

Land slope cluster dataset of the eco-region of the Roof of the World

LIU Chuang¹, SHI Ruixiang¹, LV Tingting², CHEN Wenbo³, WANG Zhengxing¹, ZHOU Xiang²

(1. Institute of Geographic Sciences and Natural Resources Research, CAS, Beijing 100101, China;

2. Institute of Remote Sensing and Digital Earth, CAS, Beijing 100101, China;

3. Keio Research Institute at SFC, Keio University, Fujisawa 2520882, Japan)

Abstract: The land slope cluster data of the eco-region of the Roof of the World (ROTWSLC) is the basic for ecosystem analysis of the region. It was derived from ASTER GDEM 2 with the cluster models in slope degree and slope percentage. 7 clusters of the land slope according to the degree and 6 clusters according the percentage were identified. The statistics of each cluster had been calculated. The data indicates that the total area of land which slope was equal and higher than 7° was 72.02% of the region and the area of land which slope was equal and higher than 10% was 77.05% of the region. The data in raster were break down into 475 tiles of each of two groups of clusters by 1° x 1°.

Keywords: land slope; cluster; Qinghai-Tibet Plateau; Roof of the World; eco-region

DOI: 10.11821/dlxb2014S003

Citation: LIU Chuang, SHI Ruixiang, LV Tingting, CHEN Wenbo, WANG Zhengxing, ZHOU Xian. Land slope cluster dataset of the eco-region of the Roof of the World. Global Change Research Data Publishing and Repository, 2014. DOI: 10.3974/geodb.2014.01.03.v1, <http://www.geodoi.ac.cn/WebEn/doi.aspx?doi=10.3974/geodb.2014.01.03.v1>

1 Introduction

The eco-region of the Roof of the world is an unique region in the world not only because the high elevation of the land, but very high deep of the slope in the surrounding area and high mountains. For example, the Mt. Himalaya from summit 8844 meter high directly goes down to 400 m low within less than 130 km, no one else in the world like here so steep. The land slope cluster dataset of the eco-region of the Roof of the World (ROTWSLC) was derived based on ASTER GDEM 2 and the cluster models in slope degree and slope percentage^[1-3].

2 Metadata of the ROTWSLC

The descriptions of the ROTWSLC dataset are recorded. These information include the dataset full name, dataset short name, corresponding author, authors, geographical region of

Received: 2014-03-17; **Accepted:** 2014-06-20

Foundation: Chinese Academy of Sciences (2010), Human and Environment Database Development and Services, No.INF0-115-C01-SDB3-02

Author: LIU Chuang (1948-), Professor, Vice Chair of Expert Committee of China GEOSS, Editor-in-Chief of Global Change Research Data Publishing and Repository, CODATA Prize Recipient (2008). E-mail: lchuang@igsnr.ac.cn

Table 1 Summary of the ROTWSLC metadata

Dataset full name	Land slope cluster dataset of the eco-region of the Roof of the World		
Dataset short name	ROTWSLC		
Corresponding author	LIU Chuang (lchuang@igsnrr.ac.cn) LIU Chuang, IGSNRR/CAS, lchuang@igsnrr.ac.cn SHI Ruixiang, IGSNRR/CAS, shirx@igsnrr.ac.cn		
Authors	LV Tingting, RADI/CAS, lvtt@radi.ac.cn CHEN Wenbo, Keio Research Institute at SFC, Keio University, chenwb@sfc.keio.ac.jp, chenwb3@gmail.com WANG Zhengxing, IGSNRR/CAS, wangzx@igsnrr.ac.cn ZHOU Xiang, RADI/CAS, zhouxiang@radi.ac.cn		
Geographical regions	The geographical region covers the area from N40 1' 52" - N23 11' 59", E105 43' 45" - E61 28' 45", including the Qinghai Tibet Plateau, Hengduan Mountains, Himalaya mountains, Hindu Kush, Pamir Plateau. The region covers the area of the following nations: China, Myanmar, Nepal, Bhutan, India, Pakistan, Afghanistan, Tajikistan, and Kyrgyzstan.		
Time	2014	Number of tiles	950
Spatial resolution	30 meters		
Dataset format	.tif, .zip	Data size	6.11GB in .tiff format 2.22GB in compressed
Dataset publisher	Global Change Research Data Publishing and Repository DOI:10.3974/ Global Change Research Data Publishing and Repository, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, http://www.geodoi.ac.cn National Data Sharing Infrastructure of Earth System Sciences of China, http://www.geodata.cn		
Data access and services platform			
Academic editors	ZHU Yunqiang, CHEN Shengbo, HE Shujin The authors of the dataset agree to publish the data here according to the Article I of Data Sharing Policy of the Global Change Data Publishing and Repository, which states that the dataset can be used freely for research, education, and decision making; any users for commercial uses should get formal permission from IGSNRR/CAS.		
Data sharing policy			

