**USGS Benchmark Glacier Mass Balance and Project Data: 1966-2016**

Metadata also available as - [[Questions & Answers](https://mrdata.usgs.gov/validation/php3gL39N.faq.html)] - [[Parseable text](https://mrdata.usgs.gov/validation/php3gL39N-new.txt" \o "This metadata record in an alternative format)] - [[XML](https://mrdata.usgs.gov/validation/php3gL39N-new.xml)]

**Metadata:**

* [Identification\_Information](https://mrdata.usgs.gov/validation/php3gL39N.html#1)
* [Data\_Quality\_Information](https://mrdata.usgs.gov/validation/php3gL39N.html#2)
* [Entity\_and\_Attribute\_Information](https://mrdata.usgs.gov/validation/php3gL39N.html#3)
* [Distribution\_Information](https://mrdata.usgs.gov/validation/php3gL39N.html#4)
* [Metadata\_Reference\_Information](https://mrdata.usgs.gov/validation/php3gL39N.html#5)

*Identification\_Information:*

*Citation:*

*Citation\_Information:*

*Originator:* Emily H. Baker (ORCID: 0000-0002-0938-3496)  
*Originator:* Christopher J. McNeil (ORCID: 0000-0003-4170-0428)  
*Originator:* Louis C. Sass (ORCID: 0000-0003-4677-029X)  
*Originator:* Shad O'Neel (ORCID: 0000-0002-9185-0144)  
*Publication\_Date:* 20180101  
*Title:* USGS Benchmark Glacier Mass Balance and Project Data: 1966-2016  
*Geospatial\_Data\_Presentation\_Form:* tabular digital data  
*Publication\_Information:*

*Publication\_Place:* Anchorage, AK  
*Publisher:* U.S. Geological Survey, Alaska Science Center

Other\_Citation\_Details: Suggested citation: Baker, E. H., (add authors), 2018, USGS Benchmark Glacier Mass Balance and Project Data: 1966-2016: U.S. Geological Survey data release, <https://doi.org/10.5066/xxxxxxx>

*Online\_Linkage:* <https://doi.org/10.5066/xxxxxxx>  
*Larger\_Work\_Citation:*

*Citation\_Information:*

*Originator:* Shad O'Neel (ORCID: 0000-0002-9185-0144)  
*Originator:* Emily H. Baker (ORCID: 0000-0002-0938-3496)  
*Originator:* Louis C. Sass (ORCID: 0000-0003-4677-029X)  
*Publication\_Date:* 2018  
*Title:* Alaska Benchmark Glacier Mass Balance  
*Geospatial\_Data\_Presentation\_Form:* Web Site  
*Publication\_Information:*

*Publication\_Place:* Anchorage, Alaska  
*Publisher:* U.S. Geological Survey, Alaska Science Center

*Online\_Linkage:* <https://alaska.usgs.gov/portal/project.php?project_id=18>

*Larger\_Work\_Citation:*

*Citation\_Information:*

*Originator:* Shad O'Neel (ORCID: 0000-0002-9185-0144)  
*Originator:* Emily H. Baker (ORCID: 0000-0002-0938-3496)  
*Publication\_Date:* 2018  
*Title:* Alaska Benchmark Glacier Mass Balance  
*Geospatial\_Data\_Presentation\_Form:* Web Site  
*Publication\_Information:*

*Publication\_Place:* somewhere  
*Publisher:* CLU

*Online\_Linkage:* <https://www2.usgs.gov/climate_landuse/clu_rd/glacierstudies/>

*Description:*

*Abstract:*

Since the late 1950s, the USGS has maintained a long-term glacier mass-balance program at three North American glaciers. Measurements began on South Cascade Glacier, WA in 1958, expanding to Gulkana and Wolverine glaciers, AK in 1966, and later Sperry Glacier, MT in 2005. Additional measurements have been made on Lemon Creek and Taku glaciers, AK to compliment data collected by the Juneau Icefield Research Program (JIRP; Pelto et al., 2013). Direct field measurements of point glaciological data are combined with weather and geodetic data to derive glacier-wide seasonal and annual surface mass balance solutions of each glacier in conventional and reference surface formats (Cogley et al., 2011). Additional details on the calculation of glacier-wide surface mass balance is described in Van Beusekom et al. (2010).

*Purpose:*

The purpose of this project is to quantitatively record changes in mass at specified glaciers over the period of record. Although this data was primarily collected for the purpose of mass balance, there are many other potential uses for this data, including ecological assessments, remote sensing validation, or water resource applications. Data is included as available, though the history of the project. Additional older, analog records may be available via digitized scans of field notebooks.

