL:IPSL-CM5A2-INCA	LUMIP	Boucher et al. (2020f), DOI:10.22033/ESGF/CMIP6.15666
IPSL:IPSL-CM5A2-INCA	ScenarioMIP	Boucher et al. (2020d), DOI:10.22033/ESGF/CMIP6.15667
IPSL:IPSL-CM6A-ATM-HR	HighResMIP	Boucher et al. (2019e), DOI:10.22033/ESGF/CMIP6.2361
IPSL:IPSL-CM6A-LR	C4MIP	Boucher et al. (2018d), DOI:10.22033/ESGF/CMIP6.1521
IPSL:IPSL-CM6A-LR	CFMIP	Boucher et al. (2018a), DOI:10.22033/ESGF/CMIP6.1522
IPSL:IPSL-CM6A-LR	CMIP	Boucher et al. (2018c), DOI:10.22033/ESGF/CMIP6.1534

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IPSL:IPSL-CM6A-LR	DAMIP	Boucher et al. (2018f), DOI:10.22033/ESGF/CMIP6.13801
IPSL:IPSL-CM6A-LR	DCPP	Boucher et al. (2019b), DOI:10.22033/ESGF/CMIP6.1523
IPSL:IPSL-CM6A-LR	GMMIP	Boucher et al. (2018h), DOI:10.22033/ESGF/CMIP6.1525
IPSL:IPSL-CM6A-LR	GeoMIP	Boucher et al. (2018g), DOI:10.22033/ESGF/CMIP6.1526
IPSL:IPSL-CM6A-LR	HighResMIP	Boucher et al. (2019f), DOI:10.22033/ESGF/CMIP6.13803
IPSL:IPSL-CM6A-LR	LS3MIP	Boucher et al. (2019g), DOI:10.22033/ESGF/CMIP6.1527
IPSL:IPSL-CM6A-LR	LUMIP	Boucher et al. (2019h), DOI:10.22033/ESGF/CMIP6.1528
IPSL:IPSL-CM6A-LR	OMIP	Boucher et al. (2019c), DOI:10.22033/ESGF/CMIP6.1529
IPSL:IPSL-CM6A-LR	PAMIP	Boucher et al. (2019d), DOI:10.22033/ESGF/CMIP6.13802
IPSL:IPSL-CM6A-LR	PMIP	Boucher et al. (2018b), DOI:10.22033/ESGF/CMIP6.1530
IPSL:IPSL-CM6A-LR	RFMIP	Boucher et al. (2018e), DOI:10.22033/ESGF/CMIP6.1531
IPSL:IPSL-CM6A-LR	ScenarioMIP	Boucher et al. (2019a), DOI:10.22033/ESGF/CMIP6.1532
IPSL:IPSL-CM6A-LR-INCA	AerChemMIP	Boucher et al. (2020b), DOI:10.22033/ESGF/CMIP6.13581
IPSL:IPSL-CM6A-LR-INCA	CMIP	Boucher et al. (2021), DOI:10.22033/ESGF/CMIP6.13582
IPSL:IPSL-CM6A-LR-INCA	RFMIP	Boucher et al. (2020c), DOI:10.22033/ESGF/CMIP6.14583
KIOST:KIOST-ESM	CMIP	Kim et al. (2019a), DOI:10.22033/ESGF/CMIP6.1922
KIOST:KIOST-ESM	ScenarioMIP	Kim et al. (2019b), DOI:10.22033/ESGF/CMIP6.11241
LLNL:E3SM-1-0	CFMIP	Qin et al. (2021), DOI:10.22033/ESGF/CMIP6.15093
MIROC:MIROC-ES2H	CMIP	Watanabe et al. (2021a), DOI:10.22033/ESGF/CMIP6.901
MIROC:MIROC-ES2H	GeoMIP	Watanabe et al. (2021b), DOI:10.22033/ESGF/CMIP6.907
MIROC:MIROC-ES2H-NB	AerChemMIP	Sudo et al. (2020), DOI:10.22033/ESGF/CMIP6.13305
MIROC:MIROC-ES2L	C4MIP	Hajima et al. (2019c), DOI:10.22033/ESGF/CMIP6.906
MIROC:MIROC-ES2L	CDRMIP	Hajima et al. (2020b), DOI:10.22033/ESGF/CMIP6.2161
MIROC:MIROC-ES2L	CMIP	Hajima et al. (2019a), DOI:10.22033/ESGF/CMIP6.902
MIROC:MIROC-ES2L	DAMIP	Ohgaito et al. (2020), DOI:10.22033/ESGF/CMIP6.15241