the dataset content, year of the dataset, number of the dataset tiles, dataset spatial and temporal resolution, dataset format and size, data publisher, data sharing platform and contact information, technical editors, foundation and the data sharing policy. Table 1 below summarizes the main metadata elements of the ROTWSLC dataset.

3 Methodology of the dataset development

3.1 Dataset development and data files

The land slope cluster dataset of the eco-region of the Roof of the World (ROTWSLC) covers the area between 40°1'52"-23°11'59"N and 105°43'45"-61°28'45"E, including the Qinghai-Tibet Plateau, Hengduan Mountains, Himalaya mountains, Hindu Kush Mountains, and Pamir Plateau. The region covers the area of the following nations: China, Myanmar, Nepal, Bhutan, India, Pakistan, Afghanistan, Tajikistan, and Kyrgyzstan. The total area of the region is 4,000,691 km². In order to make the data easily being downloaded, the dataset was divided into 1° x 1° tiles shown in Figure 1^[4].

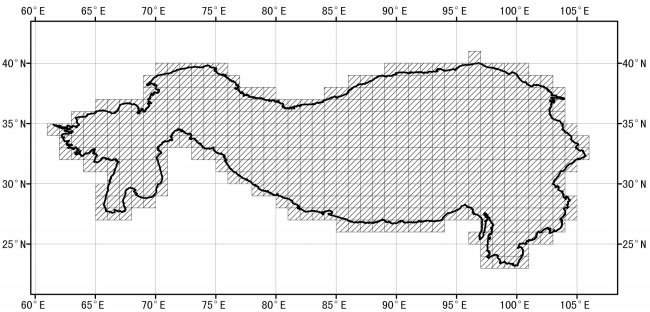


Figure 1 Map of the ROTWSLC dataset tiles

3.2 Dataset pre-processing

The land slope cluster dataset of the eco-region of the Roof of the World (ROTWSLC)was developed based on the ASTER GDEM 2 (Japan, ASTER GDS User Service, 2011)^[5].

Because of the special geographical environment in this region, some of the ASTER GDEM 2 data covering this region were empty. In this case, pre-processing of the ASTER data became necessary and important^[6]. The methodology of pre-processing the ASTER GEDM 2 data covering the region of the Root of the World was illustrate at the data paper on elevation cluster dataset covering the eco- region of the Roof of the World (LIU Chuang etc. DOI: 10.3974/geodb.2014.01.02.v1)^[7]

3.3 The land slope cluster classification system

There are two models in classification of the land slope clusters, one is the degree of slope model and the other one is the percent of slope model, which are shown in Figure 2.

Select degrees of 1, 3, 7, 15, 25, and 35 as the indexes for classification for the degree of slope clusters, seven clusters of degree of slope had been identified in the eco-region of the Roof of the World shown in Table 2.

Select percentages of 5%, 10%, 25%, 50% and 70% as the indexes for classification for the percent of slope clusters, six clusters of degree of slope were identified in the eco-region of the Roof of the World shown in Table 3.

3.4 The dataset

3.4.1 The clusters of degree of slope in the eco-region of the Roof of the World Naming the dataset files in degree of slope as SLD_NxxExxx.zip, in which, the Nxx represents the location of latitude of southwest point of the data, and the Exxx represents the location of longitude of southwest point of the data. For example, the SLD_N30E080 shown in Figure 3 is the land degree of slope data file in 1° x 1° from north 30 to 31 latitude and eastern 80 to 81 longitude.