*Supplemental\_Information:*

This collection of data is composed of the varied datasets used by the USGS Benchmark Glacier program to measure seasonal and annual mass balance. Products within the release range from raw field data to processed glacier-wide mass balance measurements.

*Time\_Period\_of\_Content:*

*Time\_Period\_Information:*

*Range\_of\_Dates/Times:*

*Beginning\_Date:* 19700101  
*Ending\_Date:* 20170101

*Currentness\_Reference:* publication date

*Status:*

*Progress:* Planned  
*Maintenance\_and\_Update\_Frequency:* Annually

*Spatial\_Domain:*

*Bounding\_Coordinates:*

*West\_Bounding\_Coordinate:* -148.95  
*East\_Bounding\_Coordinate:* -145.33  
*North\_Bounding\_Coordinate:* 63.35  
*South\_Bounding\_Coordinate:* 60.35

*Keywords:*

*Theme:*

*Theme\_Keyword\_Thesaurus:* ISO 19115 Topic Category  
*Theme\_Keyword:* geoscientificInformation  
*Theme\_Keyword:* boundaries  
*Theme\_Keyword:* climatologyMeteorologyAtmosphere  
*Theme\_Keyword:* elevation  
*Theme\_Keyword:* environment

*Theme:*

*Theme\_Keyword\_Thesaurus:* None  
*Theme\_Keyword:* geophysics  
*Theme\_Keyword:* Glaciology

*Theme:*

*Theme\_Keyword\_Thesaurus:* NASA Earth Science Thesaurus  
*Theme\_Keyword:* Cryosphere  
*Theme\_Keyword:* Glaciers/Ice Sheets  
*Theme\_Keyword:* Glaciers  
*Theme\_Keyword:* Ablation Zones/Accumulation Zones  
*Theme\_Keyword:* Glacier Elevation/Ice Sheet Elevation  
*Theme\_Keyword:* Glacier Mass Balance/Ice Sheet Mass Balance

*Theme:*

*Theme\_Keyword\_Thesaurus:* USGS CSA Biocomplexity Thesaurus  
*Theme\_Keyword:* Glaciology  
*Theme\_Keyword:* Geomorphology  
*Theme\_Keyword:* Geology  
*Theme\_Keyword:* Remote Sensing

*Theme:*

*Theme\_Keyword\_Thesaurus:* USGS Thesaurus  
*Theme\_Keyword:* glaciology  
*Theme\_Keyword:* glaciation  
*Theme\_Keyword:*   
*Theme\_Keyword:* precipitation measurement  
*Theme\_Keyword:* snow and ice cover  
*Theme\_Keyword:*

*Place:*

*Place\_Keyword\_Thesaurus:Place\_Keyword:*

*Place:*

*Place\_Keyword\_Thesaurus:* USGS Geographic Names Information System  
*Place\_Keyword:* Wolverine Glacier

*Place\_Keyword:* Gulkana Glacier  
*Place\_Keyword:* Sperry Glacier  
*Place\_Keyword:* South Cascade Glacier  
*Place\_Keyword:* Lemon Creek Glacier  
*Place\_Keyword:* Juneau Icefield

*Access\_Constraints:* none  
*Use\_Constraints:*

It is requested that the authors and the USGS Alaska Science Center be cited for any subsequent publications referencing this dataset. It is strongly recommended that careful attention be paid to the contents of the metadata file associated with these data in order to evaluate data set limitations, restrictions and recommended uses. When appropriate, please consider co-authorship with the authors of this data.

*Point\_of\_Contact:*

*Contact\_Information:*

*Contact\_Organization\_Primary:*

*Contact\_Organization:* U.S. Geological Survey, Alaska Science Center

*Contact\_Address:*

*Address\_Type:* Mailing  
*Address:* 4210 University Dr.  
*City:* Anchorage  
*State\_or\_Province:* AK  
*Postal\_Code:* 99508-4626  
*Country:* USA

*Contact\_Voice\_Telephone:* (907) 786-7000  
*Contact\_Facsimile\_Telephone:* (907) 786 - 7020  
*Contact\_Electronic\_Mail\_Address:* ascweb@usgs.gov

*Data\_Quality\_Information:*

*Attribute\_Accuracy:*

*Attribute\_Accuracy\_Report:*

Attribute accuracy is described in each individual dataset metadata separately, and should be referenced there for specific descriptions.

*Logical\_Consistency\_Report:*

Logical consistency is described in each individual dataset metadata separately, and should be referenced there for specific descriptions.

*Completeness\_Report:*

Dataset compleness is described in each individual dataset metadata separately, and should be referenced there for specific descriptions.

