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A dataset of lake-catchment characteristics for the Tibetan Plateau

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Table S1. The static and seasonal attributes in the LCC-TP dataset (version 1.0)

Category	Variable	Unit	Source data	Source Resolution (G: Grid V: Vector)	Temporal coverage	Reference	column(s)	Number of individual attributes
Lake body	Lake area	m^2	The lakes larger than $1km^2$ in Tibetan Plateau (V3.0) (1970s-2021)	V	2018	Zhang et al., 2019	LK_Area	1
Lake body	Lake perimeter	km	The lakes larger than $1km^2$ in Tibetan Plateau (V3.0) (1970s-2021)	V	2018	Zhang et al., 2019	LK_Perimeter	1
Lake body	Shoreline development index	index	The lakes larger than $1km^2$ in Tibetan Plateau (V3.0) (1970s-2021)	V	2018	This Study	LK_DevelopmentIndex	1
Lake body	IsTerminalLake	bool	MERIT DEM	-	2018	This Study	LK_IsTerminalLake	1
Topographic	Elevation	m	MERIT DEM	G: 3"	2018	Yamazaki et al., 2017	*level*_Elevation_*stat*	7
Topographic	Slope	%	MERIT DEM	G: 3"	2018	Yamazaki et al., 2017	*level_Slope_mean*	2
Topographic	Relief	m	Digital elevation model of China	G: 0.0083°	2000	Tang, 2019	*level*_Relief-*window*_mean	12
Topographic	Catchment area	km^2	This study	V	2018	This study	*level*_Area	2
Topographic	Lake-catchment area ratio	%	This study	V	2018	This study	*level*_LCR	2
Climate	2-meter air temperature	K	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Temp-*time scale*_mean	42
Climate	Precipitation	mm	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Prec-*time scale*_mean	42
Climate	Surface downward shortwave radiation	$W\ m^{-2}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Srad-time *scale*_mean	42
Climate	Surface downward longwave radiation	$W\ m^{-2}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Lrad-time *scale*_mean	42
Climate	10-meter wind speed	$m\ s^{-1}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Wind-*time scale*_mean	42
Climate	2-meter air pressure	Pa	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Pres-*time scale*_mean	42
Climate	2-meter air specific humidity	$kg\ kg^{-1}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018	He et al., 2020	*level*_Shum-*time scale_mean*	42

Climate	Potential evapotranspiration	mm	Global Aridity and PET Database	G: 30"	1970-2000	Zomer et al., 2008	*level*_PET-*timescale*_mean	42
Climate	Actual evapotranspiration	mm	Global High-Resolution Soil-Water Balance	G: 30"	1970-2000	Zomer et al., 2019	*level_AET-timescale_mean*	42
Climate	Aridity index	index	Global Aridity and PET Database	G: 30"	1970-2000	Zomer et al., 2008	*level*_AridityIndex_mean	2
Climate	Climate Moisture Index	index	China meteorological forcing dataset (1979-2018), Global Aridity and PET Database	G: 0.1°, G: 30"	1979-2000	He et al., 2020; Zomer et al., 2008	*level*_CMI-*timescale*_mean	42
Land cover/use	Enhanced vegetation index	index	MOD13Q1	G:250m	2000-	Didan et al., 2021	*level*_EVI-*timescale*_mean	4
Land cover/use	Normalized difference vegetation index	index	MOD13Q1	G:250m	2000-	Didan et al., 2021	*level*_NDVI-*timescale*_mean	4
Land cover/use	Gross Primary Productivity	kg C m^{-2}	MOD17A2H.006	G:500	2000-	Running et al., 2015	*level*_GPP-*timescale*_mean	4
Land cover/use	Net Primary Production	Kg C m^{-2}	MOD17A3HGF.006	G500	2000-	Running et al., 2019	*level*_NPP-*timescale*_mean	2
Land cover/use	Land cover classes	Classes	Land use of the Tibet Plateau in 2015 (Version 1.0)	G: 300m	2015	Xu., 2019	*level*_Landcover_majority	2
Land cover/use	Land cover extent (%)	%	Land use of the Tibet Plateau in 2015 (Version 1.0)	G: 300m	2015	Xu., 2019	*level_LCtype*_percent	18
Land cover/use	Glacier extent (%)	%	The second glacier inventory dataset of China (version 1.0) (2006-2011)	V	2006-2011	Guo et al., 2017	*level*_Glacier_percent	2
Land cover/use	Wetland extent (%)	%	The dataset of wetland pattern changes on the Tibet Plateau (1970s, 2000s)	G: 0.0042°	1970s, 2000s	Zhou, 2018	*level*_Wetland-*timescale*_percent	4
Land cover/use	Snow extent (%)	%	Daily fractional snow cover dataset over High Asia (2002-2016)	G: 500m	2002-2016	Qiu, 2018a	*level*_FSC-*timescale*_mean	26
Land cover/use	Protected area extent (%)	%	The World Database on Protected Areas (WDPA)	V	2021	UNEP-WCMC and IUCN, 2022	*level*_ProtectedArea_percent	2
Soils & geology	Sand	g kg^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_Sand-*depth*_mean	12

