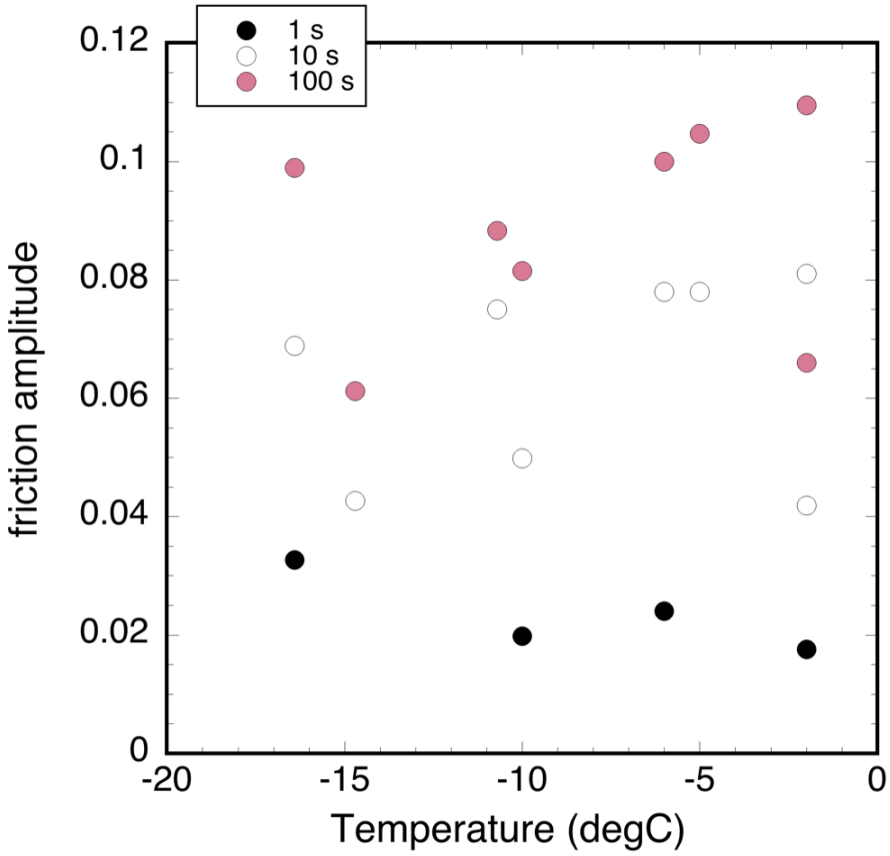
frontiers

Supplementary Material

1 Supplementary Data

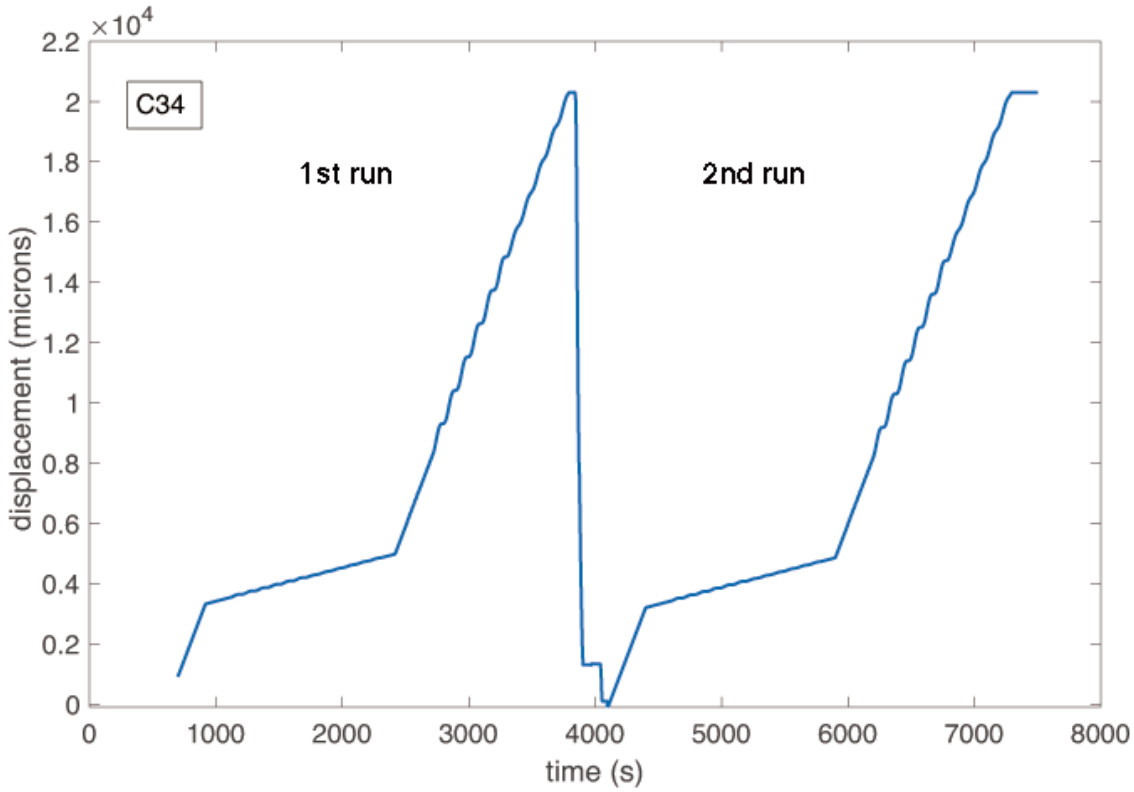
In section 4.2 of the text we describe our method of measuring the mid-to-peak amplitude of the frictional response in these oscillatory experiments. In Fig. 4 we demonstrate clear dependence of this amplitude on forcing period, which is analogous to hold time during slide-hold-slide experiments from previous experiments [*McCarthy et al., 2017*]. Although the 2017 paper demonstrated a temperature dependence of healing, the oscillatory friction data in Fig. 4 do not indicate such temperature dependence. To demonstrate this more clearly, we here plot friction amplitude as a function of temperature (Fig. S1). Here the symbols represent forcing periods. No discernable temperature dependence is observed over this range of conditions.



