AGU PUBLICATIONS

Geochemistry, Geophysics, Geosystems

Supporting Information for

The Impact of Matrix Rheology and Stress Concentration in Embedded Brittle Clasts

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Additional Supporting Information (Files uploaded separately)

Caption for Dataset S1 with 66 image traces (in jpg format).

Introduction

This Supporting Information file contains:

1. additional flow laws (Figure S1) and discussion which one we considered for our models (Text S1)
2. a table with the coordinates for the trace locations (Table S1). First column: Sample regions corresponding to figure #1 in the accompanying paper, second column, unspaced UTM format for use with ArcGIS, third and fourth columns latitude and longitude, respectively, sixed column distance to pluton rim.
3. caption for the supplementary scans of traces collected in the field (Dataset S1). Nomenclature for the files herein:
    a. All the 'o' within the names simply indicate that they are all the original scans.
    b. NWO - 'Northwest' location. Labeled #1 in Figure 1 in the accompanying paper.
    c. nwo19 - 'Northwest' location. Labeled #2 in Figure 1 in the accompanying paper.
    d. nco - 'North Central' location. Labeled #3 in Figure 1 in the accompanying paper.

e. sco19 - 'South central' location. Labeled #4 in Figure 1 in the accompanying paper.
f. SWO - 'Southwest' location labeled #5 in Figure 1 in the accompanying paper.
g. swo19 - 'Southwest' location. Labeled #6 in Figure 1 in the accompanying paper.

Text S1.

Figure S1 shows different flow laws that may be used for describing the viscous rheology of continental crust: wet Westerly granite by Hansen and Carter (1982; WetGr-HC1982 in red), quartzite by Ranalli (1997; Qz-Ranalli1997 in green) and by Hirth et al (2001; Qz-Hirth2001 in pink) and dry granite from Carter et al. (1981; DryGr-Carter1981 in blue) and Hansen and Carter (1982; DryGr-HC1982 in brown).

In our chosen P-T-$\dot{\varepsilon}$ conditions (which correspond to about 13-14 km depth and to a strain rate of 10^{-11} s^{-1}), dry granite by Hansen and Carter (1982, brown curve) and quartz by Hirth et al. (2001, pink curve) are too “strong”, therefore deformation of the plutonic matrix using these two laws would result in frictional deformation of the matrix, inconsistent with field observations. The other three flow laws have similar behavior (top three curves). Since the matrix of the pluton consists of granite, we chose the dry granite flow law of Carter et al. (1981), based on the absence of extensive veining (therefore fluids) in our field area.

As in all geodynamic models, our results are sensitive to the choice of flow law. There is a lot of uncertainty regarding the strain rates during deformation of the pluton (a range from ~10^{-8} to ~10^{-12} s^{-1} has been suggested by Chen and Nabelek, 2017, with a most likely estimate towards the fastest stain rates). Uncertainty exists also for extrapolation of the dislocation creep parameters from laboratory scales and strain rates to lithospheric length- and time-scales. Therefore, the differences between these two flow laws (wet and dry granite - red and blue curves) are not significant with respect to the necessary assumptions for running the models.

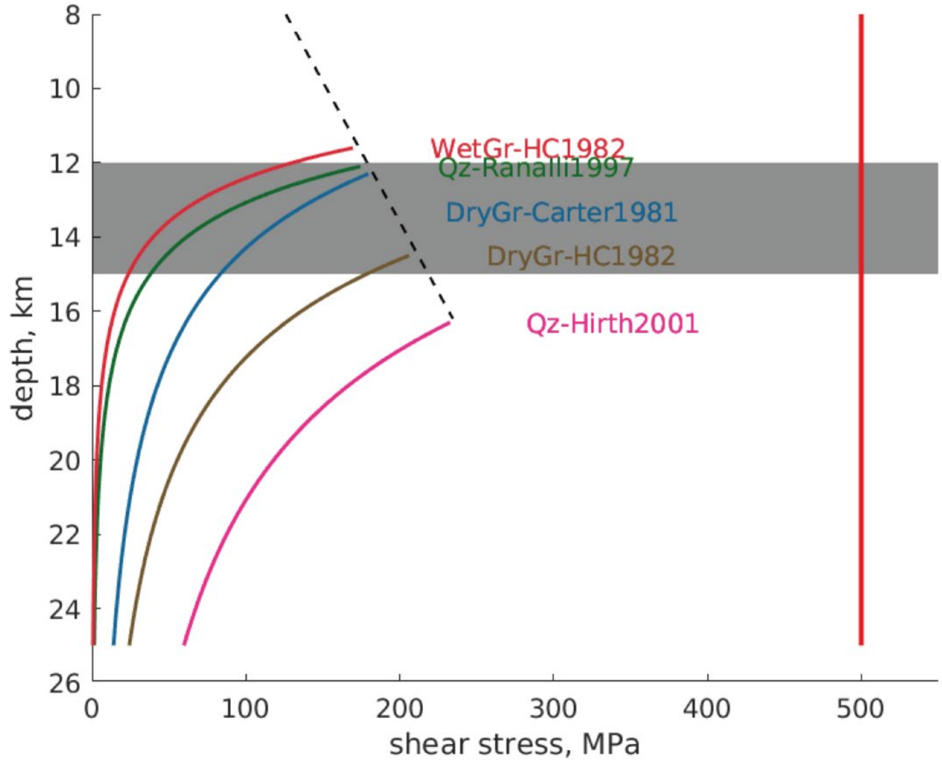

Figure S1. Schematic representation of different rheological law considered for the matrix. Dashed line represents the frictional strength of the matrix. Curved lines represent the different viscous strengths for different materials. Gray box shows the estimated depth of the pluton according to de Saint-Blanquat et al. (2001).

