



Historical Soviet Daily Snow Depth (HSDSD), Version 2

USER GUIDE

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Armstrong, R. 2001. *Historical Soviet Daily Snow Depth (HSDSD), Version 2*. [Indicate subset used].
Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center.
<https://doi.org/10.7265/N5JW8BS3>. [Date Accessed].

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National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

The Historical Soviet Daily Snow Depth Version 2 (HSDSD) product updates and replaces HSDSD Version 1. The new version contains an additional ten years of data, improved data quality control, an HTML interface, and a Java tool for data browsing and extraction. Data now span from 1881 (for the earliest operational stations) through 1995. Other parameters include snow cover percent, snow characteristics, site characterization, and quality flags. Data are in ASCII format.

The HSDSD product is based on observations from 284 World Meteorological Organization (WMO) stations throughout Russia and the former Soviet Union. The State Hydrometeorological Service in Obninsk, Russia, sent the data to NSIDC through the bilateral US-USSR Working Group Eight data exchange program.

Data are stored in ASCII text files and are available in five different temporal resolutions:

- Daily Data
- Seasonal Summary Data
- Monthly Climatology Data
- Monthly Summary Data
- Synoptic Data

1.1 Parameters

The parameters in this data set are percentage of ground covered by snow and snow depth.

1.2 Daily Data

The daily data files contain daily records of snow cover percentage and snow depth for each of the 284 WMO stations along with characteristics of the sites and the quality of the observations. The file names for daily data begin with the letters `dat` followed by the WMO station number and end with the extension `.dat` (for example, `dat22887.dat`). Appendix A – Station List/Locations provides a complete list of these 284 stations and their numbers. These data reside in the `daily_data` directory in the data zip file.

The data are stored in comma-delimited ASCII files with 9 columns of data. Each row (record) of data in the data files represents one day's worth of data and are fixed length with a total record length of 26 characters. The columns of data are described in Table 1 and a sample data record is shown in Figure 1.

Table 1. Daily Data Column Descriptions

Column	Description
1	4-digit year of the observation
2	1- or 2-digit month of observation
3	1- or 2-digit day of month of observation
4	<p>Snow cover percentage (SCP): Percentage of ground covered by snow, determined by visual examination of exposed ground. Values range from 0 to 9, indicating 0% to 90% coverage, respectively. However, a value of 0 in this field and a 1 in the snow cover characteristic (SCC) field indicates 100% snow. See Table 2 for a list of SCP, SCC, and SCQ value combinations and their meanings.</p> <p>Note: These data were not subject to additional quality control at NSIDC; suspect values may exist.</p>
5	<p>Snow cover characteristic (SCC): Characteristics of the snow cover estimate. Possible values are 0, 1, 2, or 9.</p> <p>0: SCP value is reliable 1: along with a 0 in the SCP column, this indicates 100% ice concentration for this SCP observation 2: temporary snow melt 9: SCP value is invalid (also indicated by a 3 or a 4 in the snow cover quality (SCQ) field).</p> <p>See Table 2 for a list of SCP, SCC, and SCQ value combinations and their meanings.</p>
6	<p>Snow cover quality (SCQ): Quality of snow cover measurements. Possible values are 0, 2, 3, and 4.</p> <p>0: SCP value is reliable 2: SCP value is suspect 3: SCP value was rejected 4: SCP observation was not made.</p> <p>See Table 2 for a list of SCP, SCC, and SCQ value combinations and their meanings.</p>

Column	Description
7	<p>Location characteristic (LC) and location quality (LQ): A 2-digit code describing the LC and LQ. The LC is describes characteristics of the location where snow depth is measured. The LQ indicates the reliability of the location characteristic observation. The first digit is LC and the second digit is LQ.</p> <p>Possible values of LC are 0, 1, 2, 3, 4, 5, 7, and 9. 0: Along with a 0 for LQ, indicates continuous snow melting (summer) 1: Site is protected from strong wind 2: Site is open to wind 3: Observations are made at two sites 4: There is no information about the site's characteristic 5: Site is not protected and not always open 7: Type of site is not specified and therefore snow depth is not measured 9: Site characteristic value was rejected or observations were not made.</p> <p>Possible values of LQ are 0, 2, 3, or 4 0: SD value is reliable 2: SD value is suspect 3: SD value is rejected 4: SD observation was not made</p> <p>See Table 3 for a list of LC and LQ value combinations and their meanings.</p>
8	<p>Snow depth (SD): Depth measured in cm by permanent snow stakes placed at sites. A value of 999 indicates a value was rejected or an observation was not made. A value of 000 indicates thin snow, snow melt, or a humidity value. The SDC and SDQ value further indicate which of these things has occurred.</p> <p>See Table 4 for a list of SD, SDC, and SDQ value combinations and their meanings.</p>
9	<p>Snow depth characteristic (SDC) and snow depth quality (SDQ): A 2-digit code describing the SDC and SDQ. The SDC describes characteristics of the snow depth measurement. The SDQ is the reliability of the snow depth measurement. The first digit is the SDC and the second digit is the SDQ. If only one zero exists in this field, the user should read it as zero for both fields.</p> <p>Possible values of SDC are 0, 1, 2, 3, 4, 5, 6, 7, and 9 0: SD value is reliable if the SDQ is also 0 1: Continuous snow melting (summer) 2: Temporary snow melting 3: Snow cover absent at site; however, snow is in the vicinity and a coverage is specified. 4: Snow depth is less than 0.5 cm 5: SD value suspected to be humidity - set to 000 or 999 6: Snow depth was identified as high by a factor of ten and was rescaled by 0.1 7: Snow depth was identified as low by a factor of ten and was rescaled by 10 9: SD value is rejected or an observation was not made depending on the SDQ value</p> <p>Possible values of SDQ are 0, 2, 3, and 4 0: SD value is reliable 2: SD value is suspect 3: SD value is rejected 4: SD observation was not made</p> <p>See Table 4 for a list of SD, SDC, and SDQ value combinations and their meanings.</p>

Table 2. Possible value combinations for SCP, SCC, and SCQ and their definitions.