Soils & geology	Silt	g kg^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_Silt-*depth*_mean	12
Soils & geology	Clay	g kg^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_Clay-*depth*_mean	12
Soils & geology	Coarse fragments	cm^3 dm^{-3}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_CFVO-*depth*_mean	12
Soils & geology	Bulk density	cg cm^{-3}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_BDOD-*depth*_mean	12
Soils & geology	Porosity	m^3 m^{-3}	GLHYMPS	V	-	Huscroft et al., 2018	*level*_Porosity_mean	2
Soils & geology	Cation exchange capacity at pH7	mmol(c) kg^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level_CEC-depth_mean*	12
Soils & geology	pH in H_2O	-	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_pH-*depth*_mean	12
Soils & geology	Total nitrogen	cg kg^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_Nitrogen-*depth*_mean	12
Soils & geology	Organic carbon density	g dm^{-3}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_OCD-*depth*_mean	12
Soils & geology	Organic carbon stock	t ha^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_OCS-*depth*_mean	2
Soils & geology	Soil organic carbon	dg kg^{-1}	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_SOC-*depth*_mean	12
Soils & geology	Organic carbon stock	kg m^{-2}	Dataset of soil organic carbon in the Third pole	G: 1km	-	Wang et al., 2021	*level*_TPSOC-*depth*_mean	10
Soils & geology	Permafrost extent (%)	%	Global Permafrost Zonation Index Map	G: 30"	-	Gruber, 2012	*level*_Permafrost_mean	2
Soils & geology	Soil erosion classes	Classes	Dataset of soil erosion intensity with 300m resolution in Tibetan Plateau (1992, 2005, 2015)	G: 300m	1992, 2005, 2015	Zhang, 2019	*level*_SoilErosion-*year*_majority	6
Soils & geology	Soil Erodibility	-	Soil Erodibility Dataset of Pan-Third Pole 20 countries (2020, with a resolution of7.5 arc second)	G:7.5"	2020	Yang et al., 2021	*Level*_SoilErodibility_mean	2
Soils & geology	mean annual ground temperature	° C	The mean annual ground temperature (MAGT) and permafrost thermal stability dataset over Tibetan Plateau for 2005-2015	G:1km	2005-2015	Ran et al., 2019	*Level*_MAGT_mean	2
Soils & geology	Soil water content	%	Global High-Resolution Soil-Water Balance	G: 30"	-	Zomer et al., 2019	*level*_SWC-*timescale*_majority	26
Soils & geology	Lithological classes	Classes	GLiM	G:0.5°	-	Hartmann et al., 2012	*level*_Lithological_majority	2

Soils & geology	permeability with permafrost regions	m^2	GLHYMPS	V	-	Huscroft et al.,2018	*level*_Permeability_mean	2
Soils & geology	C:N	-	SoilGrids 2.0	G: 250m	-	Poggio et al., 2021	*level*_CNR-*depth*_mean	12
Anthropogenic activity	Urban extent (%)	%	GHS_SMOD_POPMT_GLOBE_R2019A	G: 1km	2015	Pesaresi et al., 2019	*level*_Urban_percent	2
Anthropogenic activity	Road density	m km^{-2}	GRIP global roads database	G: 5'	2022	Meijier et al., 2018	*level*_RoadDensity_mean	2
Anthropogenic activity	Population density	people km^{-2}	Gridded Population of the World, Version 4 (GPWv4): Population Density, Revision 11	G: 30"	2020	CIESIN, 2018	*level*_PopulationDensity_mean	2
Anthropogenic activity	Population count	people	Gridded Population of the World, Version 4 (GPWv4): Population Count, Revision 11	G: 30"	2020	CIESIN, 2018	*level*_PopulationCount_sum	2
Anthropogenic activity	Nighttime light	index	Version 4 DMSP-OLS Nighttime Lights Time Series	G: 30"	2013	Doll, 2008	*level*_NighttimeLight_mean	2
Anthropogenic activity	Human footprint	index	Global Human Footprint v2	G: 30"	1993, 2009	Venter et al., 2016	*level*_HumanFootprint-*year*_mean	4
Total	57							721

