Supplementary material to: “CMIP6 data usage: Lessons learned from more than 200 million downloads”

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S1 Tables of variables according to their downloads

Table S1: Long names of top 15 most downloaded unique variables on ESGF

unique variable	variable_long_name
thetao_Omon	Sea Water Potential Temperature
ua_Amon	Eastward Wind
ua_6hrLev	Eastward Wind
va_6hrLev	Northward Wind
hus_6hrLev	Specific Humidity
ta_6hrLev	Air Temperature
pr_day	Precipitation
ua_day	Eastward Wind
va_day	Northward Wind
vo_Omon	Sea Water Y Velocity
so_Omon	Sea Water Salinity
uo_Omon	Sea Water X Velocity
ta_day	Air Temperature
tas_day	Near-Surface Air Temperature
tasmax_day	Daily Maximum Near-Surface Air Temperature

Table S2: Long names of top 15 least downloaded unique variables on ESGF

unique variable	variable_long_name
modelcellareai_IyrGre	The Cell Area of the Ice Sheet Model
rootdsl_Efx	Root Distribution
iareagr_IyrGre	Area Covered by Grounded Ice Sheet
libmassbffl_IyrGre	Basal Specific Mass Balance Flux of Floating Ice Shelf
limnsw_IyrGre	Ice Sheet Mass That Does not Displace Sea Water
lim_IyrGre	Ice Sheet Mass
snc_IyrGre	Snow Area Percentage
sosga_Odec	Global Average Sea Surface Salinity
licalvf_IyrGre	Land Ice Calving Flux
snc_IyrAnt	Snow Area Percentage
iareafl_IyrGre	Area Covered by Floating Ice Shelves
yvelsurf_IyrGre	Y-Component of Land Ice Surface Velocity
sftflf_IyrGre	Floating Ice Shelf Area Percentage
hus4_6hrPlev	Specific Humidity
hfibthermds2d_Omon	Heat Flux into Sea Water Due to Iceberg Thermodynamics

Table S3: List of variables with R <1.

unique variable	downloaded (GB)	available (GB)	R
aerasymbnd_E3hrPt	55.22	159.47	0.35
aeroptbnd_E3hrPt	40.67	266.16	0.15
aerssabnd_E3hrPt	61.78	159.51	0.39
albdiffbnd_E3hrPt	2.04	5.77	0.35
albdirbnd_E3hrPt	2.82	11.43	0.25
aoanh_AERmon	137.77	277.91	0.50
areacellr_fx	0.42	0.58	0.73
bigthetaoga_Odec	0.00	0.00	0.00
bs550aer_6hrLev	1.76	153.67	0.01
c2h6_AERmon	2439.59	3076.24	0.79
c3h6_AERmon	1451.42	1779.29	0.82
c3h8_AERmon	2547.88	3180.49	0.80
ccn_AERmon	16.60	20.35	0.82
cfc113global_Amon	0.01	0.02	0.44
ch3coch3_AERmon	2439.22	3110.33	0.78
cheaqpso4_AERmon	1036.03	2457.56	0.42
chegpso4_AERmon	2280.65	4210.92	0.54
chepasoa_AERmon	7.56	9.17	0.82
ci_CF3hr	1.23	1.45	0.85
clc_CF3hr	2849.75	4877.35	0.58
cldnci_Emon	6.29	49.11	0.13
cldncl_Emon	17.18	62.73	0.27
cldnvi_Emon	121.32	121.61	1.00
clic_CF3hr	537.61	1409.70	0.38
climodis_Emon	4.14	9.14	0.45
clis_CF3hr	1627.77	4412.83	0.37
clittershrub_Emon	5.69	11.92	0.48
clivi_E3hr	792.36	2416.60	0.33
cls_CF3hr	1966.60	2402.80	0.82

