Output parameter list for CLM regional climate model runs performed as community runs in the context of the BMBF funding priority "Research for Climate Protection and Protection from Climate Impacts" attended by Service Group Adaptation (SGA)

General information:

The overall output data format of the CLM regional model is **netCDF**.

The regional model variables are calculated as **two-dimensional near surface fields** and **three dimensional soil and atmospheric fields**, respectively.
The soil fields are simulated on 10 different levels with a maximum depth of 15 meters. See CERA data base for more details.
The atmospheric fields are given on 6 pressure levels (200, 500, 700, 850, 925 and 1000 hPa).
The time interval of the output fields ranges from 1 to 3 hours and includes daily output fields, depending on the respective variables.

The CLM model output is provided as timeseries via the CERA data base in **two different data streams**:
Data stream 2 (DS2) is given on the rotated grid with 0.165° spatial resolution.
Data stream 3 (DS3) is projected onto a regular geographical grid with a spacing of 0.2°. The transformation from DS2 to DS3 has been performed with either **bilinear interpolation or via the nearest neighbour method** where necessary. The respective method is indicated in the CERA data base.
Note: None of the DS3-parameters has been corrected for topographical differences between the two grids which are due to interpolation.

For data stream 3 only:
In addition to the model output parameters at the given time interval, some post processed values are provided via the CERA data base:
These additional values are some statistics on daily, monthly or yearly basis for a subset of model parameters.

cf- long name	**parameter name**	**MKS Units**	output interval **DS2 + DS3**	daily **(for DS3)**	monthly **(for DS3)**	yearly **(for DS3)**	**comments:** x = mean over given interval * = sum over given interval # = number of days in given interval + =absolute maximum - =absolute minimum x+ and x- = both values available	1h/3h = one/three-hourly instantaneous output 1hc/3hc = output accumulated over one/three hours 1hm/3hm = output meaned over one/three hours d= instantaneous daily output at 0 UTC dm = meaned daily output at 0 UTC over previous day dc = accumulated daily output at -"- f = fixed field
Near surface fields DS2 + DS3								
U-component of 10m wind	U_10M	m/s	1h	x	x	x		
V-component of 10m wind	V_10M	m/s	1h	x	x	x		
maximum 10m wind speed	VMAX_10M	m/s	1hc	x+	x+	x+	Maximum value is calculated by gust-parameterization.	
convective snowfall	SNOW_CON	kg/m^2	1hc	*	*	*		
large scale snowfall	SNOW_GSP	kg/m^2	1hc	*	*	*		
convective rainfall	RAIN_CON	kg/m^2	1hc	*	*	*		
large scale rainfall	RAIN_GSP	kg/m^2	1hc	*	*	*		
surface runoff	RUNOFF_S	kg/m^2	1hc	*	*			
2m temperature	T_2M	K	3h				see below T_2M_AV	
2m dew point temperature	TD_2M	K	3h				see below TD_2M_AV	
mean sea level pressure	PMSL	Pa	3h	x	x			
total cloud cover	CLCT	1	3h	x	x			
high cloud cover	CLCH	1	3h	x	x			
medium cloud cover	CLCM	1	3h	x	x			
low cloud cover	CLCL	1	3h	x	x			
specific convectively available potential energy	CAPE_CON	J/kg	3h	x	x			
surface net downward shortwave radiation	ASOB_S	W/m^2	3hm	x	x	x	Positive values denote downward direction towards the surface.	
surface net downward longwave radiation	ATHB_S	W/m^2	3hm	x	x	x	Positive values denote downward direction towards the surface.	
net downward shortwave radiation (at model top)	ASOB_T	W/m^2	3hm	x	x	x	Positive values denote downward direction towards the surface.	
outgoing longwave radiation (at model top)	ATHB_T	W/m^2	3hm	x	x	x	Positive values denote downward direction towards the surface.	
surface latent heat flux	ALHFL_S	W/m^2	3hm	x	x	x	Positive values denote downward direction towards the surface.	
surface sensible heat flux	ASHFL_S	W/m^2	3hm	x	x	x	Positive values denote downward direction towards the surface.	
surface albedo	ALB	1	3h	x	x	x	Is provided in DS3 for both transformation methods (bilinear and nearest neighbour NN).	

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daily output DS2 + DS3								
surface photosynthetic active radiation	APAB_S	W/m^2	dm		x			
height of the snow fall limit in m above sea level	SNOWLMT	m	d				Gives the height in the atmosphere above which possible precipitation would be frozen.	
height of freezing level	HZEROCL	m	d				Gives the height of the lowest 0 °C limit. See CERA data base for more details.	
surface snow amount	W_SNOW	m	d		x		W_SNOW ge 0.01 (liquid water equivalent of 1cm snow cover in grid box) is used to mask out T_SNOW. See CERA data base for more details.	
2m temperature	T_2M_AV	K	dm		x	x		
2m maximum temperature	TMAX_2M	K	dc		x+			
2m minimum temperature	TMIN_2M	K	dc		x-			
2m dew point temperature	TD_2M_AV	K	dm		x	x		
subsurface runoff	RUNOFF_G	kg/m^2	dc		*			
sunshine duration	DURSUN	s	dc		*	*	Sunshine: instantaneous 1-hourly value of direct shortwave radiation (perpendicular to the surface) exceeds 120 W/m^2.	
Soil fields DS2 + DS3 (on 10 levels below surface: 0.01, 0.04, 0.1, 0.22, 0.46, 0.94, 1.9, 3.82, 7.66, 15.34 m; for DS3 the upper 8 levels are provided)								
soil temperature	T_SO	K	d		x	x		
soil water content	W_SO	m	d		x	x	Total water content of the soil layer.	
soil frozen water content	W_ICE	m	d		x	x	Subset of the total water content of the soil W_SO.	
canopy water amount	W_I	kg/m^2	d		x	x		
snow surface temperature	T_SNOW	K	d		x	x	Temperature of the snow surface. T_SNOW is set to missing value if W_SNOW lt 0.01; Mean value is taken only over days with snow in time interval (W_SNOW ge 0.01) See CERA database for more details.	
Fields on selected pressure levels DS2 + DS3 (on 6 pressure levels: 200, 500, 700, 850, 925, 1000 hPa)								
geopotential	GPH	m^2/s^2	3h	x	x			
temperature	T	K	3h	x	x			
U-component of wind	U	m/s	3h	x	x			
V-component of wind	V	m/s	3h	x	x			
omega (dp/dt)	OMEGA	Pa/s	3h	x	x			
specific humidity	QV	1	3h	x	x		Note on units: unit "1" denotes kg/kg.	