For SCP, "N" is any value from 0 to 9 (0% to 90% concentration)

Definition	SCP	SCC	SCQ
SCP value is reliable	N	0	0
Snow cover is 100%	0	1	0
Temporary snow melting	0	2	0
SCP value is suspect	N	0	2
SCP value is rejected	9	9	3
SCP observation was not made	9	9	4

Table 3. Possible value combinations for LC and LQ and their definitions.

For LC, "N" can be 0, 1, 2, 3, 4, or 5

Definition	LC	LQ
SD value is correct	N	0
Type of the site is not specified; therefore, SD is not measured	7	0
Continuous snow melting (summer)	0	0
SD value is suspect	N	2
SD value is rejected	9	3
SD Observation was not made	9	4

Table 4. Possible value combinations for SD, SDC, and SDQ and their definitions.

For SD, "N" indicates any snow depth measurement in cm

Definition	SD	SDC	SDQ
SD value is correct	N	0	0
Snow depth is less than 0.5 cm	000	4	0
Snow cover absent at site; however, snow is in the vicinity and a coverage is specified.	000	3	0
SD value suspected to be humidity - set to 000 or 999	000	5	0
Snow depth was identified as high by a factor of ten and was rescaled by 0.1	N	6	0
Snow depth was identified as low by a factor of ten and was rescaled by 10	N	7	0
Continuous snow melting (summer)	000	1	0

Definition	SD	SDC	SDQ
Temporary snow melting	000	2	0
SD value is suspect	N	0	2
SD value is rejected	999	9	3
SD observation was not made	999	9	4

```

1881, 1, 1, 9, 9, 3, 93, 999, 94
1881, 1, 2, 9, 9, 3, 93, 999, 94
1881, 1, 3, 9, 9, 3, 93, 999, 94
1881, 1, 4, 9, 9, 3, 93, 999, 94
1881, 1, 5, 9, 9, 3, 93, 999, 94
1881, 1, 6, 9, 9, 3, 93, 999, 94
1881, 1, 7, 9, 9, 3, 93, 999, 94
1881, 1, 8, 9, 9, 3, 93, 999, 94
1881, 1, 9, 9, 9, 3, 93, 999, 94
1881, 1, 10, 9, 9, 3, 93, 999, 94
1881, 1, 11, 9, 9, 3, 93, 999, 94
1881, 1, 12, 9, 9, 3, 93, 999, 94
.
.
.
1995, 12, 20, 0, 1, 0, 20, 44, 0
1995, 12, 21, 0, 1, 0, 20, 44, 0
1995, 12, 22, 0, 1, 0, 20, 45, 0
1995, 12, 23, 0, 1, 0, 20, 45, 0
1995, 12, 24, 0, 1, 0, 20, 45, 0
1995, 12, 25, 0, 1, 0, 20, 45, 0
1995, 12, 26, 0, 1, 0, 20, 45, 0
1995, 12, 27, 0, 1, 0, 20, 45, 0
1995, 12, 28, 0, 1, 0, 20, 49, 0
1995, 12, 29, 0, 1, 0, 20, 44, 0
1995, 12, 30, 0, 1, 0, 20, 44, 0
1995, 12, 31, 0, 1, 0, 20, 44, 0
    
```

Figure 1. First 12 rows and last 12 rows of data from dat24908.dat

1.3 Seasonal Summary Data

NSIDC computed the first and last dates of existing snow. All years (1881 through 1995) are included even if no data were reported. File names for seasonal summary data begin with the letters sea followed by the WMO station number and end with the .dat extension (for example, sea22887.dat). Data fields are fixed length and comma-delimited with a total record length of 34 characters. All data files are in the seasonal_summary directory in the data zip file and contain the following fields:

- Hydrological year
- Day of the first recorded snow depth
- Month of the first recorded snow depth
- Year of the first recorded snow depth
- Day of year (DOY) of the first recorded snow depth
- Day of the last recorded snow depth
- Month of the last recorded snow depth
- Year of the last recorded snow depth
- Day of year (DOY) of the last recorded snow depth

Figure 2 shows a sample seasonal summary data record.

```

1984,27,10,1983,300,11, 5,1984,132
1985,16,10,1984,290,21, 5,1985,141
1986,28,10,1985,301, 5, 5,1986,125
1987,11,10,1986,284,11, 5,1987,131
1988, 5,11,1987,309,29, 4,1988,120
1989,23,10,1988,297,12, 4,1989,102
1990,16,11,1989,320,12, 5,1990,132
1991,20,10,1990,293,27, 4,1991,117
1992,25,10,1991,298,30, 4,1992,121
1993, 9,10,1992,283,24, 4,1993,114
1994,19,10,1993,292,28, 5,1994,148
1995, 1, 1,1995, 1,15, 5,1995,135
1996,-2,-2, -2, -2,-2,-2, -2, -2
    
```

Figure 2. Seasonal Summary sample data record showing the last 12 lines of sea22522.dat

A hydrological year runs from October through the following September. For example, the hydrological year 1978 runs from October 1977 through September 1978. All other years in the seasonal summary data refer to the standard calendar year.

1.4 Monthly Climatology Data

NSIDC generated monthly climatological data for a 30-year time series (1966-1995). The data are stored in fixed length, comma-delimited fields with a total record length of 46 characters. The first record contains the station number for the file. Records 2 through 11 contain the data fields. The monthly climatology file names begin with the letters c1m followed by the WMO station number and end with the .dat extension (for example, c1m22887.dat). The files are stored in the climatology directory in the data zip file. The following fields are included:

First line:

- WMO Station Number

Second and continuing lines:

- Month
- Mean depth - monthly mean depth in cm
- Mean standard deviation depth - monthly mean standard deviation depth in cm
- Number of valid days - number of valid days used in the above calculations
- Mean maximum depth - mean maximum snow depth for this month in cm
- Mean maximum standard deviation - monthly maximum standard deviation depth in cm
- Number of mean maximum depth measurements
- Mean minimum depth - mean minimum snow depth for this month in cm
- Mean minimum standard deviation - monthly minimum standard deviation depth in cm
- Number of mean minimum depth measurements