*Positional\_Accuracy:*

*Horizontal\_Positional\_Accuracy:*

*Horizontal\_Positional\_Accuracy\_Report:*

Positions are reported to 1 m and the location of the site is known to higher accuracy. However, ablation stakes located on the glacier are moving, and the coordinates represent an average location that the measurement stake flows through on an annual basis. Snow pits and probed snow depths are located close to, but not precisely at site coordinates.

*Lineage:*

*Process\_Step:*

*Process\_Description:*

Processing steps are detailed separately for each item in the collection.

*Process\_Date:* 2018

*Entity\_and\_Attribute\_Information:*

*Overview\_Description:*

*Entity\_and\_Attribute\_Overview:*

Mass balance is calculated from direct field measurements in combination with weather data and imagery analyses. Mass balance is calculated at both a seasonal and annual time-step at each glacier in both a conventional and reference surface format (Cogley and others, 2011). The analysis framework (Van Beusekom and others, 2010; O’Neel and others, 2014) is identical at each glacier to enable cross-comparison between output time series. Vocabulary used follows Cogley and others (2011) Glossary of glacier mass balance.

Interpreted data, including calculated glacier-wide mass balance, daily weather data, and point mass balances are released in O'Neel (2016), at <https://doi.org/10.5066/F7HD7SRF>.

Point raw glaciological data, including snow density, ablation stake, and snow depth measurements are released in Baker (2018), at <https://doi.org/10.5066/XXXXXXXXXX>.

Geodetic data, and raw, sub-daily weather data will be included in future releases.

*Entity\_and\_Attribute\_Detail\_Citation:*

Cogley, J. G., Hock, R., Rasmussen, L. A., Arendt, A. A., Bauder, A., Braithwaite, R. J., et al. (2011). Glossary of Glacier Mass Balance and Related Terms. IHP-VII Technical Documents in Hydrology, 86.

O’Neel, S., Hood, E., Arendt, A., and Sass, L., 2014, Assessing streamflow sensitivity to variations in glacier mass balance: Climatic Change, v. 123, no. 2, p. 1–13.

Van Beusekom, A.E., O’Neel, S., March, R.S., Sass, L.C., and Cox, L.H., 2010, Re-analysis of Alaskan benchmark glacier mass-balance data using the index method: U.S. Geological Survey Scientific Investigations Report, v. 2010, no. 5247, p. 16.

*Distribution\_Information:*

*Distributor:*

*Contact\_Information:*

*Contact\_Organization\_Primary:*

*Contact\_Organization:* U.S. Geological Survey, Alaska Science Center

*Contact\_Address:*

*Address\_Type:* Mailing and Physical  
*Address:* 4210 University Dr.  
*City:* Anchorage  
*State\_or\_Province:* AK  
*Postal\_Code:* 99508-4626  
*Country:* USA

*Contact\_Voice\_Telephone:* (907) 786-7000  
*Contact\_Electronic\_Mail\_Address:* [ascweb@usgs.gov](mailto:ascweb@usgs.gov)

Resource\_Description: Authoritative source for access to data in the collection.

*Distribution\_Liability:*

Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data on any other system or for general or scientific purposes, nor shall the act of distribution constitute any such warranty.

*Standard\_Order\_Process:*

*Digital\_Form:*

*Digital\_Transfer\_Information:*

*Format\_Name:* Zip

Format\_Version\_Number: 19.0

Format\_Information\_Content: See metadata for individual data sets regarding information about zip package contents.

*Digital\_Transfer\_Option:*

*Online\_Option:*

*Computer\_Contact\_Information:*

*Network\_Address:*

*Network\_Resource\_Name:* <https://doi.org/10.5066/xxxxxxxxxxxxx>

*Fees:* none

*Metadata\_Reference\_Information:*

*Metadata\_Date:* 20180201  
*Metadata\_Contact:*

*Contact\_Information:*

*Contact\_Organization\_Primary:*

*Contact\_Organization:* U.S. Geological Survey, Alaska Science Center

*Contact\_Address:*

*Address\_Type:* Mailing and Physical  
*Address:* 4210 University Dr.  
*City:* Anchorage  
*State\_or\_Province:* Alaska  
*Postal\_Code:* 99508-4626  
*Country:* USA

*Contact\_Voice\_Telephone:* (907) 786-7000  
*Contact\_Electronic\_Mail\_Address:* ascweb@usgs.gov

*Metadata\_Standard\_Name:* FGDC Content Standard for Digital Geospatial Metadata  
*Metadata\_Standard\_Version:* FGDC-STD-001.1-1999

Generated by [mp](https://geology.usgs.gov/tools/metadata/tools/doc/mp.html) version 2.9.45 on Thu Jan 25 18:00:07 2018