README

----- GENERAL INFORMATION -----

DATA TITLE: Data supplementing “Controls on subglacial rock friction: Experiments with debris in temperate ice”

PROJECT TITLE: Controls on subglacial rock friction: Experiments with debris in temperate ice

DATA ABSTRACT: These data supplement the article “Controls on subglacial rock friction: Experiments with debris in temperate ice” by Anna C. Thompson, Neal R. Iverson, and Lucas K. Zoet. Included are time-series data from the four experiments with debris in ice (.csv files), including records of shear stress, normal stress on the ice ring (i.e., ice pressure), and vertical position. Plots of these data (.tif files) from the four experiments illustrate the measurement periods between adjustments in bed-normal ice velocity and ice pressure, from which the values of Table 1 in the article were calculated. Three additional figures (.tif files) illustrate, respectively, the relationship between contraction rate and bed-normal ice velocity, the setup of the ancillary experiments for measuring clast-bed friction, and the relationship between contact forces and shear forces measured in those experiments.

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ASSOCIATED PUBLICATIONS: Controls on subglacial rock friction: Experiments with debris in temperate ice, in review.

COLLECTION INFORMATION:

Time period: 2018-2019

Location: Iowa State University

----- FILE DIRECTORY -----

1a. Exp1_TimeSeriesData.csv
1b. Exp2_TimeSeriesData.csv
1c. Exp3_TimeSeriesData.csv
1d. Exp4_TimeSeriesData.csv
2a. Exp1_TimeSeriesPlot.tif

2b. Exp2_TimeSeriesPlot.tif
2c. Exp3_TimeSeriesPlot.tif
2d. Exp4_TimeSeriesPlot.tif
3. ContractionRate_vs_BedNormalIceVelocity.tif
4. Setup_ClastBedFrictionExperiments.tif
5. Results_ClastBedFrictionExperiments.tif

----- FILE LIST-----

1. (a-d). Time Series – Data from each experiment.

2. (a-d). Time Series Plots – Plots of shear stress, normal stress, and vertical position during each experiment. Red highlights the periods between adjustments over which measurements were made. Blue stars mark the beginnings of measurement periods.

3. Contraction rate vs. bed-normal ice velocity - Relationship between contraction rate and bed-normal ice velocity, used to calculate bed-normal ice velocity from measurements of contraction rate.

4. Configuration of clast-bed friction experiments - Photographs that illustrate the setup of the ancillary experiments to measure clast-bed friction in the absence of ice.

5. Results of clast-bed friction experiments – Shear force per clast as a function of contact force per clast.

----- CODEBOOK -----

Number Of Variables: 4

Number Of Cases/Rows: 59757(a), 68022(b), 90125(c), 63031(d)

Missing Data Codes: blank, NaN

----- VARIABLES -----

Name	Description	Units
Normal stress	Stress applied normal to the ice ring, controlled by a hydraulic ram.	kPa
Total shear stress	Total shear stress recorded between the ice ring and the ice chamber.	kPa

Shear stress from debris friction	Shear stress in excess of the shear stress recorded with a clean ice ring, and thus the result of debris	kPa
Vertical position	The vertical position of the ice ring, which reflects melting ice. Used to calculate contraction rate.	mm

----- METHODS AND MATERIALS -----

----- DATA COLLECTION METHODS -----

Using a ring-shear device at Iowa State University, we rotate an ice ring (outside diameter = 0.9 m) with isolated till clasts over a smooth rock bed. Ice is kept within 0.01oC of its pressure-melting temperature, and meltwater drains along a film at the bed to atmospheric pressure at its edges. The ice pressure or bed-normal component of ice velocity is controlled, while bed shear stress is measured. Normal stress is measured with a load cell above the hydraulic-press piston, shear stress is measured with a sensor in the central drive shaft that records the torque required to turn the upper platen, and vertical position is measured with an LVDT.

----- DATA PROCESSING METHODS -----

The LVDT is periodically reset when it reaches its full extent. Thus, vertical position measurements during the brief periods when the device is out of place have been removed. When the LVDT is replaced, vertical position is reported relative to the position it left off.

Shear stress from debris friction is calculated using the normal stress and relationships from debris-free experiments. The shear stress measured in experiments with debris-free ice at a given normal stress is subtracted from the total measured shear stress to isolate the remaining shear stress due to debris-bed friction.

All other data here are raw data.

------- Licensing -------