MIROC:MIROC-ES2L	LUMIP	Hajima et al. (2019b), DOI:10.22033/ESGF/CMIP6.922
MIROC:MIROC-ES2L	OMIP	Watanabe et al. (2020), DOI:10.22033/ESGF/CMIP6.934
MIROC:MIROC-ES2L	PMIP	Ohgaito et al. (2019), DOI:10.22033/ESGF/CMIP6.932
MIROC:MIROC-ES2L	ScenarioMIP	Tachiiri et al. (2019), DOI:10.22033/ESGF/CMIP6.936
MIROC:MIROC-ES2L	VolMIP	Abe et al. (2021), DOI:10.22033/ESGF/CMIP6.918
MIROC:MIROC6	AerChemMIP	Takemura (2019), DOI:10.22033/ESGF/CMIP6.9121
MIROC:MIROC6	CFMIP	Ogura et al. (2019), DOI:10.22033/ESGF/CMIP6.885
MIROC:MIROC6	CMIP	Tatebe and Watanabe (2018), DOI:10.22033/ESGF/CMIP6.881
MIROC:MIROC6	DAMIP	Shiogama (2019), DOI:10.22033/ESGF/CMIP6.894
MIROC:MIROC6	DCPP	Mochizuki et al. (2019), DOI:10.22033/ESGF/CMIP6.890
MIROC:MIROC6	FAFMIP	Suzuki (2019), DOI:10.22033/ESGF/CMIP6.892
MIROC:MIROC6	GMMIP	Watanabe and Tatebe (2019), DOI:10.22033/ESGF/CMIP6.886
MIROC:MIROC6	LS3MIP	Onuma and Kim (2020), DOI:10.22033/ESGF/CMIP6.887
MIROC:MIROC6	OMIP	Komuro (2019), DOI:10.22033/ESGF/CMIP6.897
MIROC:MIROC6	PAMIP	Mori (2019), DOI:10.22033/ESGF/CMIP6.2162
MIROC:MIROC6	RFMIP	Sekiguchi and Shiogama (2019), DOI:10.22033/ESGF/CMIP6.895
MIROC:MIROC6	ScenarioMIP	Shiogama et al. (2019), DOI:10.22033/ESGF/CMIP6.898
MIROC:NICAM16-7S	HighResMIP	Kodama et al. (2019a), DOI:10.22033/ESGF/CMIP6.1033
MIROC:NICAM16-8S	HighResMIP	Kodama et al. (2019b), DOI:10.22033/ESGF/CMIP6.1034
MIROC:NICAM16-9S	HighResMIP	Kodama et al. (2019c), DOI:10.22033/ESGF/CMIP6.1036

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MOHC:HadGEM3-GC31-HH	HighResMIP	Roberts (2018), DOI:10.22033/ESGF/CMIP6.445
MOHC:HadGEM3-GC31-HM	HighResMIP	Roberts (2017a), DOI:10.22033/ESGF/CMIP6.446
MOHC:HadGEM3-GC31-LL	CFMIP	Webb (2019), DOI:10.22033/ESGF/CMIP6.435
MOHC:HadGEM3-GC31-LL	CMIP	Ridley et al. (2018a), DOI:10.22033/ESGF/CMIP6.419
MOHC:HadGEM3-GC31-LL	DAMIP	G. Jones (2019), DOI:10.22033/ESGF/CMIP6.471
MOHC:HadGEM3-GC31-LL	HighResMIP	Roberts (2017b), DOI:10.22033/ESGF/CMIP6.1901
MOHC:HadGEM3-GC31-LL	LS3MIP	Wiltshire et al. (2020b), DOI:10.22033/ESGF/CMIP6.14460
MOHC:HadGEM3-GC31-LL	LUMIP	Wiltshire et al. (2020a), DOI:10.22033/ESGF/CMIP6.14461
MOHC:HadGEM3-GC31-LL	RFMIP	Andrews (2019), DOI:10.22033/ESGF/CMIP6.475
MOHC:HadGEM3-GC31-LL	ScenarioMIP	Good (2019), DOI:10.22033/ESGF/CMIP6.10845
MOHC:HadGEM3-GC31-LM	HighResMIP	Roberts (2017c), DOI:10.22033/ESGF/CMIP6.1321
MOHC:HadGEM3-GC31-MH	HighResMIP	Roberts (2017d), DOI:10.22033/ESGF/CMIP6.1762
