

Northern Hemisphere Seasonal and Intermittent Frozen Ground Areas 1901-2001, Version 1

USER GUIDE

How to Cite These Data

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

T. Zhang, J. Smith 2006. *Northern Hemisphere Seasonal and Intermittent Frozen Ground Areas 1901-2001, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center. <https://doi.org/10.7265/37tw-0059>. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/GGD650>



National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 File Information

1.1.1 Format

ASCII text tables with fixed width columns. Each file has a four line header with column headers and a brief description of the data values.

1.1.2 File Naming Convention

seasonal_frozen_area.txt and intermittent_frozen_area.txt

1.1.3 File Size

seasonal_frozen_area.txt is 16 KB

intermittent_frozen_area.txt is 4 KB

1.2 Spatial Information

1.2.1 Coverage

Northern Hemisphere

Southernmost Latitude: 0°N

Northernmost Latitude: 90°N

Westernmost Longitude: 180°W

Easternmost Longitude: 180°E

1.2.2 Resolution

Values were derived from 0.5° gridded data ([Mitchell and Jones 2005](#)).

1.3 Temporal Information

1.3.1 Coverage

1901 - 2001

1.3.2 Resolution

Monthly for seasonally frozen ground and annual for intermittently frozen ground.

1.4 Parameter or Variable

1.4.1 Parameter Description

Monthly values of the total area of seasonally frozen ground in km² and annual values of the total area of intermittently frozen ground in km². Seasonally frozen ground is defined as the near-surface soil that experiences freeze for more than 15 days per year, while intermittently frozen ground experiences fewer than 15 days of freeze per year. The specifics of calculating these values from monthly mean air temperatures is described in the spatial and temporal coverage sections.

1.4.2 Sample Data Record

The following values come from `seasonal_frozen_area.txt`:

Year	January	February	March	April	May	June	July	August	September	October	November	December
1901							1212145	2208127	14535686	34029291	48517220	53636003
1902	54199660	53681875	47683360	37908909	22461443	7558155	1109719	2111357	14388017	35094395	48522247	53745341
1903	54653979	53460057	48665517	35513524	21643921	7225742	1245449	2728426	15270891	35041611	48755376	54975709
1904	55138460	52695318	49236715	37847327	19809680	6206509	1223456	2573216	16884571	33879736	47848623	53801267

Figure 1. Sample values from `seasonal_frozen_area.txt`

2 DATA ACQUISITION AND PROCESSING

2.1 Theory of Measurements and Processing Steps

Seasonally frozen ground is defined as the near-surface soil that experiences freeze for more than 15 days per year, while intermittently frozen ground experiences fewer than 15 days of freeze per year. Zhang, et al. (2003) established a relationship between near-surface soil freeze/thaw status and mean monthly air temperatures. They compared daily 5 cm soil temperature data from several Russian hydrometeorological stations with mean monthly air temperature. The station measurements indicate that soils experience freezing at 5 cm for several weeks when the mean monthly air temperature is at or near 0°C. This relationship led to the algorithm where seasonally frozen ground areas are defined as the areas that experience annually at least one month with a mean monthly air temperature of 0°C or less, or two months with mean monthly air temperatures of 5°C or less. Intermittently frozen ground areas experience only one month of mean monthly air temperatures less than or equal to 5°C. The values were calculated based upon the monthly mean

air temperature from the 1901-2002, 0.5 deg. global land temperatures from the University of East Anglia Climate Research Unit (Mitchell and Jones, 2005) regrided to the NSIDC Equal Area Scalable Earth Grid (EASE-Grid). Zhang et al. (2003) provide more information on the methodology.

2.2 Data Source

These data were derived from the 1901-2002 0.5° gridded monthly global land temperatures from the University of East Anglia Climatic Research Unit (Mitchell and Jones, 2005).

Land areas are derived from the EASE-Grid land-ocean-coastline-ice (LOCI) mask was derived from the [Boston University version of global 1 km land cover from MODIS 2001, version 4](#), courtesy of K. Knowles, National Snow and Ice Data Center, Boulder, CO.

2.3 Quality, Errors, and Limitations

2.3.1 Errors and Uncertainty

Missing values in the source data were replaced with the 1961-1990 climatological values as described in Mitchell and Jones (2005).

3 RELATED DATA SETS

[Northern Hemisphere EASE-Grid Annual Freezing and Thawing Indices, 1901 - 2002](#)

4 CONTACTS AND ACKNOWLEDGMENTS

4.1 Contacts

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4.2 Acknowledgments:

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The EASE-Grid land-ocean-coastline-ice (LOCI) mask was derived from the [Boston University version of global 1 km land cover from MODIS 2001, version 4](#), courtesy of K. Knowles, National Snow and Ice Data Center, Boulder, CO.

5 REFERENCES

Zhang, T., R. G. Barry, K. Knowles, F. Ling, and R. L. Armstrong. 2003. Distribution of seasonally and perennially frozen ground in the Northern Hemisphere. in Phillips, M., S. M. Springman, and L. U. Arenson (editors). Permafrost: Proceedings of the Eighth International Conference on Permafrost, 21-25 July 2003, Zurich, Switzerland. Lisse, The Netherlands: A.A. Balkema.

Mitchell T. D. and P. D. Jones. 2005. An improved method of constructing a database of monthly climate observations and associated high-resolution grids. *International Journal of Climatology* 25, 693-712.

6 DOCUMENT INFORMATION

6.1 Publication Date

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6.2 Date Last Updated

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