22887									
1,	39.300,	14.226,	930,	48.133,	14.357,	30,	30.367,	13.885,	30
2,	48.632,	12.849,	847,	54.133,	12.605,	30,	42.933,	12.961,	30
3,	47.768,	14.669,	927,	57.400,	12.389,	30,	33.100,	14.944,	30
4,	19.560,	15.570,	509,	34.400,	17.383,	30,	1.367,	1.474,	30
5,	3.000,	2.619,	15,	3.250,	3.151,	8,	1.500,	0.707,	2
6,	-99.000,	-99.000,	1,	-99.000,	-99.000,	-99,	-99.000,	-99.000,	-99
7,	-99.000,	-99.000,	1,	-99.000,	-99.000,	-99,	-99.000,	-99.000,	-99
8,	-99.000,	-99.000,	1,	-99.000,	-99.000,	-99,	-99.000,	-99.000,	-99
9,	1.750,	0.957,	4,	1.750,	0.957,	4,	-99.000,	-99.000,	0
10,	4.955,	4.849,	288,	10.115,	6.160,	26,	1.308,	0.736,	26
11,	11.331,	7.974,	719,	19.071,	9.285,	28,	3.786,	4.049,	28
12,	25.450,	13.235,	857,	34.286,	14.050,	28,	15.679,	11.152,	28

Figure 3. Sample data file for clm22887.dat

In Figure 3, the first line indicates data for station 22887. The second line contains the following fields:

- 1 - Month (January)
- 8.457 - Mean depth in cm for January
- 7.758 - Mean standard deviation depth in cm for January
- 269 - Number of valid days throughout the year
- 16.538 - Mean maximum depth in cm for January
- 11.079 - Mean maximum standard deviation depth in cm for January
- 26 - Number of mean maximum depth measurements throughout the year
- 1.130 - Mean minimum depth in cm for January
- 0.344 - Mean minimum standard deviation depth in cm for January
- 23 - Number of mean maximum depth measurements throughout the year

Data Processing:

The monthly climatological data are calculated using all observations from 1966 to 1995 for each individual month. The mean depth and standard deviation are generated with data from all valid days in a given month.

The mean maximum and minimum depth are calculated based on the number of months of valid data between 1966 and 1995. Because each month has only one maximum and minimum, a maximum of 30 values are averaged for these fields.

The number of valid and missing days inform the user of the number of days of data. Large numbers of missing days indicate that the station closed or that its data records were not included in the latest update (1985 through 1995).

In October 2001, NSIDC discovered errors in these snow depth climatology files. See section 1.10.5 Errors in Snow Depth Climatology for more information. The data have been corrected and are included in the CD-ROM zip file on the HTTPS site:

<https://noaadata.apps.nsidc.org/NOAA/G01092/>. Note: There is one file missing from the corrected climatologies: c1m37171.dat.

1.5 Monthly Summary Data

These data include the number of days where snow depth was greater than 5 cm, 10 cm, or 50 cm. File names for monthly summary data begin with the letters sum followed by the WMO station number and end with the .dat extension (for example, sum22887.dat). All data fields are fixed length and comma-delimited. The total record length is 16 characters. The data files are in the monthly directory in the data zip file. A value of -2 indicates missing data.

The data fields are as follows:

- Year
- Month
- Number of days with greater than or equal to 5 cm of snow depth
- Number of days with greater than or equal to 10 cm of snow depth
- Number of days with greater than or equal to 50 cm of snow depth

Figure 4 shows a sample monthly summary data record.

```

1994, 12, -2, -2, -2
1995, 1, 31, 31, 3
1995, 2, 28, 28, 28
1995, 3, 31, 31, 31
1995, 4, 14, 13, 2
1995, 5, 2, 1, 0
1995, 6, -2, -2, -2
1995, 7, -2, -2, -2
1995, 8, -2, -2, -2
1995, 9, -2, -2, -2
1995, 10, -2, -2, -2
1995, 11, -2, -2, -2
    
```

Figure 4. Monthly Summary sample data record showing the last 12 lines of sum23804.dat

1.6 Synoptic Data

The synoptic data product includes data for single days from every station from 1966 through 1995. These data are intended for validation of remote sensing or other projects that require data for a single day over a large spatial extent. All data files are in the `synoptic` directory in the data zip file. The file name contains the year, month, and day of the data contained in each file of the form `YYYYMMDD` followed by the `.dat` extension (for example, `19831226.dat`). Each field contains 10 columns and is fixed length and comma-delimited with a total record length of 37 characters. The data in each record are described in Table 5 and a sample record is shown in Figure 5.

Table 5. Column descriptions of the synoptic data files

Column	Description
1	5-digit WMO station number
2	Station latitude in degrees North
3	Station longitude in degrees East
4	Station elevation in m above sea level
5	<p>Snow cover percentage (SCP): Percentage of ground covered by snow, determined by visual examination of exposed ground. Values range from 0 to 9, indicating 0% to 90% coverage, respectively. However, a value of 0 in this field and a 1 in the snow cover characteristic (SCC) field indicates 100% snow. See Table 2 for a list of SCP, SCC, and SCQ value combinations and their meanings.</p> <p>Note: These data were not subject to additional quality control at NSIDC; suspect values may exist.</p>