Table 2 Seven clusters of degree of slope in the eco-region of the Roof of the World

Degree of slope Cluster	<1	[1, 3)	[3, 7)	[7, 15)	[15, 25)	[25, 35)	≥35
	1	2	3	4	5	6	7

Table 3 Six clusters of percent of slope in the eco-region of the Roof of the World

Degree of slope Cluster	<5%	[5%,10%)	[10%,25%)	[25%,50%)	[50%,70%)	≥70%
	1	2	3	4	5	6

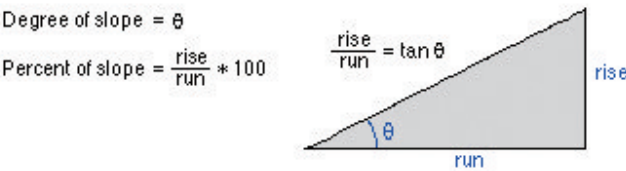


Figure 2 Figure of the Degree and Percent of Slope Models

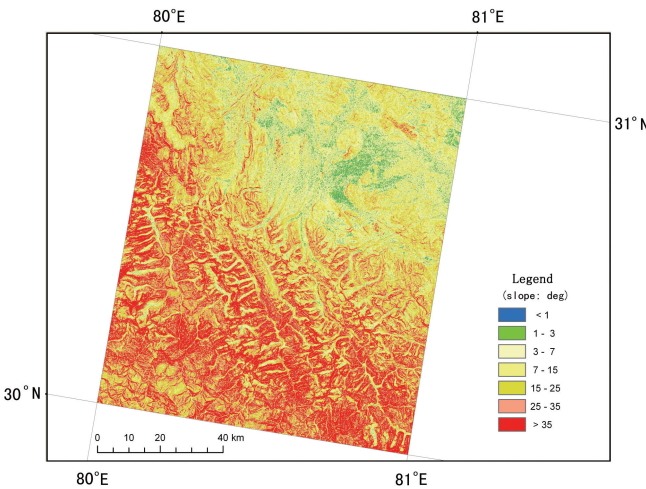


Figure 3 Map of the dataset of degree of slope cluster of the SLD_N30E080

Since the dataset of the slope clusters in the eco-region of the Roof of the World in degree is pretty big, in order to make it easily to be downloaded, the slope clusters data in degree is broken down into $1^{\circ} \times 1^{\circ}$ tiles. All the 475 datasets are divided in degree of slope cluster with the name of SLD_NxxExxx (for example SLD_N30E080). The map of the datasets of the slope clusters in the eco-region of the Roof of the World in degree is shown in Figure 4.

In order to make the dataset easy to be accessed, 475 datasets were compressed into 118 files of the dataset groups, and the files were named according to the standard of the 1:1000 000 scale of international topographic maps (The data size of each file is no more than 10 MB generally).

3.4.2 The clusters of percent of slope in the eco-region of the Roof of the World Naming the dataset files in percent of slope as SLP_NxxExxx.zip, in which, the Nxx represents the location of latitude of southwest point of the data, and the Exxx represents the location of longitude of southwest point of the data. For example, the SLP_N30E080 shown in Figure 5 is the land degree of slope data file in $1^{\circ} \times 1^{\circ}$ from North 30 to 31 latitude and Eastern 80 to 81 longitude.