Different attributes of the same variable are differentiated by the italic text in the column names. *level* refers to the level at which zonal statistics was performed, including the lake, inter-lake catchment and full catchment level; *stat* refers to the statistical method, including mean, min, majority, sum, percentage, etc; *LCtype* refers to the land cover/use type (e.g. grassland and wetland); *timescale* refers to the time range for statistics (e.g. yearly, growing-season); *window* refers to the window size when calculating topographic relief; *depth* is the soil depth; *year* is the year when the data was acquired.

Table S2. The time series data in the LCC-TP dataset (version 1.0)

Category	Variable	Unit	Source data	Source Resolution (G: Grid V: Vector)	Temporal coverage and resolution	Reference	File name
Lake body	Lake area	km^2	Lake volume changes on the Tibetan Plateau during 1976–2020 (>1 km2) v2.0	V	1976-2020, ~ 5 years	Zhang et al., 2021	Lk_area.csv
Lake body	Lake water level (altitude)	m	High-temporal-resolution water level and storage change data sets for lakes on the Tibetan Plateau during 2000-2017	V	2000-2017, weekly to monthly	Li et al., 2019	Lk_waterlevel_Li.csv Lk_waterlevel_Li_uncert.csv

							(uncertainty file)
Lake body	Lake water level (altitude)	m	Lake-level over the Tibetan Plateau using multi-sensor satellite altimetry data (2010-2020)	V	2010-2020, ~monthly	Xu et al., 2022	Lk_waterlevel_*satellite*.csv Lk_waterlevel_*satellite*_uncert.csv (uncertainty file)
Lake body	Lake volume change	km^3	High-temporal-resolution water level and storage change data sets for lakes on the Tibetan Plateau during 2000-2017	V	2000-2017, weekly to monthly	Li et al., 2019	Lk_volumechange.csv
Lake body	Lake mass change	Gt	Lake volume changes on the Tibetan Plateau during 1976–2020 (>1 km2) v2.0	V	1976-2020, ~ 5 years	Zhang et al., 2021	Lk_masschange.csv Lk_masschange_uncert.csv (uncertainty file)
Climate	2-meter air temperature	K	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_temp.csv
Climate	Precipitation	mm	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_prec.csv
Climate	Surface downward shortwave radiation	$W\ m^{-2}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_srad.csv
Climate	Surface downward longwave radiation	$W\ m^{-2}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_lrad.csv
Climate	10-meter wind speed	$m\ s^{-1}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_wind.csv
Climate	2-meter air pressure	Pa	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_pres.csv
Climate	2-meter air specific humidity	$kg\ kg^{-1}$	China meteorological forcing dataset (1979-2018)	G: 0.1°	1979-2018, daily	He et al., 2020	*level*_shum.csv
Land cover/use	Fractional snow cover	%	MODIS daily cloud-free factional snow cover data set for Asian water tower area (2000-2022)	G 0.005°	2000-2022, daily	Jiang et al., 2022	*level*_fsc.csv
Land cover/use	Snow depth	cm	Long-term series of daily snow depth dataset over the Northern Hemisphere based on machine learning (1980-2019)	G 0.25°	1980-2019, daily	Che et al., 2021	*level*_snowdepth.csv
Land cover/use	Snow water equivalent	mm	Snow water equivalent dataset for the High Asia Region (2002-2011)	G 0.05°	2002-2011, daily	Qiu et al., 2018b	*level*_swe.csv

Land cover/use	Glacier mass change rate	Gt year^{-1}	Accelerated global glacier mass loss in the early twenty-first century - Dataset	V	2000–2019, yearly	Hugonnet et al., 2021	*level*_glcmb.csv *level*_glcmb_uncert.csv (uncertainty file)
Soils & geology	Maximum freezing depth of seasonal frozen ground	cm	A decade dataset of the seasonal maximum freezing depth with 1 km from 1961 to 2020 in Northwest China, Tibet and surrounding area (1961-2020)	G 1km	1961-2020, decadal	Wang and Ran, 2021	*level*_mfsd.csv

Different attributes of the same variable are differentiated by the italic text in the column names. *level* refers to the level at which zonal statistics was performed, including the lake, inter-lake catchment and full catchment level; *satellite* refers to the name of satellite name, which could be one of Cryosat-2, ICESat-2, Sentinel-3A, Sentinel-3B.

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