Supporting information for:

The influence of confining stress and preexisting damage on strain localization in fluid-saturated crystalline rocks at the stress conditions of the upper crust

Jessica McBeck[1], Benoît Cordonnier[2], Yehuda Ben-Zion[3], François Renard[1,4]

[1]Njord Centre, Departments of Physics and Geosciences, University of Oslo, Oslo, Norway.

[2]European Synchrotron Radiation Facility, Grenoble, France

[3]Department of Earth Sciences and Southern California Earthquake Center, University of Southern California, Los Angeles, CA, USA.

[4]Université Grenoble Alpes, Université Savoie Mont Blanc, Université Gustave Eiffel, CNRS, IRD, ISTerre, 38000 Grenoble, France.

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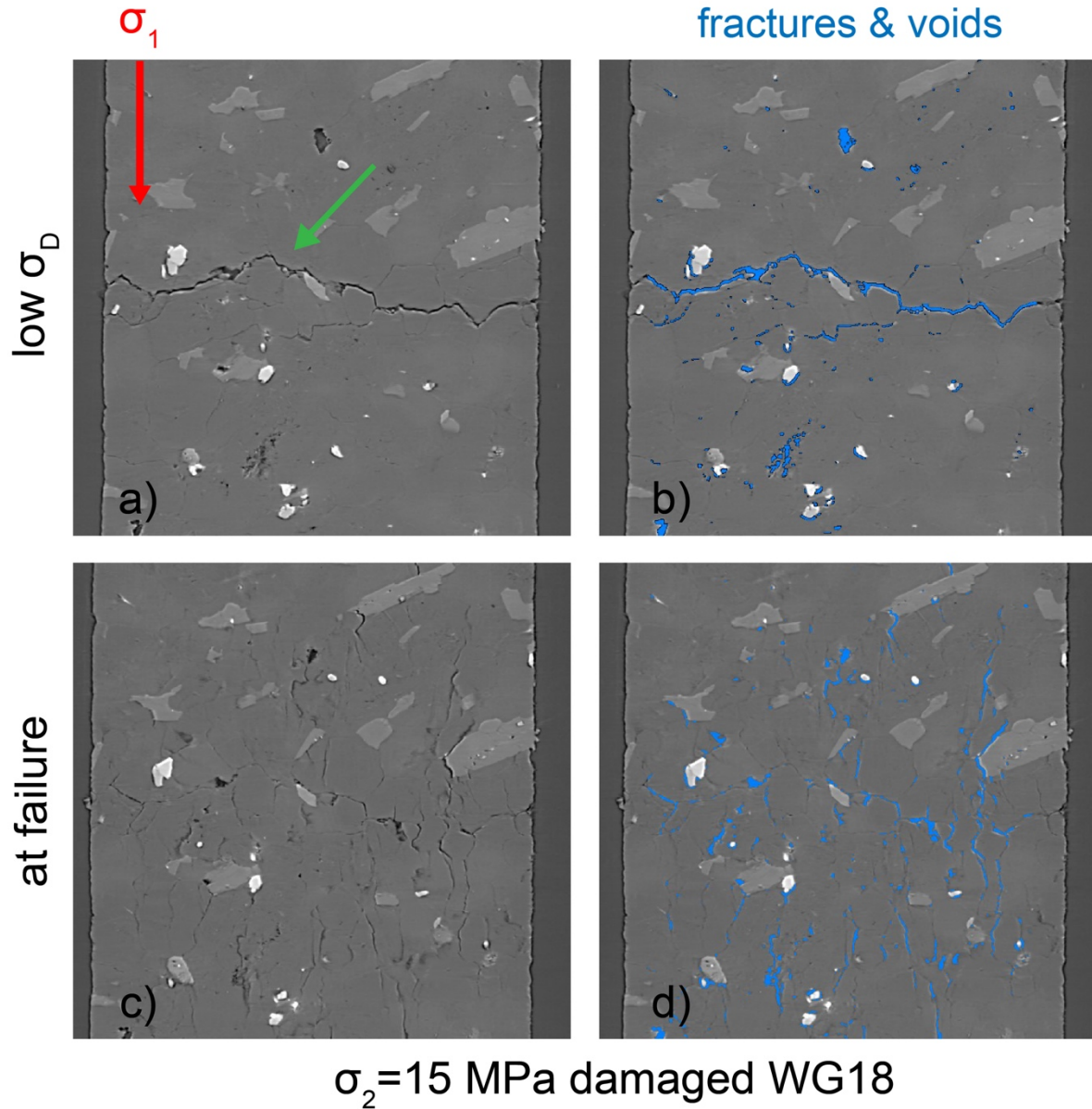Figures S1 to S5
Table S1

