Annotation to the Third Pole's glacial lake dataset

1. Overview

Brief description	This dataset was compiled for the whole Third Pole. In total, 63,727 glacial lakes (≥ 900 m^2) with a combined area of 2,122.01 ± 1.26 km^2 were included in this dataset*.
Spatial coverage	Earth's Third Pole (26 – 46 N°, 67 – 105 E°)
Data format	Standard ESRI shapefile (*.shp, *.shx, *.sbx, *.sbn, *.dbf, *.prj, *.cpg)
Geographic Coordinate System	WGS 1984
Data source	316 pan-sharpened Landsat-8 Operational Land Imager (OLI) scenes^ obtained from 2014 to 2016 (2014: 16%, 2015: 61%, 2016: 23%) were used. All scenes were picked from warm season (June: 2%, July: 14%, August: 21%, September: 30%, October: 23%, November: 10%).
Spatial resolution	15 m × 15 m
Data processing	An automated water body classification algorithm [1] was first applied to detect all water bodies from the Landsat images. A slope threshold of < 20°, as well as a shaded relief threshold of > 0.25, were employed to alleviate the disturbances from mountain shadows [1]. Subsequently, careful visual inspection and manual interpretation were carried out to remove other water bodies (e.g. reservoirs and rivers) and to re-edit the glacial lake polygons based on corresponding Landsat scenes, online maps and other available glacial lake data sets.
Data volume	36 MB
Version	v1.0 (updated August 1, 2020)

* this is an expanded glacial lake dataset for the Third Pole, here the portion of glacial lakes with surfaces ≥ 0.01 km^2 are unpublished work, which includes a total number of 26,633 glacial lakes with a combined area of 1,968.83 ± 1.24 km^2.

^ a nearest neighbour diffusion-based pan-sharpening algorithm [2] was used here.

2. Attribute table

Data label	Data type, width	Description	Note
Shape	Geometry	Feature type of the lake object	polygon
GLID	String, 20	Unique code of the glacial lake	GLxxxxxExxxxxN
Source	String, 30	Landsat identifier of the glacial lake was mapped	
Date	String, 12	The acquisition time of the Landsat scene used	YYYYMMDD
Longitude	Float	East longitude of the geometric center of the glacial lake polygon	unit: decimal degree
Latitude	Float	North latitude of the geometric center of the glacial lake polygon	unit: decimal degree
Elevation	Double	The altitude of the glacial lake	unit: meter above sea level
Area	Double	Area of the glacial lake calculated based on Universal Transverse Mercator (UTM) projected coordinate system	unit: square meter
E_area	Double	Uncertainty of glacial lake area measurement which was determined by the equation [3]: $\delta = \frac{P}{G} \times \frac{G^2}{2} \times 0.6872$, where *P* is the perimeter of the	unit: square meter

		glacial lake and *G* is the spatial resolution of the scenes used	
Perimeter	Float	The perimeter of the glacial lake polygon	unit: meter
Volume	Double	The water volume of the glacial lake calculated using a lake depth-area-volume empirical relationship [4]	unit: cubic meter
UTM	String, 5	UTM grid zone where the glacial lake located in	
Region	String, 20	The name of the region where the glacial lake located in	
Basin	String, 20	The name of the hydrobasin where the glacial lake located in	

References

[1] Zhang G, Zheng G, Gao Y, et al. Automated water classification in the Tibetan Plateau using Chinese GF-1 WFV data. Photogramm Eng Rem S 2017;83:509-519.

[2] Sun W, Chen B, Messinger DW. Nearest-neighbor diffusion-based pan-sharpening algorithm for spectral images. Opt Eng 2014;53:013107.

[3] Hanshaw MN, Bookhagen B. Glacial areas, lake areas, and snow lines from 1975 to 2012: status of the Cordillera Vilcanota, including the Quelccaya Ice Cap, northern central Andes, Peru. Cryosphere 2014;8:359–376.

[4] Huggel C, Kaab A, Haeberli W, et al. Remote sensing based assessment of hazards from glacier lake outbursts: a case study in the Swiss Alps. Can Geotech J 2002;39:316–330.