MOHC:HadGEM3-GC31-MM	CMIP	Ridley et al. (2019), DOI:10.22033/ESGF/CMIP6.420
MOHC:HadGEM3-GC31-MM	DCPP	Hermanson (2020), DOI:10.22033/ESGF/CMIP6.456
MOHC:HadGEM3-GC31-MM	HighResMIP	Roberts (2017e), DOI:10.22033/ESGF/CMIP6.1902
MOHC:HadGEM3-GC31-MM	PAMIP	Eade (2020), DOI:10.22033/ESGF/CMIP6.14627
MOHC:HadGEM3-GC31-MM	ScenarioMIP	Jackson (2020), DOI:10.22033/ESGF/CMIP6.10846
MOHC:UKESM1-0-LL	AerChemMIP	O'Connor (2019), DOI:10.22033/ESGF/CMIP6.1561
MOHC:UKESM1-0-LL	C4MIP	Liddicoat et al. (2019), DOI:10.22033/ESGF/CMIP6.1562
MOHC:UKESM1-0-LL	CDRMIP	Jones et al. (2019), DOI:10.22033/ESGF/CMIP6.12181
MOHC:UKESM1-0-LL	CMIP	Tang et al. (2019), DOI:10.22033/ESGF/CMIP6.1569
MOHC:UKESM1-0-LL	DAMIP	Rumbold et al. (2020), DOI:10.22033/ESGF/CMIP6.14830
MOHC:UKESM1-0-LL	GeoMIP	A. Jones (2019), DOI:10.22033/ESGF/CMIP6.1563
MOHC:UKESM1-0-LL	LS3MIP	Wiltshire et al. (2020c), DOI:10.22033/ESGF/CMIP6.14462
MOHC:UKESM1-0-LL	LUMIP	Wiltshire et al. (2019), DOI:10.22033/ESGF/CMIP6.1564
MOHC:UKESM1-0-LL	RFMIP	O'Connor et al. (2019), DOI:10.22033/ESGF/CMIP6.11061
MOHC:UKESM1-0-LL	ScenarioMIP	Good et al. (2019), DOI:10.22033/ESGF/CMIP6.1567
MPI-M:MPI-ESM1-2-HR	CMIP	Jungclaus et al. (2019a), DOI:10.22033/ESGF/CMIP6.741
MPI-M:MPI-ESM1-2-HR	DCPP	Pohlmann et al. (2019), DOI:10.22033/ESGF/CMIP6.768
MPI-M:MPI-ESM1-2-HR	FAFMIP	Haak et al. (2019), DOI:10.22033/ESGF/CMIP6.774
MPI-M:MPI-ESM1-2-HR	GeoMIP	Niemeier et al. (2019a), DOI:10.22033/ESGF/CMIP6.15294
MPI-M:MPI-ESM1-2-HR	HighResMIP	von Storch et al. (2017a), DOI:10.22033/ESGF/CMIP6.762
MPI-M:MPI-ESM1-2-LR	C4MIP	Brovkin et al. (2019), DOI:10.22033/ESGF/CMIP6.748
MPI-M:MPI-ESM1-2-LR	CMIP	Wieners et al. (2019b), DOI:10.22033/ESGF/CMIP6.742
MPI-M:MPI-ESM1-2-LR	DAMIP	Müller et al. (2019), DOI:10.22033/ESGF/CMIP6.15016
MPI-M:MPI-ESM1-2-LR	GeoMIP	Niemeier et al. (2019b), DOI:10.22033/ESGF/CMIP6.751
MPI-M:MPI-ESM1-2-LR	LS3MIP	Stracke et al. (2019), DOI:10.22033/ESGF/CMIP6.760
MPI-M:MPI-ESM1-2-LR	LUMIP	Pongratz et al. (2019), DOI:10.22033/ESGF/CMIP6.772
MPI-M:MPI-ESM1-2-LR	PMIP	Jungclaus et al. (2019b), DOI:10.22033/ESGF/CMIP6.787
MPI-M:MPI-ESM1-2-LR	RFMIP	Fiedler et al. (2019b), DOI:10.22033/ESGF/CMIP6.784
MPI-M:MPI-ESM1-2-LR	ScenarioMIP	Wieners et al. (2019a), DOI:10.22033/ESGF/CMIP6.793
MPI-M:MPI-ESM1-2-XR	HighResMIP	von Storch et al. (2017b), DOI:10.22033/ESGF/CMIP6.10290
MRI:MRI-AGCM3-2-H	HighResMIP	Mizuta et al. (2019a), DOI:10.22033/ESGF/CMIP6.10942
MRI:MRI-AGCM3-2-S	HighResMIP	Mizuta et al. (2019b), DOI:10.22033/ESGF/CMIP6.1625
