

CanESM2 Large Ensembles: Available runs and output

Each CanESM2 large ensemble run listed in Table 1 consists of 50-member perturbed initial condition ensembles from 1950 to 2020. The simulations are initialized from five CMIP5 CanESM2 historical simulations indicated by the label r1 to r5 in the experiment names (see Table 1 below) by randomly perturbing the initial conditions in year 1950 and performing 10 runs for each CMIP5 ensemble member, resulting in the total ensemble size of 50. The simulations were run to 2005 using CMIP5 historical forcings and then to 2020 using RCP 8.5 forcings. The model, forcings, variable names and file formats all follow those used in CMIP5. Table 2 lists the variables that are available for each frequency and realm.

Refer to Kirchmeier-Young et al (2017) for a description of the large ensembles:

Kirchmeier-Young, M.C., F.W. Zwiers, and N.P. Gillett, 2017: Attribution of Extreme Events in Arctic Sea Ice Extent. *J. Climate*, **30**, 553–571, <https://doi.org/10.1175/JCLI-D-16-0412.1>

Table 1: List of ensemble runs and their forcings

Experiment names	Ensemble identifiers	Description
historical-r1 to historical-r5	r1i1p1 to r10i1p1	all forcings
historicalNat-r1 to historical-r5	r1i1p1 to r10i1p1	solar and volcanic forcings only
historicalMisc-r1 to historicalMisc-r5	r1i1p4 to r10i1p4	anthropogenic aerosols only
historicalMisc-r1 to historicalMisc-r5	r1i1p6 to r10i1p6	stratospheric ozone only

Table 2: List of variables for each frequency and realm

Frequency	Realm (Definition)	Variables	Name	Variable Unit
day (daily average)	atmos (Atmosphere)	evspsbl	Evaporation	$\text{kg m}^{-2} \text{s}^{-1}$
		pr	Precipitation	$\text{kg m}^{-2} \text{s}^{-1}$
		prc	Convective Precipitation	$\text{kg m}^{-2} \text{s}^{-1}$
		prsn	Snowfall Flux	$\text{kg m}^{-2} \text{s}^{-1}$
		psl	Sea Level Pressure	Pa
		tas	Near-Surface Air Temperature	K
		tasmax	Daily Maximum Near-Surface Air Temperature	K
		tasmin	Daily Minimum Near-Surface Air Temperature	K
		uas	Eastward Near-Surface Wind	m s^{-1}
		vas	Northward Near-Surface Wind	m s^{-1}
	zg	Geopotential Height	m	
	land (Land)	mrro	Surface Runoff	$\text{kg m}^{-2} \text{s}^{-1}$
		tlsi	Surface Temperature Where Land or Sea Ice	K
	landIce (Land ice)	snc	Snow Area Fraction	%
snw		Snow Area Amount	kg m^{-2}	

	sealce (Sea ice)	sic	Sea Ice Area Fraction	%
		sit	Sea Ice Thickness	m
		usi	X-Component of Sea Ice Velocity	$m s^{-1}$
		vsi	Y-Component of Sea Ice Velocity	$m s^{-1}$
fx (fixed time)	atmos (Atmosphere)	areacella	Atmosphere Grid-Cell Area	m^2
		orog	Surface Altitude (zero over oceans)	m
		orograw	Unmodified Surface Altitude	M
		sftlf	Land Area Fraction	%
	land (Land)	mrsofc	Capacity of Soil to Store Water	$kg m^{-2}$
		rootd	Maximum Root Depth	m
		sftgif	Fraction of Grid Cell Covered with Glacier	%
	ocean (Ocean)	areacello	Ocean Grid-Cell Area	m^2
		basin	Region Selection Index	unitless
		deptho	Sea Floor Depth	m
		stfof	Sea Area Fraction	%
		thkcello	Ocean Model Cell Thickness	m
		volcello	Ocean Grid-Cell Volume	m^3
mon (monthly average)	aerosol (Aerosol)	loadso4	Load of SO4	$kg m^{-2}$
		sconcs04	Surface Concentration of SO4	$kg m^{-3}$
	atmos (Atmosphere)	cl	Cloud Area Fraction	%
		evspsbl	Evaporation from Canopy	$kg m^{-2} s^{-1}$
		hfss	Surface Upward Sensible Heat Flux over Sea Ice	$W m^{-2}$
		hus	Specific Humidity	Unitless
		pr	Precipitation	$kg m^{-2} s^{-1}$
		prc	Convective Precipitation	$kg m^{-2} s^{-1}$
		prsn	Snowfall Flux	$kg m^{-2} s^{-1}$
		ps	Surface Air Press	Pa
		psl	Sea Level Pressure	Pa
		rlds	Surface Downwelling Longwave Radiation	$W m^{-2}$
		rldscs	Surface Downwelling Clear-Sky Longwave Radiation	$W m^{-2}$
		rlus	Surface Upwelling Longwave Radiation	$W m^{-2}$
rlut	TOA Outgoing Longwave	$W m^{-2}$		