Column	Description
6	<p>Snow cover characteristic (SCC): Characteristics of the snow cover estimate. Possible values are 0, 1, 2, or 9.</p> <p>0: SCP value is reliable 1: along with a 0 in the SCP column, this indicates 100% ice concentration for this SCP observation 2: temporary snow melt 9: SCP value is invalid (also indicated by a 3 or a 4 in the snow cover quality (SCQ) field).</p> <p>See Table 2 for a list of SCP, SCC, and SCQ value combinations and their meanings.</p>
7	<p>Snow cover quality (SCQ): Quality of snow cover measurements. Possible values are 0, 2, 3, and 4.</p> <p>0: SCP value is reliable 2: SCP value is suspect 3: SCP value was rejected 4: SCP observation was not made.</p> <p>See Table 2 for a list of SCP, SCC, and SCQ value combinations and their meanings.</p>
8	<p>Location characteristic (LC) and location quality (LQ): A 2-digit code describing the LC and LQ. The LC describes characteristics of the location where snow depth is measured. The LQ indicates the reliability of the location characteristic observation. The first digit is LC and the second digit is LQ.</p> <p>Possible values of LC are 0, 1, 2, 3, 4, 5, 7, and 9. 0: Along with a 0 for LQ, indicates continuous snow melting (summer) 1: Site is protected from strong wind 2: Site is open to wind 3: Observations are made at two sites 4: There is no information about the site's characteristic 5: Site is not protected and not always open 7: Type of site is not specified and therefore snow depth is not measured 9: Site characteristic value was rejected or observations were not made.</p> <p>Possible values of LQ are 0, 2, 3, or 4 0: SD value is reliable 2: SD value is suspect 3: SD value is rejected 4: SD observation was not made</p> <p>See Table 3 for a list of LC and LQ value combinations and their meanings.</p>
9	<p>Snow depth (SD): Depth measured in cm by permanent snow stakes placed at sites. A value of 999 indicates a value was rejected or an observation was not made. A value of 000 indicates thin snow, snow melt, or a humidity value. The SDC and SDQ value further indicate which of these things has occurred.</p> <p>See Table 4 for a list of SD, SDC, and SDQ value combinations and their meanings.</p>

Column	Description
10	<p>Snow depth characteristic (SDC) and snow depth quality (SDQ): A 2-digit code describing the SDC and SDQ. The SDC describes characteristics of the snow depth measurement. The SDQ is the reliability of the snow depth measurement. The first digit is the SDC and the second digit is the SDQ. If only one zero exists in this field, the user should read it as zero for both fields.</p> <p>Possible values of SDC are 0, 1, 2, 3, 4, 5, 6, 7, and 9 0: SD value is reliable if the SDQ is also 0 1: Continuous snow melting (summer) 2: Temporary snow melting 3: Snow cover absent at site; however, snow is in the vicinity and a coverage is specified. 4: Snow depth is less than 0.5 cm 5: SD value suspected to be humidity - set to 000 or 999 6: Snow depth was identified as high by a factor of ten and was rescaled by 0.1 7: Snow depth was identified as low by a factor of ten and was rescaled by 10 9: SD value is rejected or an observation was not made depending on the SDQ value</p> <p>Possible values of SDQ are 0, 2, 3, and 4 0: SD value is reliable 2: SD value is suspect 3: SD value is rejected 4: SD observation was not made</p> <p>See Table 4 for a list of SD, SDC, and SDQ value combinations and their meanings.</p>

```

20674,73.5, 80.4,0047 0,1,0,20, 12, 0
20891,72.0,102.5,0033 0,1,0,20, 19, 0
21946,70.6,147.9,0048 0,1,0,20, 18, 0
21982,71.0,178.5,0003 0,1,0,50,  1, 0
22113,69.0, 33.1,0046 0,1,0,20, 31, 0
22217,67.1, 32.4,0026 0,1,0,10, 22, 0
22522,65.0, 34.8,0010 0,1,0,20,  8, 0
22550,64.6, 40.5,0013 0,1,0,20, 31, 0
22583,64.8, 47.7,0062 0,1,0,10, 35, 0
22602,63.8, 30.8,0181 0,1,0,20, 12, 0
22641,63.9, 38.1,0008 0,1,0,20, 29, 0
22802,61.7, 30.7,0018 0,1,0,20, 16, 0
    
```

Figure 5. Synoptic sample data record showing the first 12 lines of 19891221.dat

1.7 Volume

File sizes vary by data type:

- **Daily data:** 1.1 MB per file
- **Seasonal summary data:** 4 KB per file
- **Monthly climatology data:** 1 KB per file

- **Monthly summary data:** 23 KB per file
- **Synoptic data:** 22 KB per file

1.8 Spatial Coverage

WMO stations are primarily located in inhabited areas within the middle latitudes of Eurasia: 35 to 75 degrees north latitude and 20 to 180 degrees east longitude.

1.8.1 Spatial Resolution

Resolution varies; data were collected from irregular sampling locations. For a list of weather stations see Appendix A – Station List/Locations.

1.9 Temporal Information

Data span from 1881 (for the earliest operational stations, not all stations were operational that early) through 1995.

1.9.1 Temporal Resolution

Data were collected daily.

1.10 Quality Assessment

Systematic data gaps (caused by breaks in station function or punch card deterioration) are set to default values. To estimate the quality of the data, each snow depth value in the archive is followed by characteristic (C) and quality (Q) flags set to one of the following values:

CQ

00: valid value

02: suspect value

93: rejected value

94: observation was not made

Field positions are filled with 9 for quality flag values of 3 or 4. NSIDC added additional flags in the characteristic field to indicate data with errors that were fixed during processing. Data flagged in this manner have a quality value of 0, indicating valid data. The numeric flags are as follows:

50 - Humidity data

60 - Snow depth high by a factor of ten

70 - Snow depth low by a factor of ten

The quality flag is set to 99 for invalid dates such as 30 February.

NSIDC checked the locations of the meteorological stations against the WMO station directory for close correlation.

NSIDC developed a quality control routine to correct gross errors within the data. This routine differs from that used in Version 1 of the Historical Soviet Daily Snow Depth; therefore, Version 2 data supersede all Version 1 data.

NSIDC developed an improved quality control routine for HSDSD Version 2, based on input from several users of HSDSD Version 1. Results were compared to manually-corrected Version 1 raw data independently developed by Dr. David Robinson (Robinson, 1993) at Rutgers University.

The new algorithm checks for data entries outside of two standard deviations from the monthly mean and examines these entries for the following known errors:

- Factor of ten high
- Factor of ten low
- Missing humidity flag
- Misplaced summer melt flag

1.10.1 Corrections to Factor of Ten Errors

NSIDC noted anomalously large snow depth fluctuations -- often more than a normal snowfall -- and determined that the data changed by a factor of ten, for example, from 11 cm one day to 110 cm the next.