MRI:MRI-ESM2-0	AerChemMIP	Yukimoto et al. (2019b), DOI:10.22033/ESGF/CMIP6.633

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MRI:MRI-ESM2-0	C4MIP	Yukimoto et al. (2019c), DOI:10.22033/ESGF/CMIP6.623
MRI:MRI-ESM2-0	CFMIP	Yukimoto et al. (2019d), DOI:10.22033/ESGF/CMIP6.625
MRI:MRI-ESM2-0	CMIP	Yukimoto et al. (2019e), DOI:10.22033/ESGF/CMIP6.621
MRI:MRI-ESM2-0	DAMIP	Yukimoto et al. (2019f), DOI:10.22033/ESGF/CMIP6.634
MRI:MRI-ESM2-0	DCPP	Yukimoto et al. (2020a), DOI:10.22033/ESGF/CMIP6.630
MRI:MRI-ESM2-0	FAFMIP	Yukimoto et al. (2019g), DOI:10.22033/ESGF/CMIP6.632
MRI:MRI-ESM2-0	GMMIP	Yukimoto et al. (2019h), DOI:10.22033/ESGF/CMIP6.626
MRI:MRI-ESM2-0	OMIP	Yukimoto et al. (2020b), DOI:10.22033/ESGF/CMIP6.637
MRI:MRI-ESM2-0	PMIP	Yukimoto et al. (2019i), DOI:10.22033/ESGF/CMIP6.636
MRI:MRI-ESM2-0	RFMIP	Yukimoto et al. (2019j), DOI:10.22033/ESGF/CMIP6.635
MRI:MRI-ESM2-0	ScenarioMIP	Yukimoto et al. (2019k), DOI:10.22033/ESGF/CMIP6.638
NASA-GISS:GISS-E2-1-G	AerChemMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019a), DOI:10.22033/ESGF/CMIP6.2059
NASA-GISS:GISS-E2-1-G	C4MIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019b), DOI:10.22033/ESGF/CMIP6.2060
NASA-GISS:GISS-E2-1-G	CFMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2018a), DOI:10.22033/ESGF/CMIP6.2061
NASA-GISS:GISS-E2-1-G	CMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2018b), DOI:10.22033/ESGF/CMIP6.1400
NASA-GISS:GISS-E2-1-G	DAMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2018c), DOI:10.22033/ESGF/CMIP6.2062
NASA-GISS:GISS-E2-1-G	ISMIP6	NASA Goddard Institute for Space Studies (NASA/GISS) (2018d), DOI:10.22033/ESGF/CMIP6.2066
NASA-GISS:GISS-E2-1-G	LS3MIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2018e), DOI:10.22033/ESGF/CMIP6.2067
NASA-GISS:GISS-E2-1-G	LUMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2018f), DOI:10.22033/ESGF/CMIP6.2068
NASA-GISS:GISS-E2-1-G	PMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019c), DOI:10.22033/ESGF/CMIP6.2071
NASA-GISS:GISS-E2-1-G	RFMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019d), DOI:10.22033/ESGF/CMIP6.2072
NASA-GISS:GISS-E2-1-G	ScenarioMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2020), DOI:10.22033/ESGF/CMIP6.2074
NASA-GISS:GISS-E2-1-G-CC	C4MIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019f), DOI:10.22033/ESGF/CMIP6.11656
NASA-GISS:GISS-E2-1-G-CC	CMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019g), DOI:10.22033/ESGF/CMIP6.11657