cltc_AERmon	179.14	189.54	0.95
cltmodis_Emon	6.63	9.17	0.72
clwc_CF3hr	1054.34	2392.45	0.44
clws_CF3hr	2184.91	4925.03	0.44
clwvi_CF3hr	4.25	11.27	0.38
clwvi_E3hr	425.89	2230.13	0.19
cly_AERmonZ	12.10	12.42	0.97
cnc_Eday	155.12	299.85	0.52
conccmcn_Emon	3177.69	3554.23	0.89
concnmcn_Emon	1126.59	1254.83	0.90
cropfracc3_Emon	116.13	129.15	0.90
cropfracc4_Emon	79.96	98.93	0.81
csoilshrub_Emon	4.97	11.85	0.42
drynh3_AERmon	47.16	54.09	0.87
drynh4_AERmon	50.16	54.21	0.93
drynoy_AERmon	43.18	54.60	0.79
dryo3_AERmon	68.11	71.87	0.95
dryoa_AERmon	170.79	191.95	0.89
ec550aer_Emon	2511.03	4711.59	0.53
emiaco_AERmon	1.74	22.05	0.08
emianox_AERmon	1.42	22.37	0.06
emiaoa_AERmon	11.69	46.63	0.25
eminh3_AERmon	37.33	44.02	0.85
expcalc_Emon	7525.83	13902.62	0.54
expn_Emon	4961.74	6164.02	0.80
expp_Emon	5151.97	6229.65	0.83
expsi_Emon	12889.48	21060.41	0.61
fco2antt_CFsubhr	1.60	1.61	0.99
h2o_AERmon	3834.03	3998.06	0.96
h2o_AERmonZ	14.12	17.30	0.82
hcfc22global_Amon	0.01	0.02	0.45
hcho_AERmon	3693.60	5245.14	0.70
hcl_AERmon	3006.00	4841.00	0.62
hfds_Odec	25.83	37.15	0.70
hfls_Esubhr	513.66	971.79	0.53
hfss_CF3hr	10.87	11.62	0.94
hfss_Esubhr	482.14	1060.16	0.45
hno3_AERmon	3863.37	5371.88	0.72
hurs_6hrPlev	9074.90	11845.32	0.77
hurs_CF3hr	6.79	8.97	0.76
hus7h_6hrPlevPt	0.05	790.00	0.00
hus_Esubhr	31431.27	57695.95	0.54
intpbp_Omon	78.93	141.02	0.56
isop_AERmon	2869.08	4522.27	0.63
jno2_AERmon	1907.77	3532.71	0.54
lossco_AERmon	3351.74	3769.95	0.89
lossn2o_AERmon	1389.37	1752.13	0.79
lwsffluxaero_6hrPlevPt	127.87	2598.22	0.05
lwsrfcsdust_Emon	0.26	0.27	0.95
lwtoaasdust_Emon	0.20	0.23	0.86
lwtoafluxaerocs_6hrPlevPt	24.92	1006.35	0.02
masso_Odec	0.00	0.00	0.00
maxpblz_AERday	500.73	659.30	0.76
mc_Esubhr	6073.57	18279.98	0.33
minpblz_AERday	371.35	584.36	0.64
mlotst_Eday	7414.01	8193.30	0.90
mmraerh2o_AERmon	1952.13	4097.07	0.48
mmrno3_AERmon	1530.39	1714.76	0.89
mmrpm10_AERmon	1818.94	3443.40	0.53
mmrpm1_AERmon	1989.12	3812.83	0.52
mrro_3hr	7034.91	8566.98	0.82
mrsol_6hrPlevPt	5457.81	11832.12	0.46
mrsos_3hr	8506.85	9529.16	0.89
mrsos_6hrPlevPt	2053.11	3129.73	0.66
o2satos_Omon	134.09	141.08	0.95
o3ste_AERmon	523.41	567.89	0.92
phalf_CF3hr	1728.03	1788.73	0.97
phycos_Oday	2907.18	4287.17	0.68
pop_Oyr	352.79	357.72	0.99
popos_Omon	88.69	153.12	0.58
ppdiaz_Emon	836.61	1641.30	0.51