The Russian and USSR data collection instructions required snow depth in cm and precipitation in mm. NSIDC discovered errors in transcribing or reporting the snow depth, for example, confusing the units of snow depth and precipitation in the original data; therefore, if a change in snow depth was greater than or equal to two standard deviations from the mean, a factor of ten error was investigated. If the value had changed by approximately a factor of ten, NSIDC rescaled the data by 0.10.

Other data appeared to be a factor of ten lower than data from the surrounding days. If the value had changed to a single digit and could be explained by a factor of ten decrease, NSIDC rescaled the value by ten.

For both types of factor of ten errors, NSIDC checked the corrected value for plausibility by evaluating the difference between the mean daily change for the previous day and that of the corrected current day.

1.10.2 Humidity Flag Corrections

The completed HSDSD data product contains no humidity values; however, the raw data uses the same field for both snow depth and humidity data, depending on the season. A data quality flag of 50 indicates that humidity data were recorded. This flag was occasionally missed during digitization, resulting in an invalid snow value. If a value deviated more than ten times from the mean for a given month, the value was assumed to represent humidity data and was flagged accordingly. NSIDC set the value of these data records to 000. Any record with a characteristic and quality code combination of 50 is suspect and should be ignored.

1.10.3 Misplaced Summer Melt Flag

A characteristic and quality flag combination of 10 indicates summer melting. The value 00010 represents a valid snow measurement during the summer months; however, errors in the digitization process might yield an entry of 00100 that would indicate a valid 1 cm snow depth measurement. NSIDC fixed this problem by taking the indication of summer as truth; therefore, if a day indicated summer melting (10) then all values less than 1 cm were corrected to 0 cm depth with a characteristic and quality flag combination of 02 to indicate a suspect value.

1.10.4 Monthly Products Quality Control

Valid snow depths with a characteristic and quality flag combination of 50 were used for the development of the monthly products. These flags indicate a non-zero and valid snow depth measurement.

1.10.5 Errors in Snow Depth Climatology

In October 2001 NSIDC discovered errors in mean and standard deviation depth values for climatology data files. Mean snow depth values were computed using erroneous data. Mean maximum and minimum depth were calculated correctly.

NSIDC computed a corrected mean snow depth climatology. The statistics in the reprocessed files were calculated without using zero snow depth values; therefore, they represent mean snow depth only when snow was present. The corrected climatologies are included in the CD-ROM zip file on the HTTPS site: <https://noaadata.apps.nsidc.org/NOAA/G01092/>. Note: There is one file missing from the corrected climatologies: c1m37171.dat.

2 SOFTWARE AND TOOLS

The Historical Soviet Daily Snow Depth Version 2 was originally available on CD-ROM. Now the entire contents of the CD-ROM are available as a zip file and contain an HTML interface and Java tool for extracting and browsing data.

3 DATA ACQUISITION AND PROCESSING

3.1 Data Acquisition Methods

Observers took daily measurements of snow depth from three snow measuring rods placed in a meteorological enclosure. In individual cases when the enclosure was not representative of the surroundings with respect to snow cover formation, they placed the snow measuring rods near the station on a specially selected plot.

Observations were made on each rod to 1 cm precision. The observers remained 2 m to 3 m away from the rod while making measurements. The measured snow depth was indicated by the line on the rod that was level with the snow surface. The observers also read the layer of ice or water on the rod that often formed after snow melted near the rod.

If the reading was less than 0.5 cm, they recorded it as 0 cm. If the depth was greater than 0.5 cm but less than 1.0 cm, they recorded it as 1 cm.

The observers calculated the daily mean by averaging the readings on the three rods, rounded to the nearest whole cm. If the mean was less than 0.5 cm, they recorded it as 0 cm; if the mean was greater than 0.5 cm but less than 1 cm, they recorded it as 1 cm.

3.2 Data Source

NSIDC derived the HSDSD product from the Soviet meteorological archive, Sytochny Temperatur, Osadki, Sneg (STOS), which contains daily temperature, precipitation, and snow depth data from Russian World Meteorological Organization (WMO) stations. The State Hydrometeorological Service in Obninsk, Russia, sent the data to NSIDC through the bilateral US-USSR Working Group Eight data exchange program.

The original data set was a compilation of the following three meteorological archives:

- TM1-Day archive with daily meteorological observations for the USSR between 1874 and 1965
- Day-76 meteorological archive for the entire USSR between 1966 and 1984
- Day-76 meteorological archive for the Taiga region between 1966 and 1984

The latest update from 1985 through 1995 comes from the Day-76 meteorological archives and includes 222 stations.

NSIDC checked the WMO station latitude and longitude of the original data with those listed in the WMO Handbook (1984) to determine the station name and elevation. The WMO station position was used where slight differences between the two existed. Six stations had WMO numbers that did not match any station within the WMO directory. The original data may have contained typographic errors such as 24759 for station 24959. NSIDC corrected these station numbers to match the WMO station listing based on the station name, latitude, longitude, and elevation. Corrected station numbers are identified by an asterisk (*). Appendix A – Station List/Locations summarizes station locations in the data set, ordered by WMO number.

4 REFERENCES AND RELATED PUBLICATIONS

World Meteorological Organization. 1984. *Handbook No. 9 Weather Reporting Vol. A*.

Robinson, D.A. 1993. Historical daily climatic data for the United states. *Preprints of the Eighth Conference on Applied Climatology*, Anaheim, CA, American Meteorological Society, 264-269.

4.1 Related Data Collections

- [Central Asian Snow Cover from Hydrometeorological Surveys](#)
- [Estonian Mean Snow Depth and Duration \(1891-1994\)](#)
- [Former Soviet Union Hydrological Snow Surveys](#)
- [MODIS/Terra Snow Cover 5-Min L2 Swath 500m](#)
- [MODIS/Terra Snow Cover 8-Day L3 Global 500m ISIN Grid](#)
- [MODIS/Terra Snow Cover Daily L3 Global 500m ISIN Grid](#)
- [Near-Real-Time SSM/I EASE-Grid Daily Global Ice Concentration and Snow Extent](#)
- [Nimbus-7 SMMR Derived Monthly Global Snow Cover and Snow Depth](#)
- [Northern Hemisphere EASE-Grid Weekly Snow Cover and Sea Ice Extent](#)
- [Rand Corporation Mean Monthly Global Snow Depth](#)
- [Western Italian Alps Monthly Snowfall and Snow Cover Duration](#)

5 CONTACTS AND ACKNOWLEDGMENTS

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5.1 Acknowledgments

The development of this data product was funded through NOAA's Environmental Services Data and Information Management (ESDIM) program, and through the support of the NOAA/NESDIS National Geophysical Data Center (NGDC).