NASA-GISS:GISS-E2-1-H	CFMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019e), DOI:10.22033/ESGF/CMIP6.13941
NASA-GISS:GISS-E2-1-H	CMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2018g), DOI:10.22033/ESGF/CMIP6.1421
NASA-GISS:GISS-E2-2-G	CFMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019h), DOI:10.22033/ESGF/CMIP6.11659
NASA-GISS:GISS-E2-2-G	CMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019i), DOI:10.22033/ESGF/CMIP6.2081
NASA-GISS:GISS-E3-G	RFMIP	NASA Goddard Institute for Space Studies (NASA/GISS) (2019j), DOI:10.22033/ESGF/CMIP6.2098
NCAR:CESM1-1-CAM5-CMIP5	DCPP	Danabasoglu (2019a), DOI:10.22033/ESGF/CMIP6.11542
NCAR:CESM1-CAM5-SE-HR	HighResMIP	Gent (2020a), DOI:10.22033/ESGF/CMIP6.14220
NCAR:CESM1-CAM5-SE-LR	HighResMIP	Gent (2020b), DOI:10.22033/ESGF/CMIP6.14262
NCAR:CESM1-WACCM-SC	PAMIP	Peings (2020), DOI:10.22033/ESGF/CMIP6.12281
NCAR:CESM2	AerChemMIP	Danabasoglu (2019b), DOI:10.22033/ESGF/CMIP6.2181
NCAR:CESM2	C4MIP	Danabasoglu (2019c), DOI:10.22033/ESGF/CMIP6.2182
NCAR:CESM2	CDRMIP	Danabasoglu (2019d), DOI:10.22033/ESGF/CMIP6.2183
NCAR:CESM2	CFMIP	Danabasoglu (2019e), DOI:10.22033/ESGF/CMIP6.2184
NCAR:CESM2	CMIP	Danabasoglu (2019f), DOI:10.22033/ESGF/CMIP6.2185
NCAR:CESM2	DAMIP	Danabasoglu (2019g), DOI:10.22033/ESGF/CMIP6.2187
NCAR:CESM2	FAFMIP	Danabasoglu (2020), DOI:10.22033/ESGF/CMIP6.14052
NCAR:CESM2	GMMIP	Danabasoglu (2019h), DOI:10.22033/ESGF/CMIP6.2190
NCAR:CESM2	ISMIP6	Danabasoglu (2019i), DOI:10.22033/ESGF/CMIP6.2193
NCAR:CESM2	LS3MIP	Danabasoglu (2019j), DOI:10.22033/ESGF/CMIP6.2194
NCAR:CESM2	LUMIP	Danabasoglu (2019k), DOI:10.22033/ESGF/CMIP6.2195
NCAR:CESM2	OMIP	Danabasoglu (2019l), DOI:10.22033/ESGF/CMIP6.2196

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NCAR:CESM2	PAMIP	Danabasoglu (2019m), DOI:10.22033/ESGF/CMIP6.2197
NCAR:CESM2	PMIP	Danabasoglu (2019n), DOI:10.22033/ESGF/CMIP6.2198
NCAR:CESM2	RFMIP	Danabasoglu (2019o), DOI:10.22033/ESGF/CMIP6.2199
NCAR:CESM2	ScenarioMIP	Danabasoglu (2019p), DOI:10.22033/ESGF/CMIP6.2201
NCAR:CESM2-FV2	CMIP	Danabasoglu (2019q), DOI:10.22033/ESGF/CMIP6.11281
NCAR:CESM2-WACCM	AerChemMIP	Danabasoglu (2019r), DOI:10.22033/ESGF/CMIP6.10023
NCAR:CESM2-WACCM	CMIP	Danabasoglu (2019s), DOI:10.22033/ESGF/CMIP6.10024
NCAR:CESM2-WACCM	GeoMIP	Danabasoglu (2019t), DOI:10.22033/ESGF/CMIP6.10025
NCAR:CESM2-WACCM	RFMIP	Danabasoglu (2019u), DOI:10.22033/ESGF/CMIP6.14053