Figure S1. Two-dimensional slices of the tomograms (a, c) and segmented voids and fractures (b, d) in experiment WG18 at lower differential stress, σ_D (a, b), and higher σ_D, immediately preceding macroscopic failure (c, d). This rock core developed a horizontal, core-spanning fracture as it was loaded into the triaxial deformation apparatus, highlighted with a green arrow in (a). With increasing axial and differential stress the fracture closed, producing arrays of mostly vertically-aligned fractures that grew until system-size failure.
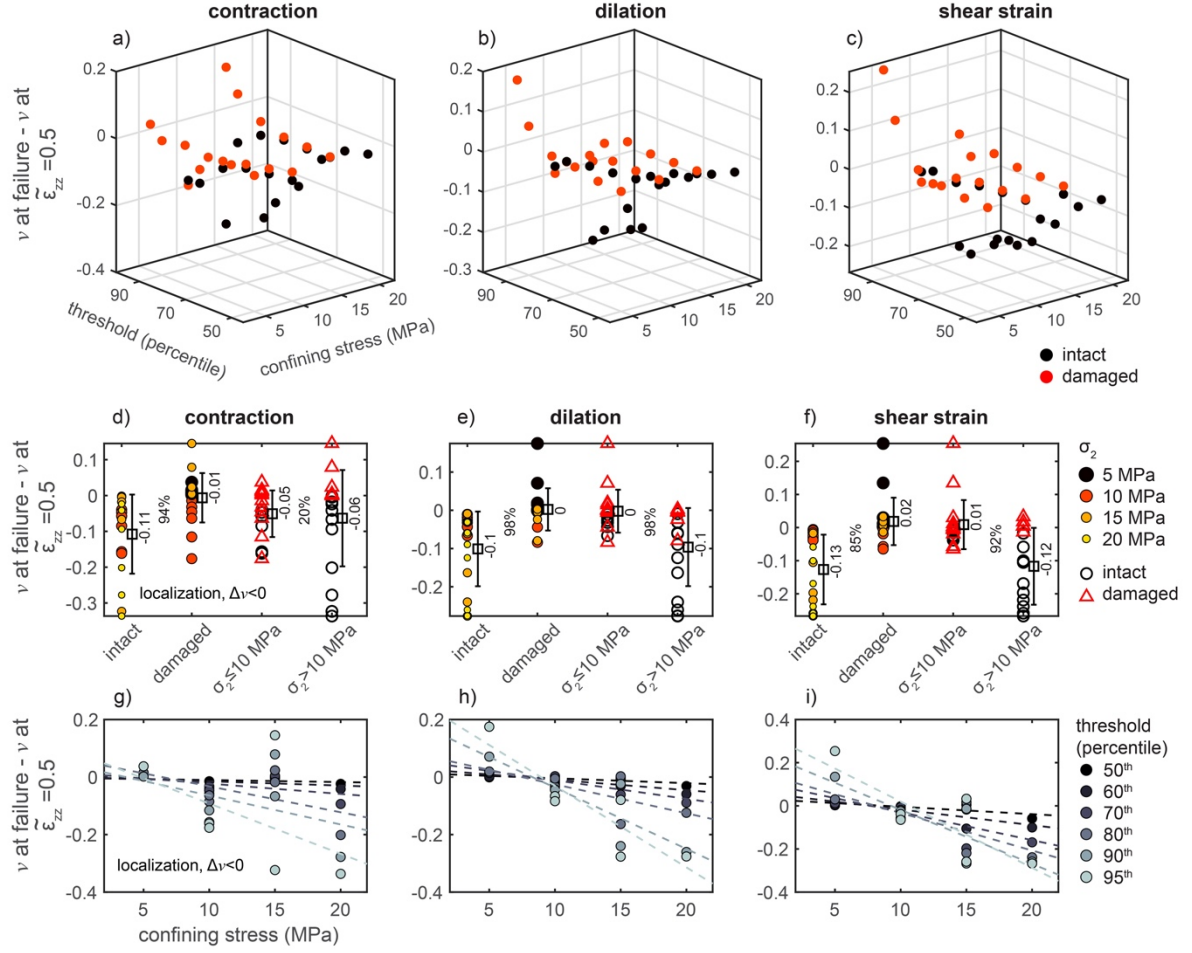
Figure S2. Localization immediately preceding failure measured as the difference in v from the final tomogram acquired immediately preceding failure, when $\widetilde{\varepsilon_{zz}}$ is one, and when $\widetilde{\varepsilon_{zz}}$ is 0.5, Δv. Negative Δv indicates that the high strain events localize towards macroscopic failure. The format of the figure is the same as **Figure 6**.