			Radiation	
		rsds	Surface Downwelling Shortwave Radiation	W m^{-2}
		rsdscs	Surface Downwelling Clear-Sky Shortwave Radiation	W m^{-2}
		rsdt	TOA Incident Shortwave Radiation	W m^{-2}
		rsus	Surface Upwelling Shortwave Radiation	W m^{-2}
		rsut	TOA Outgoing Shortwave Radiation	W m^{-2}
		ta	Air Temperature	K
		tas		
		tasmax	Near-Surface Air Temperature	K
		tasmin	Daily Maximum Near-Surface Air Temperature	K
		ts	Daily Minimum Near-Surface Air Temperature	K
		ua	Eastward Wind	m s^{-1}
		uas	Eastward Near-Surface Wind	m s^{-1}
		va	Northward Wind	m s^{-1}
		vas	Northward Near-Surface Wind	m s^{-1}
		zg	Geopotential Height	m
		evspsblsoi	Water Evaporation from Soil	$\text{kg m}^{-2} \text{ s}^{-1}$
	land (Land)	evspsblveg	Evaporation from Canopy	$\text{kg m}^{-2} \text{ s}^{-1}$
		mrro	Total Runoff	$\text{kg m}^{-2} \text{ s}^{-1}$
		mrros	Surface Runoff	$\text{kg m}^{-2} \text{ s}^{-1}$
		mrso	Total Soil Moisture Content	kg m^{-2}
		mrsos	Moisture in Upper Portion of Soil Column	kg m^{-2}
		tran	Transpiration	$\text{kg m}^{-2} \text{ s}^{-1}$
		tsl	Temperature of Soil	K
		sbl	Surface Snow and Ice Sublimation Flux	$\text{kg m}^{-2} \text{ s}^{-1}$
	landIce (Land ice)	snc	Snow Area Fraction	%
		snd	Snow Depth	m
		snw	Surface Snow Amount	kg m^{-2}
		msftmyz	Ocean Meridional Overturning Mass Streamfunction	kg s^{-1}
	ocean (Ocean)	sos	Sea Surface Salinity	psu

		tos	Sea Surface Temperature	K
		uos	Eastward Sea Surface Wind	m s^{-1}
		vos	Northward Sea Surface Wind	m s^{-1}
		pr	Rainfall Flux where Ice Free Ocean over Sea	$\text{kg m}^{-2} \text{s}^{-1}$
	sealce (Sea ice)	prsn	Snowfall Flux where Ice Free Ocean over Sea	$\text{kg m}^{-2} \text{s}^{-1}$
		rldssi	Downwelling Longwave over Sea Ice	W m^{-2}
		rsdssi	Downwelling Shortwave over Sea Ice	W m^{-2}
		sic	Sea Ice Area Fraction	%
		sim	Sea Ice Plus Surface Snow Amount	kg m^{-2}
		sit	Sea Ice Thickness	m
		snd	Snow Depth	M
		snomelt	Snow Melt Rate	$\text{kg m}^{-2} \text{s}^{-1}$
		strairx	X-Component of Atmospheric Stress on Sea Ice	N m^{-2}
		strairy	Y-Component of Atmospheric Stress on Sea Ice	N m^{-2}
		tsice	Surface Temperature of Sea Ice	K