Geocryology and Geocryological Zonation of Mongolia, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Sodnom, N. and A. L. Yanshin, eds. 2005. *Geocryology and Geocryological Zonation of Mongolia, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center. https://doi.org/10.7265/a7rr-na50. [Date Accessed].

National Snow and Ice Data Center

TABLE OF CONTENTS

The map of Geocryology and Geocryological Zonation of Mongolia was derived from the National Atlas of Mongolia (Sodnom and Yanshin, 1990). The data set depicts the distribution and general properties of permafrost and seasonally frozen ground and locations of specific cryogenic phenomena in Mongolia. Two plates were digitized. One plate, at a scale of 1:12,000,000, depicts four general geocryological zones: continuous and discontinuous permafrost, insular and sparsely insular permafrost, sporadic permafrost, and seasonally frozen ground. The second plate, at a scale of 1:4,500,000, depicts 14 different terrain classifications determined according to elevation, mean annual air temperature, permafrost thickness and thaw depth, and seasonal frozen ground freeze depth. The locations of six specific cryogenic phenomena are also included: perennial frost mounds, icings, thermokarst, cryogenic landslides, solifluction, and cryogenic planation. Data are available via FTP as ESRI shapefiles.

1   DATA DESCRIPTION

1.1 File Format and Naming Convention

Files are in ESRI shapefile format. A shapefile consists of several actual files that are usually considered as one file by most GIS applications. The following file types are included:

*.dbf = attribute data

*.prj = projection information

*.shp = feature geometry

*.shp.xml = ESRI/FGDC formatted metadata (This file is optional and does not include all the information in this document)

*.shx = the shape index, which stores an index to the feature geometry

*.sbx, *.sbn = spatial index of the features

The data set consists of the following shapefiles:

cryo_landslide.shp = point locations of cryogenic landslides

cryo_planation.shp = point locations of cryogenic planation

dig_country_bnd.shp = digitized country boundary polygon from the 1:4,500,000 map

dig_lakes.shp = digitized lake polygons from the 1:4,500,000 map

dig_streams.shp = digitized stream vectors from the 1:4,500,000 map

geocryo_regions.shp = digitized geocryological region polygons from the 1:12,000,000 map. See the attribute description below.

geocryology.shp = digitized polygons of areas with detailed geocryological information from the 1:4,500,000 map. See the attribute description below.

icings.shp = point locations of icings

per_frost_mound.shp = point locations of perennial frost mounds

solifluction.shp = point locations of solifluction

thermokarst.shp = point locations of thermokarst

1.1.1 File Size

11 ESRI shapefiles consisting of 79 actual files total 1.6 MB. Individual files sizes range from from 2 KB to 1 MB.

1.2 Spatial Information

1.2.1 Coverage

Mongolia

Southernmost Latitude: 40.608° N
Northernmost Latitude: 52.230° N
Westernmost Longitude: 87.002° E
Easternmost Longitude: 121.355° E

1.2.2 Projection

Albus Equal Area-Conic
Central Meridian: 103.833 degrees
Origin Latitude: 46.867 degrees
Standard Parallel 1: 43.342 degrees
Standard Parallel 2: 50.383 degrees

1.2.3   Parameters and Attributes

Parameters include the locations of thermokarst, icings, perennial frost mounds cryogenic landslides, solifluction, and cryogenic planation. The geocryo_regions.shp file shows the location of four geocryological regions: continuous and discontinuous permafrost, insular and sparsely insular permafrost, sporadic permafrost, and seasonal frozen ground. These regions are labeled in the shapefile attribute table. This classification scheme is not defined. It is unclear how it relates to the International Permafrost Association definitions for permafrost regions. The geocryology.shp file includes a more detailed 14-level classification scheme shown in the table below. The values in the table are included in the attribute table of the shapefile.