Sample region	UTM coordinate	Latitude	Longitude	Distance from pluton contact (m)
1	11S04003634098482	37.02725613N	118.12021053W	11
	11S04003854098487	37.02730353N	118.11996389W	16
	11S04004234098490	37.02733460N	118.11953714W	27
	11S04004714098447	37.02695214N	118.11899189W	88
	11S04005174098465	37.02711925N	118.11847719W	104
	11S04005274098457	37.02704821N	118.11836373W	117
	11S04003554098454	37.02700293N	118.12029675W	32
	11S04003694098443	37.02690528N	118.12013792W	48
	11S04003674098435	37.02683296N	118.12015935W	54
	11S04003654098424	37.02673361N	118.12018037W	65

	11S04003574098401	37.02652547N	118.12026725W	78
	11S04003494098367	37.02621819N	118.12035268W	104
2	11S04008014098253	37.02523343N	118.11524442W	457
	11S04007924098250	37.02520544N	118.11534519W	452
	11S04007904098245	37.02516017N	118.11536701W	454
	11S04008684098257	37.02527656N	118.11449183W	508
	11S04008674098262	37.02532151N	118.11450372W	505
	11S04008704098266	37.02535788N	118.11447053W	505
3	11S04016044097692	37.02026179N	118.10614492W	1434
	11S04015984097688	37.02022511N	118.10621183W	1432
	11S04015834097706	37.02038577N	118.10638278W	1409
	11S04015684097749	37.02077175N	118.10655700W	1371
	11S04015794097752	37.02079994N	118.10643375W	1379
	11S04015884097754	37.02081891N	118.10633286W	1385
	11S04014574097797	37.02119271N	118.10781092W	1253
	11S04014574097802	37.02123778N	118.10781157W	1251
	11S04014604097802	37.02123809N	118.10777785W	1253
	11S04014124097884	37.02197210N	118.10832811W	1167
	11S04014214097894	37.02206317N	118.10822825W	1168
	11S04014214097899	37.02210823N	118.10822891W	1166
4	11S04008674096868	37.01275782N	118.11432022W	380
	11S04008744096849	37.01258732N	118.11423905W	365
	11S04008724096846	37.01256007N	118.11426113W	363
	11S04008894096841	37.01251680N	118.11406942W	368
	11S04008894096844	37.01254384N	118.11406981W	367
	11S04008294096841	37.01251047N	118.11474374W	344
	11S04008284096825	37.01236616N	118.11475287W	328
	11S04008284096812	37.01224900N	118.11475116W	316
	11S04008324096796	37.01210521N	118.11470410W	302
	11S04008284096786	37.01201467N	118.11474773W	291
	11S04008204096782	37.01197777N	118.11483712W	284
	11S04008054096775	37.01191310N	118.11500477W	273
	11S04008124096655	37.01083231N	118.11491030W	166
	11S04008084096647	37.01075979N	118.11495421W	156

	11S04008064096644	37.01073254N	118.11497629W	153
5	11S04004864096559	37.00993262N	118.11856135W	11
	11S04004794096569	37.01002200N	118.11864134W	13
	11S04004884096577	37.01009506N	118.11854125W	25
	11S04004894096584	37.01015825N	118.11853094W	30
	11S04004794096571	37.01004003N	118.11864161W	15
	11S04004884096615	37.01043754N	118.11854627W	43
	11S04005004096639	37.01065512N	118.11841458W	65
	11S04005164096622	37.01050359N	118.11823252W	72
	11S04004814096658	37.01082434N	118.11863062W	56
	11S04005264096678	37.01100936N	118.11812753W	110
	11S04005064096684	37.01106132N	118.11835309W	91
	11S04005064096693	37.01114244N	118.11835428W	95
	11S04005164096724	37.01142289N	118.11824599W	116
	11S04005064096730	37.01147591N	118.11835917W	112
	11S04005034096739	37.01155670N	118.11839407W	115
	11S04005084096745	37.01161131N	118.11833867W	124
	11S04004904096758	37.01172657N	118.11854268W	118
	11S04004544096745	37.01160559N	118.11894555W	81
6	11S04008874096439	37.00889348N	118.11403901W	4
	11S04008924096445	37.00894809N	118.11398360W	11
	11S04008814096472	37.00919027N	118.11411078W	6.6
NW pluton contact	11S04003914098509	37.02750245N	118.11989936W	-
	11S04004234098521	37.02761399N	118.11954124W	-
	11S04004494098545	37.02783305N	118.11925215W	-
	11S04003564098490	37.02732749N	118.12029027W	-
SW pluton contact	11S04004674096563	37.00996665N	118.11877541W	-
	11S04004554096587	37.01018169N	118.11891344W	-
	11S04004374096623	37.01050424N	118.11912049W	-
	11S04004254096652	37.01076433N	118.11925918W	-
	11S04004074096674	37.01096070N	118.11946438W	-
	11S04004884096544	37.00979764N	118.11853689W	-
	11S04008834096433	37.00883899N	118.11408317W	-
	11S04008904096416	37.00868651N	118.11400227W	-

	11S04008794096456	37.00904586N	118.11413115W	-
	11S04008674096479	37.00925188N	118.11426903W	-
	11S04008464096500	37.00943893N	118.11450780W	-

Table S1. Coordinates of trace locations organized by sampling region.

Data Set S1. Scans of traces collected in the field (jpg format). For nomenclature for the files herein see Introduction in this file.