ppdiaz_Oyr	114.16	161.64	0.71
pr_6hrPlev	17031.12	17105.69	1.00
pr_Esubhr	654.21	694.45	0.94
prc_Esubhr	99.50	268.66	0.37
prcsh_E3hr	0.03	43.01	0.00
prhmax_6hrPlev	650.14	1368.59	0.48
prra_E3hr	1271.03	3503.94	0.36
prra_Eday	175.98	251.35	0.70
prw_Esubhr	350.22	893.89	0.39
ps_CF3hr	17.56	95.83	0.18
ps_E3hrPt	1469.90	1561.04	0.94
reffclis_Esubhr	19.90	107.91	0.18
reffclws_Esubhr	16.03	89.01	0.18
rhshrub_Emon	5.25	11.68	0.45
rldscs_3hr	14462.22	16074.24	0.90
rls_Eday	385.00	463.22	0.83
rls_day	1629.82	2912.36	0.56
rootd_fx	0.53	0.58	0.91
rss_Eday	326.24	371.62	0.88
rss_day	1603.43	2642.62	0.61
rsuscs_CF3hr	99.98	105.32	0.95
rv850_6hrPlev	1683.07	1864.72	0.90
sbl_Eday	189.01	326.01	0.58
sfcwind_6hrPlev	1727.18	2995.38	0.58
sfcwind_6hrPlevPt	4472.82	7083.67	0.63
sfdsi_SImon	193.28	400.03	0.48
sfno2_AERhr	737.55	1243.91	0.59
sfo3max_AERday	1096.06	1112.70	0.99
sftgif_fx	0.89	0.98	0.91
siage_SImon	319.23	480.19	0.66
siareaacrossline_SImon	0.39	1.09	0.36
sicompstren_SImon	195.13	437.31	0.45
sidconcth_SImon	461.98	499.29	0.93
sidivvel_SImon	99.33	451.65	0.22
sidmassdyn_SImon	405.75	647.62	0.63
sidmassevapsubl_SImon	432.96	648.56	0.67
sidmassgrowthbot_SImon	409.05	465.24	0.88
sidmassgrowthwat_SImon	284.65	474.22	0.60
sidmasslat_SImon	214.68	352.09	0.61
sidmassmeltbot_SImon	675.28	709.22	0.95
sidmassmelttop_SImon	556.29	615.88	0.90
sidmasssi_SImon	397.17	597.68	0.66
sidmassth_SImon	497.41	749.30	0.66
sidmasstranx_SImon	495.25	616.09	0.80
sidmasstrany_SImon	413.47	629.95	0.66
sidragtop_SImon	50.92	71.32	0.71
sifb_SImon	192.74	326.84	0.59
siflcondbot_SImon	278.46	424.49	0.66
siflcondtop_SImon	309.91	570.54	0.54
siflfwbot_SImon	351.07	471.43	0.74
siflfwdrain_SImon	157.91	277.37	0.57
sifllatstop_SImon	497.41	601.04	0.83
sifllwdtop_SImon	144.62	341.86	0.42
sifllwutop_SImon	142.43	277.25	0.51
siflsenstop_SImon	106.72	295.59	0.36
siflsensupbot_SImon	263.85	486.96	0.54
siflswdbot_SImon	112.36	171.73	0.65
siflswdtop_SImon	388.56	443.40	0.88
siflswutop_SImon	270.25	367.10	0.74
siforcecoriolx_SImon	71.23	251.00	0.28
siforcecorioly_SImon	68.43	248.05	0.28
siforceintstrx_SImon	72.53	252.19	0.29
siforceintstry_SImon	69.90	252.70	0.28
siforcetiltx_SImon	73.22	169.37	0.43
siforcetilty_SImon	68.83	168.13	0.41
sihc_SImon	266.88	682.09	0.39
siitdconc_SImon	951.12	1027.62	0.93
siitdsnconc_SImon	178.25	228.65	0.78
siitdsnthick_SImon	438.37	515.09	0.85
siitdthick_SImon	437.46	491.82	0.89

simassacrossline_SImon	0.65	1.29	0.51
simpconc_SImon	72.09	142.94	0.50
simpmass_SImon	22.69	69.07	0.33
simprefrozen_SImon	4.12	4.23	0.97
sipr_SImon	238.28	514.58	0.46
sirdgconc_SImon	89.85	184.34	0.49
sirdgthick_SImon	46.03	82.40	0.56
sisali_SImon	112.16	149.67	0.75
sisaltmass_SImon	164.48	380.08	0.43
sishevel_SImon	28.90	210.60	0.14
sisnhc_SImon	285.05	549.62	0.52
sisnmass_SImon	1019.47	1138.27	0.90
sisnthick_SIday	4986.51	7169.12	0.70
sispeed_SIday	2062.01	5760.14	0.36
sispeed_SImon	891.97	1043.54	0.85
sistremax_SImon	43.51	95.44	0.46
sistresave_SImon	36.40	87.13	0.42
sistrxdtop_SImon	344.55	1396.77	0.25
sistrxubot_SImon	261.41	707.53	0.37
sistrydtop_SImon	388.82	1396.51	0.28
sistryubot_SImon	264.32	708.61	0.37
sitempbot_SImon	192.97	286.60	0.67
sitempsnic_SImon	138.55	247.90	0.56
sitemptop_SIday	3383.84	6027.13	0.56
sitemptop_SImon	913.12	946.43	0.96
sitimefrac_SIday	952.67	2640.54	0.36
sitimefrac_SImon	559.54	714.35	0.78
siu_SIday	9356.53	14640.62	0.64
siv_SIday	9513.87	14500.49	0.66
sndmassdyn_SImon	167.26	308.63	0.54
sndmassmelt_SImon	348.06	479.27	0.73
sndmasssi_SImon	149.92	222.03	0.68
sndmasssnf_SImon	606.99	741.45	0.82
sndmasssubl_SImon	144.05	196.15	0.73
sndmasswindrif_SImon	4.53	19.67	0.23