Since the dataset of the percent of slope cluster in the Eco-region of the Roof of the World is pretty big, in order to make it easily to be downloaded, the dataset of the percent of slope cluster is broken down into $1^{\circ} \times 1^{\circ}$ tiles. Total 475 datasets are divided in degree of slope cluster with the name of SLP_NxxExxx (for example

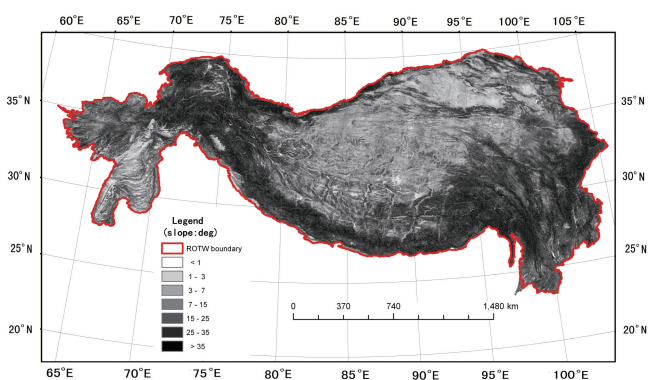


Figure 4 Map of the dataset of degree of slope cluster of the eco-region of the Roof of the World

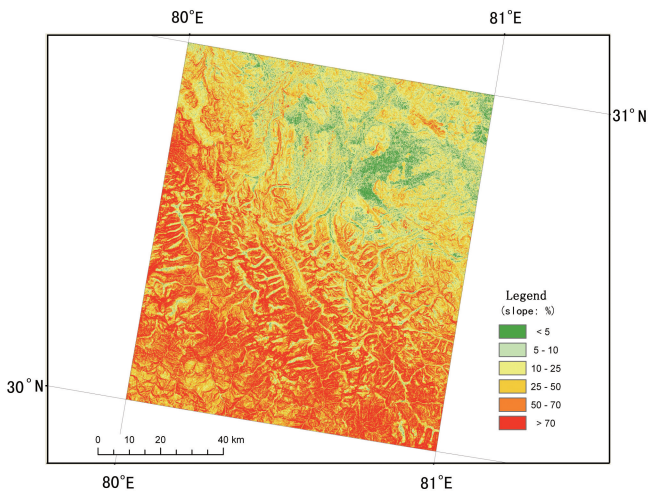


Figure 5 Map of the dataset of percent of slope cluster of the SLP_N30E080

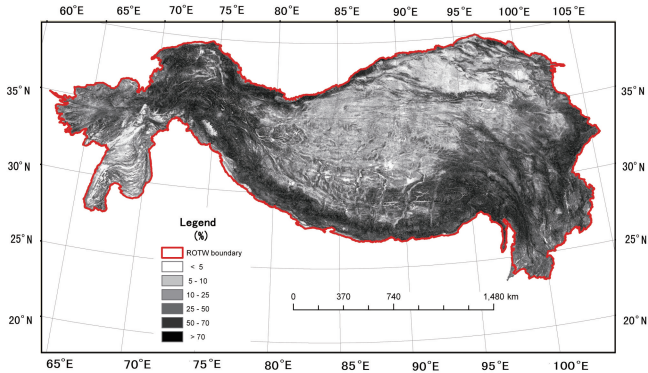


Figure 6 Map of the dataset of percent of slope cluster of the eco-region of the Roof of the World

Table 4 Statistics of the land slope clusters in the eco-region of the Roof of the World based on the degree of slope model

Cluster	Slope (°)	Area (km ²)	Percentage (%)
1	< 1	72258.87	1.81
2	1 - 3	362177.60	9.05
3	3 - 7	685293.09	17.13
4	7 - 15	900356.10	22.51
5	15 - 25	854611.91	21.36
6	25 - 35	664833.39	16.62
7	> 35	461160.06	11.53
Total		4000691	100

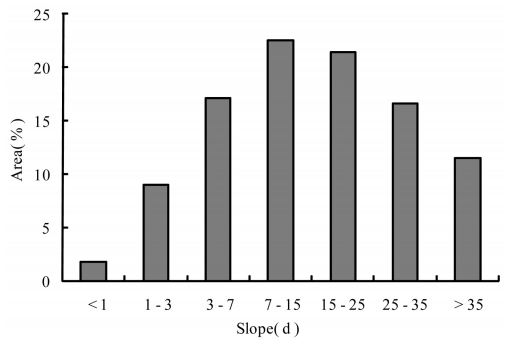


Figure 7 Statistics of slope clusters in the eco-region of the Roof of the World based on the degree of slope model

