NARCCAP REGIONAL OUTPUT ARCHIVE

GENERAL INFORMATION

Output will be reported in NetCDF using CF conventions. Variable names and units should be consistent with IPCC. Please consult with the NARCCAP group if inconsistencies found. More on CF conventions can be found at: http://badc.nerc.ac.uk/help/formats/netcdf/index_cf.html.

Output will be on the model's native horizontal grid. A supplemental archive is planned to provide some variables on a common grid.

File name

File names should follow this structure:

VariableName_ModelName_Time.nc

Where

"VariableName" is the IPCC/CF-convention Variable Name in the tables below.

"ModelName" is a 4-character identifier chosen by the modeling group (please clear it with the archival group beforehand to avoid conflicts).

"Time" is the starting time of the file, in the form "YearMonthDayUTC", e.g., 1979010100 for 00 UTC on 1 Jan 1979.

File sizes

(a) two-dimensional fields: files covering 5 years (half a decade)

For consistency with climatological averaging standards, all 2-D files should end on years ending in zero or five (e.g., 1981-1985, 1986-1990, etc.). There may be some odd file sizes at the beginning and end (e.g., 1979-1980), but there is merit in having output from all models cover the same set of periods in their files.

The ending time in a file should be 00 UTC on 1 January, since fluxes are for the 3-hour period preceding that time. For instantaneous fields, the ending time is less important, but for consistency should be the same time.

(b) three-dimensional fields: files covering 1 month

Note that the definition of a month may vary between GCMs and may also differ from the real calendar. The "month" should follow usage in the source of the boundary conditions. The ending time in a file should be 00 UTC on day 1 of the following month (i.e., at midnight UTC separating one month from the next).

Further details regarding NetCDF conventions to follow, especially for metadata, appear in *Requirements for Standard Output Contributed to the NARCCAP Archive*.

TWO-DIMENSIONAL FIELDS

Table 1: Daily fields

The "day" for minimum and maximum temperatures should be from 06 UTC - 06 UTC, with the date stamp referring to the beginning time. This follows NARCCAP Exp. 0 practice. Thus, for 06 UTC 30 June 1979 - 06 UTC 1 July 1979, the date of the record is 30 June 1979, the calendar day corresponding to the period recorded for North America.

The min/max should be recorded from instantaneous “screen height” temperatures sampled every time step during the course of the day. The “screen height” or “reference height” should be in the range 1.5 – 2 m above the surface.

Long Name	Units	Variable Name	Standard Name
Maximum Daily Surface Air Temperature	K	tasmax	air_temperature (In CF convention: air_temperature with a vertical coordinate in height of 2 m and a cell_methods attribute including time: maximum within days)
Minimum Daily Surface Air Temperature	K	tasmin	air_temperature (In CF convention: air_temperature with a vertical coordinate in height of 2 m and a cell_methods attribute including time: minimum within days)
Maximum Daily 10-Meter Wind Speed	$m\text{-}s^{-1}$	spdmax	wind_speed_of_gust (In CF convention: wind_speed with a vertical coordinate in height of 10 m and a cell_methods attribute including time: maximum within days)
Daily Average Sea-ice Fraction	fraction in [0,1]	sic	sea_ice_area_fraction

Table 2: Primary three-hourly surface fields needed for impacts assessment

For each day, values reported at 03 UTC, 06 UTC, … 24 UTC. Solar radiation is averaged over the 3-hr period prior to the reporting time. Precipitation is the 3-hour average prior to the reporting time. Other quantities are instantaneous values as noted. Winds should be the true west-east and south-north winds (i.e., rotated from the model's grid as needed to the earth's longitudinal and latitudinal directions).

The surface air temperature and specific humidity should be recorded from "screen height" values. The "screen height" or "reference height" should be in the range 1.5 – 2 m above the surface. Surface winds should be recorded from "anemometer level" values. The "anemometer level" should be 10 meters above the surface.

Note units for precipitation and surface pressure (MKS – following CF standards).

Long Name	**Units**	**Variable Name**	**Standard Name**	**Notes**
Precipitation	$kg\text{-}m^{-2}\text{-}s^{-1}$	pr	precipitation_flux	Average
Surface Specific Humidity	$kg\text{-}kg^{-1}$	huss	specific_humidity (In CF convention: specific_humidity with a vertical coordinate in height of 2 m)	Instantaneous
Surface Air Temperature	K	tas	air_temperature (In CF convention: air_temperature with a vertical coordinate in height of 2 m)	Instantaneous
Surface Downwelling Shortwave Radiation	$W\text{-}m^{-2}$	rsds	surface_downwelling_shortwave_flux_in_air	Average, Positive down
Zonal Surface Wind Speed	$m\text{-}s^{-1}$	uas	eastward_wind (In CF convention: eastward_wind with a vertical coordinate in height of 10 m)	Instantaneous, Positive to East
Meridional Surface Wind Speed	$m\text{-}s^{-1}$	vas	northward_wind (In CF convention: northward_wind with a vertical coordinate in height of 10 m)	Instantaneous, Positive to North
Surface Pressure	Pa	ps	surface_air_pressure	Instantaneous

Table 3: Additional three-hourly fields, guided by GCM output archived for IPCC Fourth Assessment Report

More on the IPCC Fourth Assessment Report can be found at https://esg.llnl.gov:8443/about/ipccTables.do. For each day, values reported at 03 UTC, 06 UTC, … 24 UTC, on the model's native grid.

Quantities that can be used for storage terms in budgets are instantaneous values. Quantities that are fluxes in budgets should be average values for the 3-hr period prior to the reporting time, except for precipitation, which should be the 3-hour accumulation up to the reporting time.