Table 1. Parameters and Attributes of geocryology.shp file

Value	Terrain	General Landform	Thaw Depth (m)	Freeze Depth (m)	Mean Annual Air Temperature (°C)	Prevalent Permafrost Thickness (m)
1	permafrost ("pf")	slopes and watersheds ("hi")	1.0 - 3.5	-	-2 - -5	> 100 ("3")
2	permafrost ("pf")	slopes and watersheds ("hi")	1.5 - 4.5	-	0 - -2	< 100 ("2")
3	permafrost ("pf")	valley bottoms and basins ("lo")	1.3 - 2.5	-	-2 - -5	> 100 ("3")
4	permafrost ("pf")	valley bottoms and basins ("lo")	1.5 - 4.0	-	0 - -2	< 100 ("2")
5	permafrost ("pf")	valley bottoms and basins ("lo")	1.7 - 3.0	-	0 - -1	< 50 ("1")
6	seasonal frozen ground ("sfg")	slopes and watersheds ("hi")	-	3.0 - 4.5	0 - +2	-
7	seasonal frozen ground ("sfg")	slopes and watersheds ("hi")	-	2.5 - 4.5	0 - +3	-

Value	Terrain	General Landform	Thaw Depth (m)	Freeze Depth (m)	Mean Annual Air Temperature (°C)	Prevalent Permafrost Thickness (m)
8	seasonal frozen ground ("sfg")	slopes and watersheds ("hi")	-	2.0 - 4.1	+2 - +5	-
9	seasonal frozen ground ("sfg")	slopes and watersheds ("hi")	-	2.0 - 4.0	+3 - +10	-
10	seasonal frozen ground ("sfg")	valley bottoms and basins ("lo")	-	2.5 - 5.0	0 - +2	-
11	seasonal frozen ground ("sfg")	valley bottoms and basins ("lo")	-	2.2 - 5.0	0 - +3	-
12	seasonal frozen ground ("sfg")	valley bottoms and basins ("lo")	-	1.6 - 4.5	+2 - +5	-
13	seasonal frozen ground ("sfg")	valley bottoms and basins ("lo")	-	2.0 - 4.5	+3 - +10	-
14	seasonal frozen ground ("sfg")	valley bottoms and basins ("lo")	-	2.5 - 4.0	+5 - +10	-

1.2.4   Sample Images

These figures show examples of geocryology.shp and geocryo_regions.shp using a color scheme that approximates that used in the original paper maps. See Appendix A for a larger version of the images.

Figure 1. Examples of geocryology.shp and geocryo_regions.shp

1.2.5   Errors and Uncertainty

The original published atlas (Sodnom and Yanshin 1990) included the following table with the maps.

Table 2. Table from original published atlas

High altitude geocryological zones	Altitude (m)	Area (sq km)	% of Mongolia
continuous & discontinuous permafrost terrains	1200-2800	175,280	11.2
insular and sparsely insular permafrost terrains	700-2600	350,560	22.4
sporadic permafrost terrains	600-1900	460,110	29.4
seasonally frozen terrains	600-1800	579,050	37.0

An analysis of the digital versions of the maps produces different percentages that can vary as much as two percentage points depending on whether lake area is included in the analysis. Furthermore, Sodnom and Yanshin's table gives the total area of Mongolia as 1,565,000 km^2 while the calculated area of geocryo_regions.shp is 1,611,023 km^2. The World Factbook (CIA 2005) lists the area of Mongolia as 1,564,116 km^2 and the Digital Chart of the World (ESRI 1992) indicates 1,565,866 km^2. Some error was inevitably introduced as part of the digitization process. The lack of information of how the original maps were produced and how the regions are defined adds additional uncertainty. This data set is best used for broad scale analysis and comparisons and is unsuitable for very fine scale spatial analysis.

2   DATA ACQUISITION AND PROCESSING

2.1 Data Acquisition Methods

The maps were digitized by first scanning the images at high resolution and then rectifying the image to the Digital Chart of the World's boundary map of Mongolia (ESRI 2005). No projection information was available on the original map, so the projection was chosen to best rectify the map.

2.2 Data Source

Sodnom, N. and A. L. Yanshin, eds. 1990. Geocryology and Geocryological Zonation, in the *National Atlas of Mongolia*. Ulan Bator, Mongolia/Moscow: GUGK. Plates 40 and 41, scale 1:4,500,000

3 REFERENCES

CIA (Central Intelligence Agency). 2005. The World Factbook. Accessed 7 September 2005 at http://www.cia.gov/cia/publications/factbook/index.html

ESRI (Environmental Systems Research Institute). 1992. Digital Chart of the World. Redlands, CA: Environmental Systems Research Institute.

Sodnom, N. and A. L. Yanshin, eds. 1990. Geocryology and Geocryological Zonation, in the National Atlas of Mongolia. Ulan Bator, Mongolia/Moscow: GUGK. Plates 40 and 41, scale 1:4,500,000

4 DOCUMENT INFORMATION

4.1 Glossary

Please see the Glossary of Permafrost and Related Ground Ice Terms for a general list of terms.