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Constant or slowly varying fields DS2 + DS3								
vegetation area fraction	PLCOV	1	d					
leaf area index	LAI	1	d					
root depth	ROOTDP	m	d					
vertical integrated ozone amount	VIO3	Pa	d					
air pressure at ozone maximum	HMO3	Pa	d					
surface roughness length	GZ0	m	d				Provided as roughness length in [m].	
surface height	HSURF	m	f				Is provided in DS3 for both transformation methods (bilinear and nearest neighbour NN).	
land-sea fraction	FR_LAND	1	f				Is provided in DS3 for both transformation methods (bilinear and nearest neighbour NN). Within the CLM model, grid boxes with FR_LAND ge 0.5 are regarded as land.	
soil type	SOILTYP	1	f				Is provided in DS3 via nearest neighbour NN method only.	
area of gridbox	BOX_AREA	m^2	f				Gives the area of the actual grid box in square meter.	
latitude	LAT	deg	f				Gives the center latitude of the actual grid box.	
longitude	LON	deg	f				Gives the center longitude of the actual grid box.	
only DS2								
latitude of the bounds	LAT_BNDS	deg	f				Gives the latitudes of the 4 corners of the bounding box.	
longitude of the bounds	LON_BNDS	deg	f				Gives the longitudes of the 4 corners of the bounding box.	
surface pressure	PS	Pa	d					
height of convective cloud base	HBAS_CON	m	1h					
height of convective cloud top	HTOP_CON	m	1h					
precipitable water	IWV	kg/m^2	3h					
cloud condensed water content	IWATER	kg/m^2	3h					
convective mass flux density	MFLX_CON	kg/m^2s	3h					
atmosphere water divergence	IDIV_HUM	kg/m^2	dc					
height (geometric height on half levels)	HHL	m	f				3D-field on 33 model half levels.	
grid mean surface temperature	T_G	K	3h				Calculated as weighted mean of the fractions with and without snow in the gridbox.	
soil surface temperature	T_S	K	d				Temperature at the boundary earth/atmosphere (in case of snow: earth/snow)	
surface specific humidity	QV_S	1	d				Note on units: unit "1" denotes kg/kg.	

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only DS3 (additional post processed values)								
evaporation	AEVAP_S	kg/m^2	3hc	*	*	*	AEVAP_S=ALHFL_S x 10800 /2.501*10^6	
rainfall	RAIN_TOT	kg/m^2	1hc	*	*	*	RAIN_TOT = RAIN_CON + RAIN_GSP	
snowfall	SNOW_TOT	kg/m^2	1hc	*	*	*	SNOW_TOT = SNOW_CON + SNOW_GSP	
convective precipitation	CON_TOT	kg/m^2	1hc	*	*	*	CON_TOT = RAIN_CON + SNOW_CON	
large scale precipitation	GSP_TOT	kg/m^2	1hc	*	*	*	GSP_TOT = RAIN_GSP + SNOW_GSP	
total precipitation	PRECIP_TOT	kg/m^2	1hc	*	*	*	PRECIP_TOT = RAIN_CON + SNOW_CON + RAIN_GSP + SNOW_GSP	
wind speed	WIND_SPEED	m/s	1h	x	x	x	WIND_SPEED= sqrt(U_10M*U_10M + V_10M*V_10M)	
wind direction	WIND_DIR	deg	1h				Wind from direction in 10m altitude; see CERA database for more details.	
relative humidity	REL_HUM	1	3h				Calculated with respect to water saturation from 2m-temperatures (T_2M, TD_2M).	
rel. freq. of potential snowfall at surface	SNOWFREQ	1			x		relative frequency of potential snow fall at ground level in the time interval. See CERA database for details.	
number of days with snowfall	SNOW_DAYS	no.			#	#	snow days: precipitation is snow only	
number of days with total precipitation at least $1kg/m^2$	RR1MM	no.			#	#	rain days	
number of days with tmin_2m below 0 °C	FD	no.			#	#	frost days	
number of days with tmax_2m above 25 °C	SU	no.			#	#	summer days	
number of days with tmin_2m above 20 °C	TR	no.			#	#	tropical nights	
number of days with total precipitation at least 10 kg/m^2	R10MM	no.			#	#		
number of days with total precipitation at least 20 kg/m^2	R20MM	no.			#	#		
number of days with frozen soil	W_ICE_DAYS	no.			#	#	number of days per time interval with frozen soil (for upper 8 soil levels)	
number of days with snowcover	SNOW_COV	no.			#	#	number of days per time interval with snowcover. Days with W_SNOW ge 0.01 are counted. This parameter gives the ensemble size for the mean values of T_SNOW.	
number of days with tmax_2m below 0 °C	ID	no.			#	#	ice days	