Snow depth is snow-water equivalent and is the average depth over the entire grid box, even if the model allows snow to cover a fraction of the grid box.

Long Name	Units	Variable Name	Standard Name	Notes
Total Cloud Fraction	fraction in [0,1]	clt	cloud_area_fraction	Average
Precipitable Water	m	prw	atmosphere_water_vapor_content	Instantaneous
Snow Depth	m	snd	surface_snow_thickness	Instantaneous, Snow-water equivalent
Soil Frozen Water Content	m	mrfso	soil_frozen_water_content	Instantaneous
Total Soil Moisture Content	m	mrso	soil_moisture_content	Instantaneous
Surface Evaporation of Condensed Water	$kg\text{-}m^{-2}\text{-}s^{-1}$	evps	surface_water_evaporation_flux	Average
Snow Melt	$kg\text{-}m^{-2}\text{-}s^{-1}$	snm	surface_snow_melt_flux_where_land	Average
Surface and Subsurface Runoff	$kg\text{-}m^{-2}\text{-}s^{-1}$	mrro	runoff_flux	Average
Surface Runoff	$kg\text{-}m^{-2}\text{-}s^{-1}$	mrros	surface_runoff_flux	Average
Convective Precipitation	$kg\text{-}m^{-2}\text{-}s^{-1}$	prc	convective_precipitation_flux	Average
Surface Latent Heat Flux	$W\text{-}m^{-2}$	hfls	surface_upward_latent_heat_flux	Average, Pos. up
Surface Sensible Heat Flux	$W\text{-}m^{-2}$	hfss	surface_upward_sensible_heat_flux	Average, Pos. up
Surface Downwelling Longwave Radiation	$W\text{-}m^{-2}$	rlds	surface_downwelling_longwave_flux_in_air	Average, Positive down
Surface Upwelling Longwave Radiation	$W\text{-}m^{-2}$	rlus	surface_upwelling_longwave_flux_in_air	Average, Pos. up

Table 3: Additional three-hourly fields (continued)

Outgoing Longwave Radiation	$W\text{-}m^{-2}$	rlut	toa_outgoing_longwave_flux	Average, Pos. up
Surface Upwelling Shortwave Radiation	$W\text{-}m^{-2}$	rsus	surface_upwelling_shortwave_flux_in_air	Average, Pos. up
TOA Incident Shortwave Radiation	$W\text{-}m^{-2}$	rsdt	toa_incoming_shortwave_flux	Average, Pos. down
TOA Reflected Shortwave Radiation	$W\text{-}m^{-2}$	rsut	toa_outgoing_shortwave_flux	Average, Pos. up
Surface downward flux of eastward momentum	Pa	tauu	surface_downward_eastward_stress	Average, Pos. down
Surface downward flux of northward momentum	Pa	tauv	surface_downward_northward_stress	Average, Pos. down
Surface (skin) temperature	K	ts	surface_temperature	Instantaneous
Sea Level Pressure	Pa	psl	air_pressure_at_sea_level	Instantaneous
500 hPa Geopotential Height	m	zg500	geopotential_height_500hpa	Instantaneous
Atmospheric Boundary Layer Thickness	m	zmla	atmosphere_boundary_layer_thickness	Instantaneous

Table 4: Fixed surface fields

For land-cover type, modelers will supply a vegetation index for each grid point along with a table linking each index value to a land-cover description. Models using a mosaic of multiple surface types in a grid box should supply sufficient information to describe the mosaic. On the models' native grids.

Long Name	**Units**	**Variable Name**	**Standard Name**	**Notes**
Capacity of Soil to Store Water	kg-m^{-2}	mrsofc	soil_moisture_content_at_field_capacity	
Surface Altitude	m	orog	surface_altitude	
Root Depth	m	rootd	root_depth	
Land-Cover Type	-	landtyp	land_cover_index	
Longitude of Grid Points	degrees east	gplon	grid_point_longitude	
Latitude of Grid Points	degrees north	gplat	grid_point_latitude	
Land Area Fraction	fraction in [0,1]	sftlf	land_area_fraction	land/ocean

THREE-DIMENSIONAL FIELDS

Table 5: Three-dimensional atmospheric fields

Reported every three hours (03 UTC, 06 UTC, 09 UTC, 12 UTC, 15 UTC, 18 UTC, 21 UTC, 24 UTC). Instantaneous values every 25 hPa from 1050 hPa to 25 hPa. Flag values for levels outside of the model's atmosphere with the PCMDI missing values flag: 1e20. (Surface pressure is listed in Table 2).

Note that according to the CF conventions, the ice cloud water and the liquid cloud water are each reported as the ratio (cloud-water mass)/(mass of gas+condensed constituents), i.e., more like specific humidity than mixing ratio.

Long Name	Units	Variable Name	Standard Name	Notes
Temperature	K	ta	air_temperature	Instantaneous
Zonal Wind Component	$m\text{-}s^{-1}$	ua	eastward_wind	Instantaneous
Meridional Wind Component	$m\text{-}s^{-1}$	va	northward_wind	Instantaneous
Vertical Wind Component	$m\text{-}s^{-1}$	wa	upward_air_velocity	Instantaneous
Specific Humidity	$kg\text{-}kg^{-1}$	hus	specific_humidity	Instantaneous
Cloud ice fraction of layer	1	cli	mass_fraction_of_cloud_ice_in_air	Instantaneous
Cloud liquid water fraction of layer	1	clw	mass_fraction_of_cloud_liquid_water_in_air	Instantaneous