6 DOCUMENT INFORMATION

6.1 Publication Date

October 1999

6.2 Date Last Updated

December 2020 – A. Windnagel put the documentation into the new template and cleaned up some of the data description sections.

APPENDIX A – STATION LIST/LOCATIONS

The station latitude and longitude provided with the original data record were checked against the WMO Handbook (No. 9, Weather Reporting Vol. A, 1984) to determine the station name and elevation. Where slight differences in position between the provided data and the WMO station position existed, the WMO station position was used. Six stations had WMO numbers that did not match any station within the WMO directory. The original data may have contained typographic errors, such as 24759 for station 24959. These station numbers were corrected to match the WMO station listing based on the station name, latitude, longitude, and elevation. Corrected station numbers are identified by an asterisk (*).

The list below contains each station represented in the data ordered by WMO number. In cases where two names are separated by a slash (/) the first name is the transliteration listed in the WMO directory while the second name is an alternate transliteration. Names listed in parentheses () are alternate names for this location.

Table A - 1. Weather station locations, elevations, and names ordered by WMO station number

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
20674	73.5N	080.4E	47	OSTROV DIKSON
20891	72.0N	102.5E	33	HATANGA
21946	70.6N	147.9E	48	COKURDAH
21982	71.0N	178.5W	3	OSTROV VRANGELJA
22113	69.0N	033.1E	46	MURMANSK
22217	67.1N	032.4E	26	KANDALAKSA
22522	65.0N	034.8E	10	KEM'-PORT
22550	64.6N	040.5E	13	ARHANGEL'SK
22583	64.8N	047.7E	62	KOJNAS
22602	63.8N	030.8E	181	REBOLY
22641	63.9N	038.1E	8	ONEGA
22802	61.7N	030.7E	18	SORTOVALA
22820	61.8N	034.4E	40	PETROZAVODSK
22837	61.0N	036.5E	59	VYTEGRA
22887	61.2N	046.6E	69	KOTLAS
23146	68.5N	073.6E	2	MYS KAMENNYJ
23205	67.7N	053.0E	7	NAR'JAN-MAR
23219	67.1N	059.4E	84	HOSEDA-HARD
23405	65.5N	052.2E	70	UST'-CIL'MA

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
23418	65.1N	057.1E	56	PECORA
23472	65.8N	087.9E	32	TURUHANSK
23527	64.3N	060.9E	29	SARAN-PAUL'
23552	64.9N	077.8E	27	TARKO-SALE
23625	63.7N	061.9E	27	SOSVA
23631	63.9N	065.1E	27	BEREZOVO
23678	63.2N	088.0E	40	VERHNE-IMBATSKOE
23711	62.7N	056.2E	107	TROICKO-PECERSKOE
23724	62.4N	060.9E	50	NJAKSIMVOL'
23734	62.5N	066.1E	38	OKTJABR'SKOE
23804	61.7N	050.9E	96	SYKTYVKAR
23849	61.3N	073.5E	44	SURGUT
23884	61.6N	090.2E	63	BOR
23891	61.7N	096.4E	179	BAJKIT
23921	60.7N	060.4E	101	IVDEL'
23929	60.3N	064.2E	53	SAIM
23933	61.0N	069.0E	40	HANTY-MANSIJSK
23955	60.4N	077.9E	47	ALEKSANDROVSKOE
23966	60.4N	084.1E	99	VANZIL'-KYNAK
23973	61.0N	089.6E	46	VOROGOVO
23975	60.4N	088.4E	85	SYM
23987	60.3N	090.2E	58	JARCEVO
24125	68.5N	112.4E	127	OLENEK
24266	67.6N	133.4E	137	VERHOJANSK
24343	66.8N	123.4E	58	ZIGANSK
24507	64.3N	100.3E	186	TURA
24629	63.2N	113.6E	163	SYUL 'DYUKAR
24639	63.3N	118.3E	129	NJURBA
24641	63.8N	121.6E	107	VILJUJSK
24652	63.9N	127.5E	90	SANGARY
24656	63.5N	129.4E	79	BATAMAJ
24671	63.9N	135.9E	400	TOMPO
24688	63.3N	143.2E	726	OJMJAKON
24724	62.5N	111.2E	240	CHERNISHEVSKII
24738	62.2N	117.7E	124	SUNTAR

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
24768	62.0N	132.6E	179	CURAPCA
24817	61.3N	107.9E	291	ERBOGACEN
24856	61.5N	129.2E	112	POKROVSKAJA
24908	60.3N	102.3E	260	VANAVARA
24923	60.7N	114.9E	169	LENSK
24934	60.5N	116.2E	168	NJUJA
24944	60.4N	120.4E	226	OLEKMINSK
24951	60.8N	125.3E	118	ISIT'
24959	62.1N	129.8E	103	*YAKUTSK (in original data = 24759)
24962	60.9N	131.9E	148	*AMGA (doc = 24692)
24966	60.4N	134.5E	175	*UST'-MAJA (doc = 24999)
24982	60.7N	142.8E	398	UEGA
24988	60.1N	142.3E	198	ARKA
25173	68.9N	179.5W	7	MYS SMIDTA
25551	64.7N	170.4E	33	MARKOVO
25563	64.8N	177.6E	62	ANADYR
25594	64.4N	173.2W	3	PROVIDENJA
25703	62.9N	152.4E	207	SEJMCAN
25744	62.5N	166.2E	8	KAMENSKOE
25913	59.5N	150.7E	118	MAGADAN
25954	60.4N	166.0E	3	KORF
26038	59.4N	024.8E	44	TALLIN
26063	60.0N	030.3E	4	SANKT-PETERSBURG (LENINGRAD)
26188	58.7N	032.7E	116	VEREB' E
26231	58.4N	024.5E	14	PJARNO
26258	57.8N	028.4E	42	PSKOV
26406	56.5N	021.0E	8	LIEPAJA
26422	57.0N	024.0E	3	RIGA
26477	56.4N	030.6E	98	VELIKIE LUKI
26629	54.8N	023.9E	74	KAUNAS
26702	54.7N	020.6E	27	KALININGRAD
26730	54.7N	025.3E	189	VIL'NJUS
26781	54.8N	032.1E	241	SMOLENSK