NCAR:CESM2-WACCM	ScenarioMIP	Danabasoglu (2019v), DOI:10.22033/ESGF/CMIP6.10026
NCAR:CESM2-WACCM-FV2	CMIP	Danabasoglu (2019w), DOI:10.22033/ESGF/CMIP6.11282
NCC:NorCPM1	CMIP	Bethke et al. (2019a), DOI:10.22033/ESGF/CMIP6.10843
NCC:NorCPM1	DCPP	Bethke et al. (2019b), DOI:10.22033/ESGF/CMIP6.10844
NCC:NorESM1-F	CMIP	Guo et al. (2019b), DOI:10.22033/ESGF/CMIP6.11543
NCC:NorESM1-F	PMIP	Guo et al. (2019c), DOI:10.22033/ESGF/CMIP6.11544
NCC:NorESM2-LM	AerChemMIP	Olivié et al. (2019a), DOI:10.22033/ESGF/CMIP6.574
NCC:NorESM2-LM	C4MIP	Schwinger et al. (2019), DOI:10.22033/ESGF/CMIP6.13721
NCC:NorESM2-LM	CDRMIP	Tjiputra et al. (2019), DOI:10.22033/ESGF/CMIP6.13722
NCC:NorESM2-LM	CMIP	Seland et al. (2019a), DOI:10.22033/ESGF/CMIP6.502
NCC:NorESM2-LM	DAMIP	Seland et al. (2019b), DOI:10.22033/ESGF/CMIP6.580
NCC:NorESM2-LM	LUMIP	Cai et al. (2020), DOI:10.22033/ESGF/CMIP6.562
NCC:NorESM2-LM	OMIP	Bentsen et al. (2019a), DOI:10.22033/ESGF/CMIP6.598
NCC:NorESM2-LM	PAMIP	Graff et al. (2019), DOI:10.22033/ESGF/CMIP6.13723
NCC:NorESM2-LM	PMIP	Z. Zhang et al. (2019), DOI:10.22033/ESGF/CMIP6.592
NCC:NorESM2-LM	RFMIP	Olivié et al. (2019b), DOI:10.22033/ESGF/CMIP6.586
NCC:NorESM2-LM	ScenarioMIP	Seland et al. (2019c), DOI:10.22033/ESGF/CMIP6.604
NCC:NorESM2-MM	CMIP	Bentsen et al. (2019b), DOI:10.22033/ESGF/CMIP6.506
NCC:NorESM2-MM	RFMIP	Olivié et al. (2020), DOI:10.22033/ESGF/CMIP6.590
NCC:NorESM2-MM	ScenarioMIP	Bentsen et al. (2019c), DOI:10.22033/ESGF/CMIP6.608
NERC:HadGEM3-GC31-HH	HighResMIP	Coward and Roberts (2018), DOI:10.22033/ESGF/CMIP6.1822
NERC:HadGEM3-GC31-HM	HighResMIP	Schiemann et al. (2019), DOI:10.22033/ESGF/CMIP6.1824
NERC:HadGEM3-GC31-LL	FAFMIP	Gregory (2021), DOI:10.22033/ESGF/CMIP6.12065
NERC:HadGEM3-GC31-LL	PMIP	Williams et al. (2020), DOI:10.22033/ESGF/CMIP6.12067
NERC:UKESM1-0-LL	AerChemMIP	O'Connor (2020), DOI:10.22033/ESGF/CMIP6.405
NIMS-KMA:KACE-1-0-G	CMIP	Byun et al. (2019b), DOI:10.22033/ESGF/CMIP6.2241
NIMS-KMA:KACE-1-0-G	ScenarioMIP	Byun et al. (2019a), DOI:10.22033/ESGF/CMIP6.2242
NIMS-KMA:UKESM1-0-LL	AerChemMIP	Shim et al. (2020a), DOI:10.22033/ESGF/CMIP6.2243
NIMS-KMA:UKESM1-0-LL	CMIP	Shim et al. (2020b), DOI:10.22033/ESGF/CMIP6.2245
NIMS-KMA:UKESM1-0-LL	ScenarioMIP	Shim et al. (2020c), DOI:10.22033/ESGF/CMIP6.2250
NIWA:UKESM1-0-LL	AerChemMIP	Dalvi et al. (2019), DOI:10.22033/ESGF/CMIP6.1741
NOAA-GFDL:GFDL-AM4	CMIP	Zhao et al. (2018b), DOI:10.22033/ESGF/CMIP6.1401
NOAA-GFDL:GFDL-CM4	CFMIP	Silvers et al. (2018), DOI:10.22033/ESGF/CMIP6.1641