snmassacrossline_SImon	0.50	1.08	0.46
snw_6hrPlevPt	225.25	424.41	0.53
snwc_Eday	53.50	162.65	0.33
soga_Odec	10.77	34.96	0.31
sos_Odec	22.78	35.50	0.64
sosga_Odec	0.00	0.00	0.00
sossq_Oday	2760.44	3444.00	0.80
swsffluxaero_6hrPlevPt	0.96	548.79	0.00
swsrfcsdust_Emon	0.25	0.31	0.80
swtoaasdust_Emon	0.08	0.97	0.08
swtoacsdust_Emon	0.38	0.44	0.87
swtoafluxaerocs_6hrPlevPt	2.63	527.03	0.00
t20d_Eday	1469.64	2207.61	0.67
ta_Esubhr	28552.99	52476.12	0.54
tas_Esubhr	58.38	694.15	0.08
tauuo_Odec	13.46	37.14	0.36
tauvo_Odec	12.25	37.16	0.33
tcs_Eday	46.64	61.17	0.76
tnhus_Esubhr	26111.29	78483.75	0.33
tnt_Esubhr	24821.30	77940.08	0.32
tntd_Esubhr	2.43	7.20	0.34
tos_Odec	26.70	37.10	0.72
tran_Eday	222.98	245.59	0.91
tslsi_day	5633.88	6838.15	0.82
ua10_AERday	963.87	3320.43	0.29
ua_Esubhr	23419.18	76372.46	0.31
uas_6hrPlev	13308.66	25489.42	0.52
va_Esubhr	24496.51	74942.74	0.33
vas_6hrPlev	9204.28	23210.56	0.40
volo_Odec	11.71	36.41	0.32
vtendnogw_Emon	345.80	508.65	0.68
vtendnogw_EmonZ	1.21	3.96	0.31
vtendogw_Emon	171.93	279.98	0.61
wap_Esubhr	24658.63	78900.06	0.31
wfo_Odec	17.49	37.02	0.47

wo_Odec	51.81	63.22	0.82
zfull_fx	52.08	81.94	0.64
zg1000_6hrPlev	1303.87	6981.63	0.19
zg100_AERday	559.32	2476.73	0.23
zg10_AERday	624.78	641.66	0.97
zg500_6hrPlevPt	7241.09	8144.01	0.89
zmicro_Oyr	489.65	690.08	0.71
zmswaero_E6hrZ	0.10	33.82	0.00
zooc_Oyr	1618.23	2499.52	0.65

Table S4: List of variables that have an R >100.

unique variable	downloaded (GB)	available (GB)	ratio_GB
hfls_Imon Ant	93.78	0.84	111.04
pr_Amon	127177.93	671.58	189.37
pr_day	1318432.46	12598.20	104.65
prhmax_Emon	26.27	0.12	217.07
psl_Amon	54070.45	444.03	121.77
rld_Efx	5.66	0.01	836.57
rlu_Efx	5.77	0.01	543.23
rlut_CF3hr	102.64	0.81	126.85
rsd_Efx	5.78	0.01	413.34
rsu_Efx	5.73	0.00	1411.39
tas_Amon	109771.36	511.96	214.42
tas_Imon Ant	71.77	0.28	258.68
tas_Imon Gre	69.79	0.28	251.55
tos_Omon	208915.79	1544.79	135.24
ua_Amon	1807782.96	7861.11	229.97

S2 Downscaled datasets based on CMIP6 simulations

Table S5: Incomplete list of existing statistically downscaled/bias-adjusted datasets using CMIP6

Domain	Institution	Name
Global	NASA	NEX-GDDP-CMIP6
	Climate Impact Lab	CIL-GDPCIR
	ISIMIP	ISIMIP3b
	Carbon Plan	GARD-SV, GARD-MV, MACA, DEEPSD and DEEPSD-BC
	CEDA	BCCAQ
	IPSL	CMIP6-Adjust
North America	Ouranos	ESPO-G6
Canada	PCIC	CanDCS-M6
	University of Manitoba	SPQM-CMIP6-CAN
Australia	Australian Climate Service	CCiA
China	Tsinghua University	HiCPC
USA	Scripps Institution of Oceanography	LOCA2
	Texas Tech University	STAR-ESDM
South Asia	Indian Institute of Technology	Bias-corrected climate projections for South Asia from CMIP6