Data Description:
This dataset provides the mechanical data obtained and presented in the manuscript “The rheological behavior of CO2 ice: application to glacial flow on Mars”, by Cross et al., published in Geophysical Research Letters. Contained within the dataset are the steady-state differential stress and strain rate data used to derive a rheological flow law for non-linear CO2 ice creep, along with shortening strain and sample temperature data corresponding to each steady-state data point.

Acquisition Description:
Samples of fine-grained, high-purity CO2 ice were fabricated and deformed in a cryogenic gas confining medium apparatus at the University of Pennsylvania. Strain rate stepping experiments were performed in uniaxial compression under constant temperature. Axial load measurements were continuously recorded, using a semi-internal steel force gauge, while piston displacements were recorded using LVDTs. Stresses were obtained by dividing load by the cross-sectional area of the sample, calculated from piston displacement assuming isochoric (constant volume) deformation. Steady-state stresses were obtained after subtracting the strength of the indium jacket surrounding the sample, based on a calibration obtained via experiments on pure indium ingots.

Related Publications: Cross, A. J., Goldsby, D. L., Hager, T. F., Smith, I. B. (accepted). The rheological behavior of CO2 ice: application to glacial flow on Mars, *Geophysical Research Letters*.

Parameter	Description	Units
Temperature	Sample temperature, given by the average reading of two thermocouples located within the lower piston	Kelvin, K
Differential stress	Steady-state differential stress, calculated from load divided by the cross-sectional area of the sample, and corrected for the strength of the indium sample jacket	Megapascals, MPa
Strain rate	Uniaxial strain rate, calculated from the linear displacement of the lower apparatus piston. Converted to $\log_{10}$.	Inverse seconds, s^{-1}
Strain	Shortening strain, calculated from the change in sample length, divided by the original sample length. Converted to percent shortening.	Percent, %

Dataset-specific Instrument Name:
Heard-type cryogenic triaxial gas confining medium apparatus