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
26850	53.9N	027.5E	234	MINSK (doc = 27850)
27037	59.3N	039.9E	118	VOLOGDA
27196	58.5N	049.7E	164	KIROV
27333	57.8N	040.9E	139	KOSTROMA
27553	56.3N	044.0E	82	GOR'KIJ
27595	55.8N	049.3E	64	KAZAN'
27612	55.8N	037.6E	156	*MOSKVA (doc = 27515)
27648	55.0N	041.8E	136	ELAT'MA
27823	53.8N	039.3E	210	PAVELEC
27947	52.7N	041.5E	139	TAMBOV
28044	59.6N	060.6E	132	SEROV
28049	59.4N	062.3E	74	GARI
28064	59.6N	065.8E	72	LEUSI
28076	59.6N	069.3E	57	DEM'JANSKOE
28138	58.5N	058.9E	464	BISER
28144	58.9N	060.8E	126	VERHOTUR'E
28225	58.0N	056.4E	161	PERM
28240	57.9N	060.1E	258	NIZHNYJ TAGIL
28248	57.9N	061.7E	128	ALAPAEVSK
28255	58.1N	063.7E	71	TURINSK
28264	58.1N	065.4E	62	TAVDA
28275	58.2N	068.1E	44	TOBOL'SK
28346	57.4N	061.9E	177	ARTENOVSKY
28359	57.1N	064.7E	91	TUGULYM
28367	57.1N	065.4E	104	TJUMEN'
28382	57.7N	071.2E	56	UST'-ISIM
28383	57.5N	072.4E	66	TEVRIZ
28411	56.9N	053.3E	158	IZEVSK
28434	56.6N	057.8E	220	KRASNOUFIMSK
28440	56.8N	060.6E	237	SVERDLOVSK
28493	57.0N	074.4E	74	TARA
28661	55.4N	065.4E	79	KURGAN
28679	54.8N	069.2E	136	PETROPAVLOVSK
28698	55.0N	073.4E	94	OMSK
28722	54.7N	055.8E	197	UFA

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
28900	53.3N	050.2E	44	KUJBYSEV (BEZENCUK)
28952	53.2N	063.6E	171	KUSTANAJ
29023	59.9N	081.9E	76	NAPAS
29068	59.5N	091.0E	64	NAZIMOVO
29103	59.1N	076.7E	90	KATYL'GA
29111	59.2N	078.2E	69	SREDNY VASYUGAN
29122	59.1N	081.0E	63	KARGASOK
29128	58.7N	081.5E	63	PARABEL'
29198	58.6N	098.7E	150	KLIMINO
29209	57.8N	077.3E	100	MAYSK
29231	58.3N	082.9E	76	KOLPASEV
29253	58.4N	089.4E	142	LOSINOBORSK
29263	58.5N	092.2E	78	ENISIJSK
29274	58.1N	093.0E	89	STRELKA
29282	58.4N	097.5E	134	BOGUCANY
29313	57.6N	079.2E	93	PUDINO
29328	57.1N	081.9E	107	BAKCHAR
29332	57.6N	083.8E	114	MOLCHANOVO
29356	57.4N	089.3E	150	CINDAT
29363	57.6N	092.3E	184	PIROVSKOE
29430	56.4N	085.0E	121	TOMSK
29574	56.0N	092.7E	194	KRASNOYARSK
29612	55.3N	078.4E	120	BARABINSK
29698	54.9N	099.0E	410	NIZNE-UDINSK
29807	53.4N	075.5E	94	IRTYSSK
29838	53.4N	083.7E	196	BARNAUL
29866	53.7N	091.7E	251	MINUSINSK
30028	59.3N	106.2E	352	IKA
30054	59.5N	112.6E	193	VITIM
30102	59.0N	101.1E	185	KEZMA
30117	58.0N	102.7E	218	UST'-ILIMSK
30138	58.1N	108.7E	246	CECUJSK
30142	58.9N	111.2E	220	VIZIRNYJ
30151	58.9N	112.9E	201	VORONCOVKA
30157	58.3N	112.9E	224	MAMA

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
30229	57.3N	107.1E	271	VERHNE-MARKOVO
30230	57.8N	108.1E	258	KIRENSK
30253	57.9N	114.2E	278	BODAJBO
30372	56.9N	118.4E	711	CARA
30393	56.9N	124.9E	845	CUL'MAN
30521	54.8N	105.2E	415	ZIGALOVO
30555	54.6N	113.1E	1314	TROICKIJ PRIISK
30636	53.6N	109.6E	486	BARGUZIN
30673	53.7N	119.8E	619	MOGOCA
30692	54.0N	123.9E	400	SKOVORODINO
30710	52.3N	104.3E	485	IRKUTSK
30758	52.1N	113.5E	685	CITA
30777	52.3N	117.7E	465	SRETENSK
30823	51.8N	107.6E	510	ULAN-UDE
30925	50.4N	106.5E	789	KJAHTA
30949	49.6N	111.9E	908	KYRA
30965	50.4N	116.5E	684	BORZJA
31004	58.6N	125.4E	682	ALDAN
31054	59.2N	135.2E	212	UST'-JUDOMA
31088	59.4N	143.3E	6	OHOTSK
31123	57.8N	130.9E	266	CJUL'BJU
31168	56.5N	138.3E	858	AJAN
31253	54.7N	128.9E	357	BOMNAK
31329	53.1N	132.9E	543	EKIMCAN
31369	53.1N	140.8E	47	NIKOLAEVSK-NA-AMURE
31388	52.4N	129.9E	207	NORSK
31416	52.4N	136.5E	73	IM POLINY OSIPENKO
31510	50.3N	127.5E	137	BLAGOVESCHENSK
31532	50.8N	132.2E	234	CEKUNDA
31594	49.4N	130.1E	135	ARHARA
31707	47.7N	131.0E	74	EKATERINO-NIKOL'SKOE
31735	48.5N	135.1E	72	HABAROVSK
31829	47.3N	139.0E	26	MYS ZOLOTIJ
31873	45.9N	133.7E	107	DAL'NERECENSK
31909	45.0N	136.7E	11	TERNEJ