Supplementary Figure 1. Mid-to-peak friction amplitude of oscillatory experiments (those amplitudes that pass through zero velocity) for experiments C29 – C40 at normal stress = 0.1 MPa. For the range of temperatures measured in this study, no clear temperature dependence is observed.

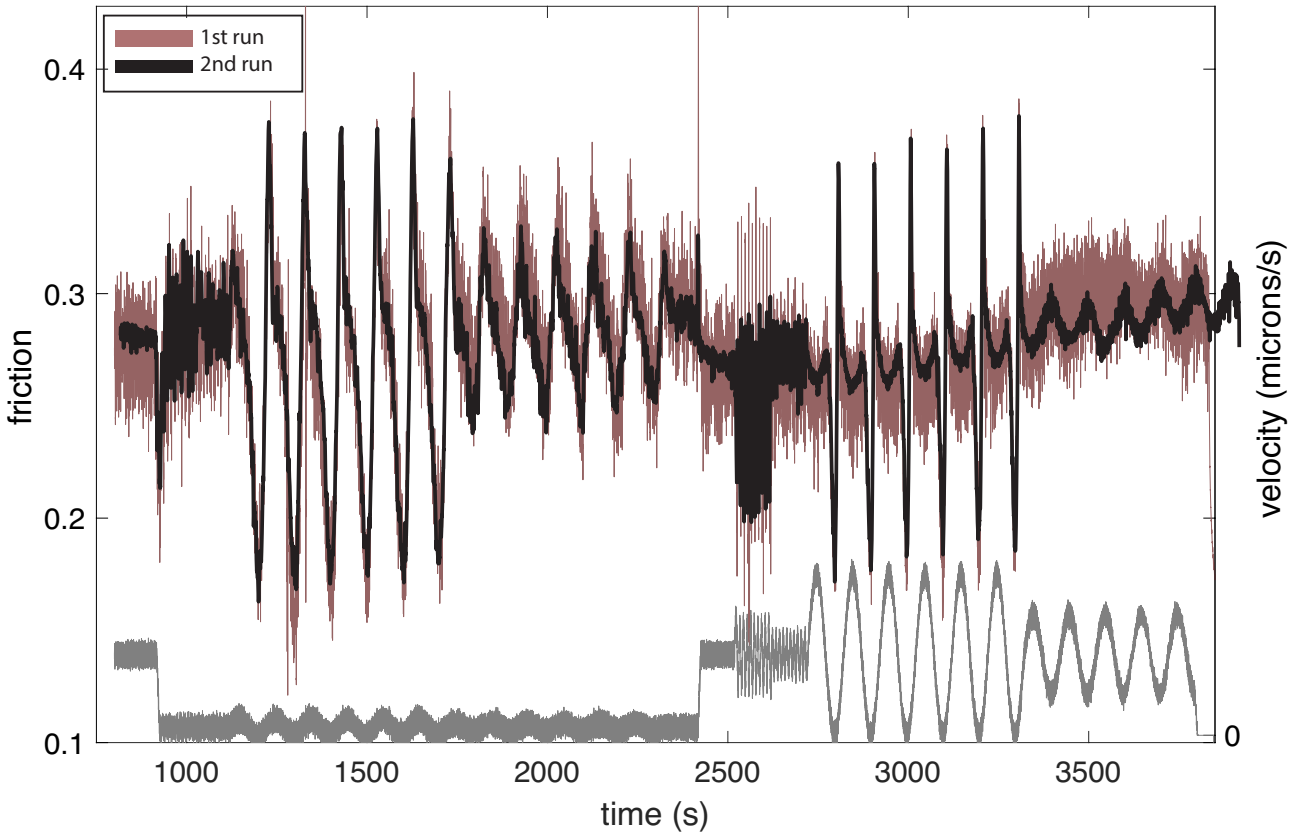
In order to demonstrate the reproducibility of the frictional response under these oscillatory conditions, select experiments were run twice. The displacement curve in Figure S2 shows the driving protocol that was first run for sample C34, at T= -5ºC and a normal stress of 100 kPa. The vertical displacement transducer (DCDT) has a working linear range of approximately 20 mm.

Therefore, once we ran a full control program, we re-zeroed the DCDT and reran the program, in this case at the same temperature and same normal stress.



Supplementary Figure 2. Displacement versus time for sample C34 run at the same conditions under the same velocity control program. A single run has a sliding distance of 20 mm (out of 50 mm maximum with this sample geometry).

Figure S3 demonstrates the reproducibility. The figure also demonstrates the effect of filtering on the response. The data from the first run (pink) is filtered using a 300-point moving average filter window size and the second run has a 200-point window size. The positions of peaks are not altered, but the amplitudes are reduced. For this reason, any measurement of peak height, for instance velocity steps, were made on raw, unfiltered data.



Supplementary Figure S3. Frictional response for two experimental runs conducted in succession at the same conditions, but here superimposed on one another to show the reproducibility of the response. The differences are largely due to filtering effects. The driving velocity is shown in gray on the bottom.