Table 5 Statistics of the land slope clusters in the eco-region of the Roof of the World on the percent of slope model

Cluster	Slope (%)	Area (KM ²)	Percentage (%)
1	< 5	409951.71	10.25
2	5 - 10	508291.11	12.71
3	10 - 25	1006856.20	25.17
4	25 - 50	1067312.46	26.68
5	50 - 70	546629.07	13.66
6	> 70	461650.47	11.54
Total		4000691	100

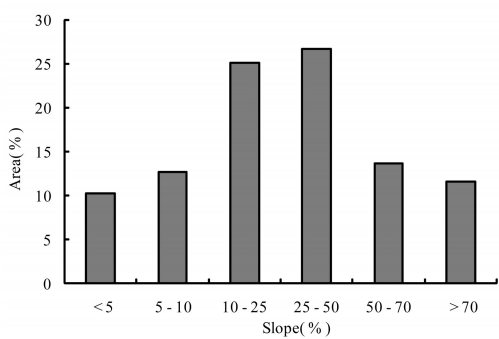


Figure 8 Statistics of the land slope clusters in the eco-region of the Roof of the World on the percent of slope model

SLP_N30E080). The map of the percent of slope cluster datasets in the eco-region of the Roof of the World is shown in Figure 6.

In order to make the dataset easy to be accessed, 475 datasets were compressed into 111 files of the dataset groups, and the files were named according to the standard of the 1:1000 000 scale of international topographic maps (The data size of each file is no more than 10 MB generally).

4 Statistics of the land slope clusters

The statistics of land slope clusters in the eco-region of the Roof of the World are based on the Albers projection. The area and percentage of each cluster are listed at Tables 4 and 5, as well as Figures 7 and 8. From the statistics, 72.02% land of the region is located in the land environment whose degree of slope is bigger than 7°, 77.05% land of the region whose percentage of slope is bigger than 10%.

5 Conclusion

The eco-region of the Roof of the World is a special region in the world, not only because of its high elevation, but also of its deep land slope. No one else in the world like the eco-region of the Roof of the World has so huge area where more than half of the land whose degree of slope is bigger than 15°(1,980,604 km²) and percent of slope is bigger than 25% (2,075,591 km²). The land slope cluster dataset of the eco-region of the Roof of the

World is one of the basic and necessary datasets for ecosystem analysis in the unique region^[8].

References

[1] Soil Resources Development and Conservation Service Land and Water Development Division, FAO, A Framework for Land Evaluation, M-51 ISBN 92-5-100111-1, Roma, 1976.

[2] Shi Yulin. Land and land evaluation. Natural Resources, 1978, (2): 1-13.

[3] Wang Hongzhen. Major stages of geological structure change of Asia. Science in China, 1979, (12): 1187-1197.

[4] Liu Chuang, Shi Ruixiang, Chen Wenbo. Eco-regional boundary data of the Roof of the World (ROTWBND) . Global Change Research Data Publishing and Repository, 2014. DOI:10.3974/geodb.2014.01.01.v1, <http://www.geodoi.ac.cn/doi.aspx?Id=10.3974/geodb.2014.01.01.v1>.

[5] ASTER GDEM 2, Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), October 2011, Digital Elevation Database, Earth Remote Sensing Data Analysis Center, Japan, ASTER GDS User Service. http://www.gds.aster.ersdac.or.jp/gds_www2002/service_e/inq.c_e/set_inq.c_e.html, LP DAAC User Services. https://lpdaac.usgs.gov/customer_service.

[6] SRTM, Shuttle Radar Topography Mission, 90m Digital Elevation Database, <http://srtm.usgs.gov/>.

[7] Liu Chuang, Shi Ruixiang, Lv Tingting et al. Elevation cluster dataset covering the eco-region of the Roof of the World. Global Change Research Data Publishing and Repository, 2014. DOI: 10.3974/geodb.2014.01.02.v1, <http://www.geodoi.ac.cn/doi.aspx?Id=10.3974/geodb.2014.01.02.v1>.

[8] A Strategy and Results Framework for ICIMOD, October 2012, www.icimod.org/resource/9311.