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
31915	44.4N	131.4E	211	POGRANICNYJ
31960	43.1N	131.8E	138	VLADIVOSTOK
32061	50.9N	142.2E	31	ALEKSANDROVSK-SAHALINSKIJ
32098	49.2N	143.1E	4	PORONAJSK
32165	44.0N	145.8E	40	JUZNO-KURIL'SK
32389	56.3N	160.8E	28	KLJUCI
32411	55.6N	155.6E	4	ICA
32540	52.9N	158.7E	7	PETROPAVLOVSK-KAMCATSKIJ
32564	52.7N	156.2E	2	OKTIABR'SKAYA
33008	52.1N	023.7E	144	BREST
33038	52.3N	029.8E	140	VASILEVICI
33345	50.5N	030.5E	179	KIEV
33377	50.0N	033.0E	156	LUBNY
33393	49.8N	024.1E	325	L'VOV
33562	49.2N	028.5E	287	VINNICA
33631	48.6N	022.3E	118	UZGOROD
33658	48.3N	025.9E	240	CERNOVCY
33815	47.0N	028.9E	95	KISINEV
33837	46.5N	030.6E	64	ODESSA
33889	45.4N	028.8E	30	IZMAIL
33910	46.2N	034.9E	15	GENICESK
33915	46.5N	033.9E	28	ASKANIJA-NOVA
33946	45.0N	034.0E	205	SIMFEROPOL'
33976	45.0N	035.4E	26	FEODOSIJA
33983	45.4N	036.4E	33	KERC'
34009	51.8N	036.2E	167	KURSK
34122	51.7N	039.1E	164	VORONEZ
34139	51.1N	040.7E	194	KAMENNAJA STEP'
34163	51.6N	045.5E	190	OKTJABR'SKIJ GORODOK
34172	51.5N	046.0E	156	SARATOV
34300	49.9N	036.3E	152	HAR'KOV
34391	50.2N	048.6E	25	ALEKSANDROV-GAJ
34524	48.4N	038.4E	334	DEBAL'CEVO
34646	47.7N	042.1E	104	VOLGODONSK
34731	47.2N	039.8E	77	ROSTOV-NA-DONU

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
34747	46.6N	041.1E	112	CELINA
34824	46.0N	038.2E	5	KANEVSKAJA
34861	46.3N	044.2E	150	ELISTA
34880	46.4N	048.0E	18	ASTRAHAN'
35078	51.8N	068.4E	308	ATBASAR
35108	51.3N	051.4E	36	URAL'SK
35121	51.8N	055.1E	109	ORENBURG
35133	51.5N	059.9E	285	ADMOVKA
35188	51.2N	071.4E	348	CELINOGRAD
35229	50.3N	057.2E	227	AKTJUBINSK
35358	49.6N	063.5E	123	TURGAJ
35394	49.8N	073.1E	555	KARAGANDA
35406	49.1N	051.9E	4	KALMYKOVO
35416	49.1N	054.7E	89	UIL
35542	48.6N	061.3E	114	IRGIZ
35576	48.3N	069.7E	361	KZYL-ZAR
35663	47.8N	066.7E	176	CELKAR
35700	47.1N	051.8E	20	GUR'EV
35746	46.8N	061.7E	56	ARAL'SKOE
35796	46.9N	075.0E	423	BALHAS
36034	51.5N	081.2E	215	RUBCOVSK
36177	50.4N	080.2E	206	SEMIPALATINSK
36665	47.5N	084.9E	603	ZAJSAN
36729	46.2N	080.9E	397	UC-ARAL
36859	44.2N	080.1E	640	PANFILOV
36870	43.2N	076.9E	847	ALMA-ATA
36974	41.4N	076.0E	2049	NARYN
37031	45.0N	041.2E	208	ARNAVIR
37050	44.1N	043.0E	300	PJATIGORSK
37171	43.5N	039.8E	16	SOTCHI
37235	43.4N	045.7E	124	GROZNYJ
37385	42.2N	042.4E	26	SAMTREDIA
37472	43.0N	047.5E	-14	MAHACKALA
37549	41.7N	045.0E	490	TBILISI (doc = 37545)
37686	40.8N	043.9E	1529	LENINAKAN

WMO station number	Latitude	Longitude	Elevation (meters)	Station Name
37735	40.7N	046.4E	303	KIROVABAD
37789	40.2N	044.5E	907	EREVAN
38198	43.3N	068.3E	209	TURKESTAN
38262	42.9N	059.8E	66	CIMBAJ
38353	42.9N	074.5E	828	FRUNZE
38413	41.7N	064.6E	220	TAMDY
38457	41.3N	069.4E	428	TASKENT
38507	40.0N	053.0E	89	KRASNOVODSK
38599	40.2N	069.7E	414	LENINABAD
38618	40.4N	071.8E	577	FERGANA
38687	39.1N	063.6E	193	CARDZOU
38696	39.6N	067.0E	675	SAMARKAND
38750	37.5N	054.0E	23	GASAN-KULI
38763	39.0N	056.3E	97	KIZYL-ARVAT
38836	38.6N	068.8E	824	DUSANBE
38880	37.9N	058.3E	223	ASHABAD
38895	37.6N	062.2E	241	BAJRAM-ALI
38927	37.3N	067.3E	302	TERMEZ
38933	37.8N	068.8E	430	KURGAN-TJUBE
38954	37.4N	071.5E	2080	HOROG
38974	36.5N	061.2E	279	SERAHS
38987	35.3N	062.4E	630	KUSKA