

README

Dataset for “Mass loss of the Antarctic ice sheet until the year 3000 under a sustained late-21st-century climate”

25 model experiments

- hist: historical simulation 1990–2015.
- ctrl_proj: constant-climate projection control experiment 2015–3001.
- exp05–10, exp12–13, expA5–A8, expB6–B10: future-climate experiments 2015–3001; see Table 1.
- abuc, abuciso, abuk, abukiso, abum, abumiso: ABUMIP experiments 1000 years into the future (schematic experiments, thus no precise calendar employed); see Table 2.

Zip archives

- hist.zip, ctrl_proj_long.zip, exp05_long.zip, exp06_long.zip, ..., expB10_long.zip, abuc_long.zip, ..., abumiso_long.zip: netCDF output files for the 25 experiments (one file for each variable).
- run_specs_headers.zip
SICOPOLIS run-specs headers for the 25 experiments.

Scalar state variables

lim	– Total ice mass (kg)
limnsw	– Mass above floatation (kg)
iareagr	– Grounded ice area (m ²)
iareafl	– Floating ice area (m ²)

These variables are provided as yearly snapshots for the following full years:

hist: 1991–2015, ctrl_proj and exp05–expB10: 2016–3001,

abuc–abumiso: 1–1000 (no precise calendar employed).

Time variable: ‘time’.

Scalar flux variables

dlimdt	– Total ice mass change (kg a ⁻¹)
tendacabf	– Total surface mass balance flux (kg a ⁻¹)
tendlibmassbf	– Total basal mass balance flux (kg a ⁻¹)
tendlibmassbffl	– Total basal mass balance flux beneath floating ice (kg a ⁻¹)
tendlicalvf	– Total calving flux (kg a ⁻¹)

These variables are provided as yearly averages over the intervals bounded by the following years:

hist: 1990–2015, ctrl_proj and exp05–expB10: 2015–3001,

abuc–abumiso: 0–1000 (no precise calendar employed).

Time variables: ‘time’, ‘time_bnds’.

2D state variables

lithk	– Ice thickness (m)
orog	– Surface elevation (m)
base	– Ice base elevation (m)
topg	– Bedrock elevation (m)
xvelsurf	– Surface velocity in x (m a^{-1})
yvelsurf	– Surface velocity in y (m a^{-1})
zvelsurf	– Surface velocity in z (m a^{-1})
horvelsurf	– Horizontal surface velocity (m a^{-1})
xvelbase	– Basal velocity in x (m a^{-1})
yvelbase	– Basal velocity in y (m a^{-1})
zvelbase	– Basal velocity in z (m a^{-1})
horvelbase	– Horizontal basal velocity (m a^{-1})
xvelmean	– Mean velocity in x (m a^{-1})
yvelmean	– Mean velocity in y (m a^{-1})
horvelmean	– Horizontal mean velocity (m a^{-1})
litemptop	– Surface temperature (K)
litempbot	– Basal temperature (K)
strbasemag	– Basal drag (Pa)
sftgif	– Land ice area fraction (–)
sftgrf	– Grounded ice sheet area fraction (–)
sftflf	– Floating ice shelf area fraction (–)

These variables are provided as snapshots for the following years:

hist: 1991 (1) 2015, ctrl_proj and exp05–expB10: 2035 (20) 2995, 3001,

abuc–abumiso: 20 (20) 1000 (no precise calendar employed).

Time variable: ‘time’.

2D flux variables

acabf	– Surface mass balance flux ($\text{kg m}^{-2} \text{a}^{-1}$)
libmassbf	– Basal mass balance flux ($\text{kg m}^{-2} \text{a}^{-1}$)
licalvf	– Calving flux ($\text{kg m}^{-2} \text{a}^{-1}$)
dlithkdt	– Ice thickness imbalance (m a^{-1})
hfgeoubed	– Geothermal heat flux (W m^{-2})

These variables are provided as averages over the intervals bounded by the following years:
hist: 1990 (1) 2015, ctrl_proj and exp05–expB10: 2015 (20) 2995 + a final snapshot for 3001,
abuc–abumiso: 0 (20) 1000 (no precise calendar employed).

Time variables: 'time', 'time_bnds'.

Notes

- The variable names follow closely the ISMIP6 convention (e.g., Table A1 of <https://tinyurl.com/ismip6-wiki-ais>). However, years are used instead of seconds as the time unit (1 a = 31,556,926 s).
- For further details, see the metadata in the netCDF files (e.g., by Linux command 'ncdump -h' or MATLAB command 'ncdisp') and the paper.

Exp_ID	Scenario	GCM	Ocean forcing	Ice-shelf fracture	
ctrl_proj	Control	—	—	—	
exp05	RCP8.5	NorESM1-M	Medium	No	Core experiments (Tier 1)
exp06	RCP8.5	MIROC-ESM-CHEM	Medium	No	
exp07	RCP2.6	NorESM1-M	Medium	No	
exp08	RCP8.5	CCSM4	Medium	No	
exp09	RCP8.5	NorESM1-M	High	No	
exp10	RCP8.5	NorESM1-M	Low	No	
exp12	RCP8.5	CCSM4	Medium	Yes	
exp13	RCP8.5	NorESM1-M	PIGL-Medium	No	
expA5	RCP8.5	HadGEM2-ES	Medium	No	
expA6	RCP8.5	CSIRO-Mk3.6.0	Medium	No	
expA7	RCP8.5	IPSL-CM5A-MR	Medium	No	
expA8	RCP2.6	IPSL-CM5A-MR	Medium	No	
expB6	SSP5-8.5	CNRM-CM6-1	Medium	No	CMIP6 extension (Tier 2)
expB7	SSP1-2.6	CNRM-CM6-1	Medium	No	
expB8	SSP5-8.5	UKESM1-0-LL	Medium	No	
expB9	SSP5-8.5	CESM2	Medium	No	
expB10	SSP5-8.5	CNRM-ESM2-1	Medium	No	

Table 1. Extended ISMIP6-Antarctica Tier-1 and Tier-2 future climate experiments for the period 2015–3001. See the paper for further details.

Exp_ID	Scenario	Isostasy
abuc	Control	No
abuciso	Control	Yes
abuk	Ice-shelf removal ('float-kill')	No
abukiso	Ice-shelf removal ('float-kill')	Yes
abum	Extreme sub-ice-shelf melt	No
abumiso	Extreme sub-ice-shelf melt	Yes

Table 2. Extended ABUMIP experiments 1000 years into the future (no precise calendar employed). See the paper for further details.