NOAA-GFDL:GFDL-CM4	CMIP	Guo et al. (2018a), DOI:10.22033/ESGF/CMIP6.1402
NOAA-GFDL:GFDL-CM4	DAMIP	Ploshay et al. (2018), DOI:10.22033/ESGF/CMIP6.11383
NOAA-GFDL:GFDL-CM4	GMMIP	Xiang et al. (2018), DOI:10.22033/ESGF/CMIP6.1642

Institute: Model	Activity ID	Dataset citation and DOI
NOAA-GFDL:GFDL-CM4	OMIP	Adcroft et al. (2018), DOI:10.22033/ESGF/CMIP6.1403
NOAA-GFDL:GFDL-CM4	RFMIP	Paynter et al. (2018c), DOI:10.22033/ESGF/CMIP6.1643
NOAA-GFDL:GFDL-CM4	ScenarioMIP	Guo et al. (2018b), DOI:10.22033/ESGF/CMIP6.9242
NOAA-GFDL:GFDL-CM4C192	HighResMIP	Zhao et al. (2018a), DOI:10.22033/ESGF/CMIP6.2262
NOAA-GFDL:GFDL-ESM2M	FAFMIP	Hurlin et al. (2018), DOI:10.22033/ESGF/CMIP6.1645
NOAA-GFDL:GFDL-ESM4	AerChemMIP	Horowitz et al. (2018b), DOI:10.22033/ESGF/CMIP6.1404
NOAA-GFDL:GFDL-ESM4	C4MIP	Krasting et al. (2018a), DOI:10.22033/ESGF/CMIP6.1405
NOAA-GFDL:GFDL-ESM4	CDRMIP	John et al. (2018a), DOI:10.22033/ESGF/CMIP6.1981
NOAA-GFDL:GFDL-ESM4	CMIP	Krasting et al. (2018b), DOI:10.22033/ESGF/CMIP6.1407
NOAA-GFDL:GFDL-ESM4	DAMIP	Horowitz et al. (2018a), DOI:10.22033/ESGF/CMIP6.1408
NOAA-GFDL:GFDL-ESM4	LUMIP	Malyshev et al. (2018), DOI:10.22033/ESGF/CMIP6.1411
NOAA-GFDL:GFDL-ESM4	RFMIP	Paynter et al. (2018d), DOI:10.22033/ESGF/CMIP6.11961
NOAA-GFDL:GFDL-ESM4	ScenarioMIP	John et al. (2018b), DOI:10.22033/ESGF/CMIP6.1414
NOAA-GFDL:GFDL-GRTCODE	RFMIP	Paynter et al. (2018a), DOI:10.22033/ESGF/CMIP6.10404
NOAA-GFDL:GFDL-OM4p5B	OMIP	Zadeh et al. (2018), DOI:10.22033/ESGF/CMIP6.2264
NOAA-GFDL:GFDL-RFM-DISORT	RFMIP	Paynter et al. (2018b), DOI:10.22033/ESGF/CMIP6.10406
NTU:TaiESM1-TIMCOM	OMIP	Tseng et al. (2020), DOI:10.22033/ESGF/CMIP6.14323
NUIST:NESM3	CMIP	Cao and Wang (2019), DOI:10.22033/ESGF/CMIP6.2021
NUIST:NESM3	PMIP	Cao (2019a), DOI:10.22033/ESGF/CMIP6.2026
NUIST:NESM3	ScenarioMIP	Cao (2019b), DOI:10.22033/ESGF/CMIP6.2027
RTE-RRTMGP-Consortium:RTE-RRTMGP-181204	RFMIP	Pincus (2019), DOI:10.22033/ESGF/CMIP6.10124
SNU:SAM0-UNICON	CMIP	Park and Shin (2019), DOI:10.22033/ESGF/CMIP6.1489
THU:CIESM	CMIP	Huang (2019a), DOI:10.22033/ESGF/CMIP6.1352
THU:CIESM	GMMIP	Xue (2020), DOI:10.22033/ESGF/CMIP6.1354
THU:CIESM	ScenarioMIP	Huang (2019b), DOI:10.22033/ESGF/CMIP6.1357
UA:MCM-UA-1-0	CMIP	Stouffer (2019a), DOI:10.22033/ESGF/CMIP6.2421
UA:MCM-UA-1-0	ScenarioMIP	Stouffer (2019b), DOI:10.22033/ESGF/CMIP6.13816
UHH:ARTS-2-3	RFMIP	Brath (2019), DOI:10.22033/ESGF/CMIP6.2001

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