4.2 List of Acronyms

The following acronyms are used in this document:

CIA: Central Intelligence Agency
ESRI: Environmental Systems Research Institute
GIS: Geographic Information System

4.3 Publication Date

September 2005

4.4 Date Last Updated

September 2005

5   APPENDIX A – FIGURES OF GEOCRYOLOGY.SHP AND GEOCRYO_REGIONS.SHP
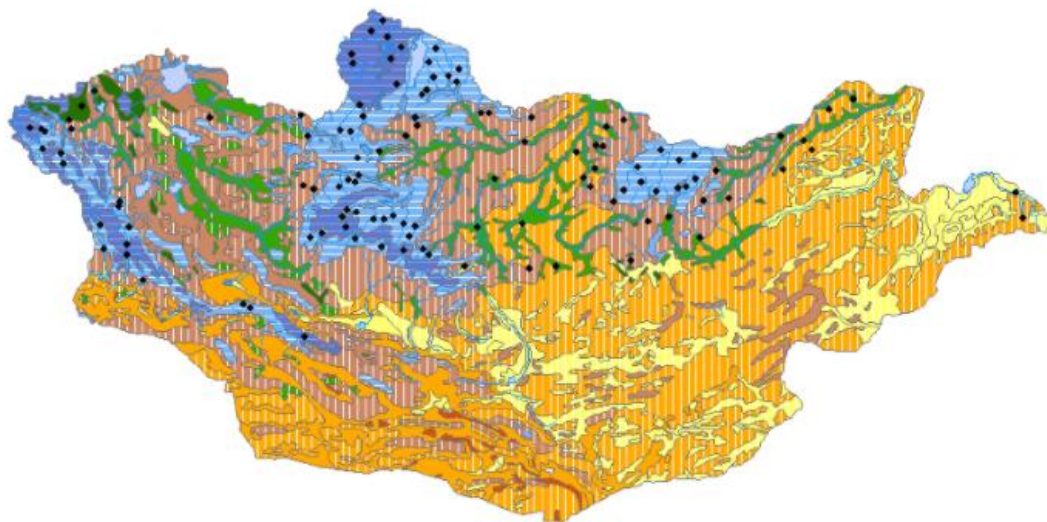
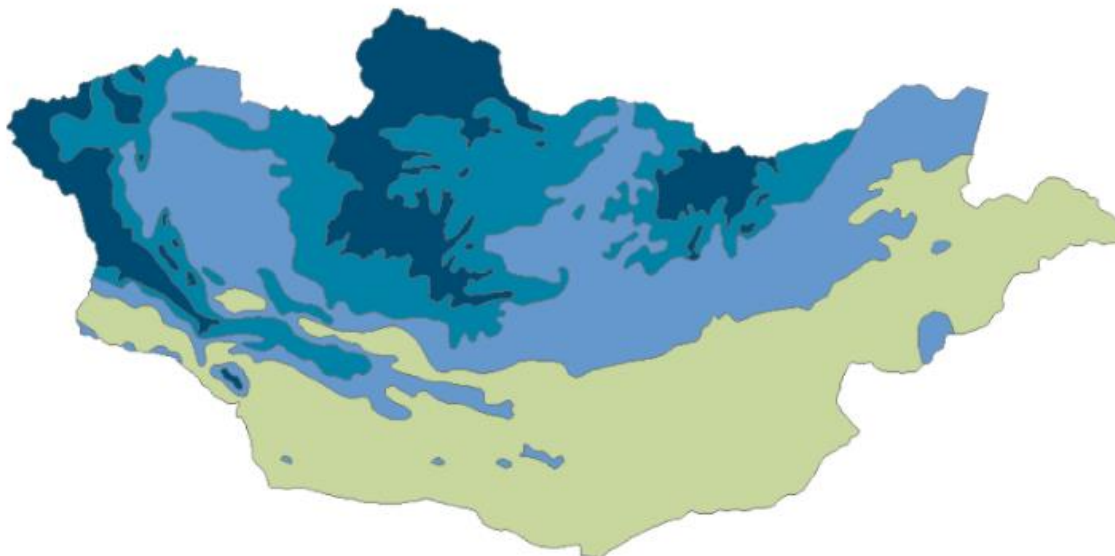## 5.1 Geocryology.shp

Figure 2. Larger version of geocryology.shp

5.2 Geocryo_regions.shp

Figure 3. Larger version of geocryo_regions.shp