Figure S3. Localization immediately preceding failure measured as the difference in v from the final tomogram acquired immediately preceding failure, when $\widetilde{\varepsilon_{zz}}$ is one, and when $\widetilde{\varepsilon_{zz}}$ is 0.9, Δv. Negative Δv indicates that the high strain events localize towards macroscopic failure. The format of the figure is the same as **Figure 6**.
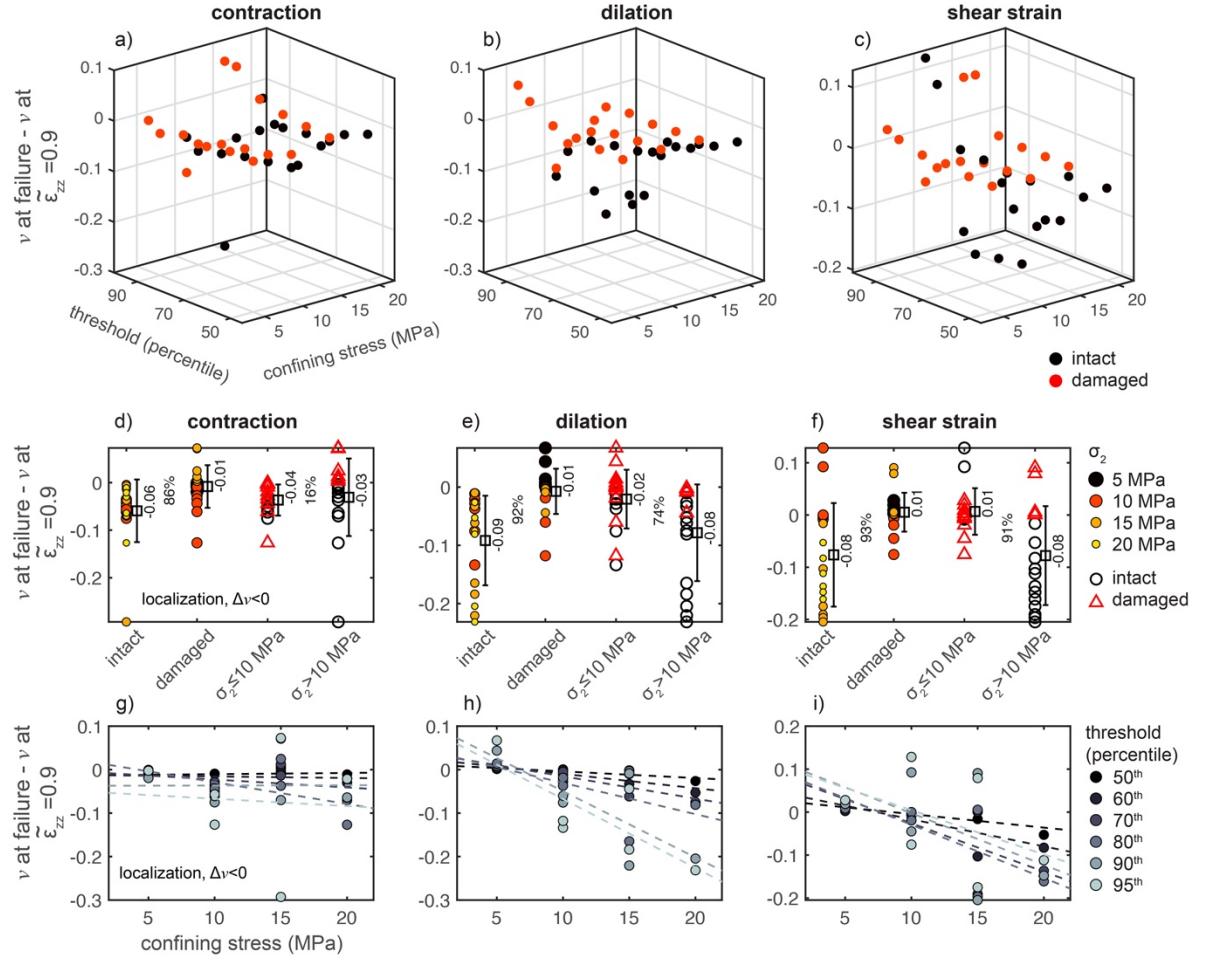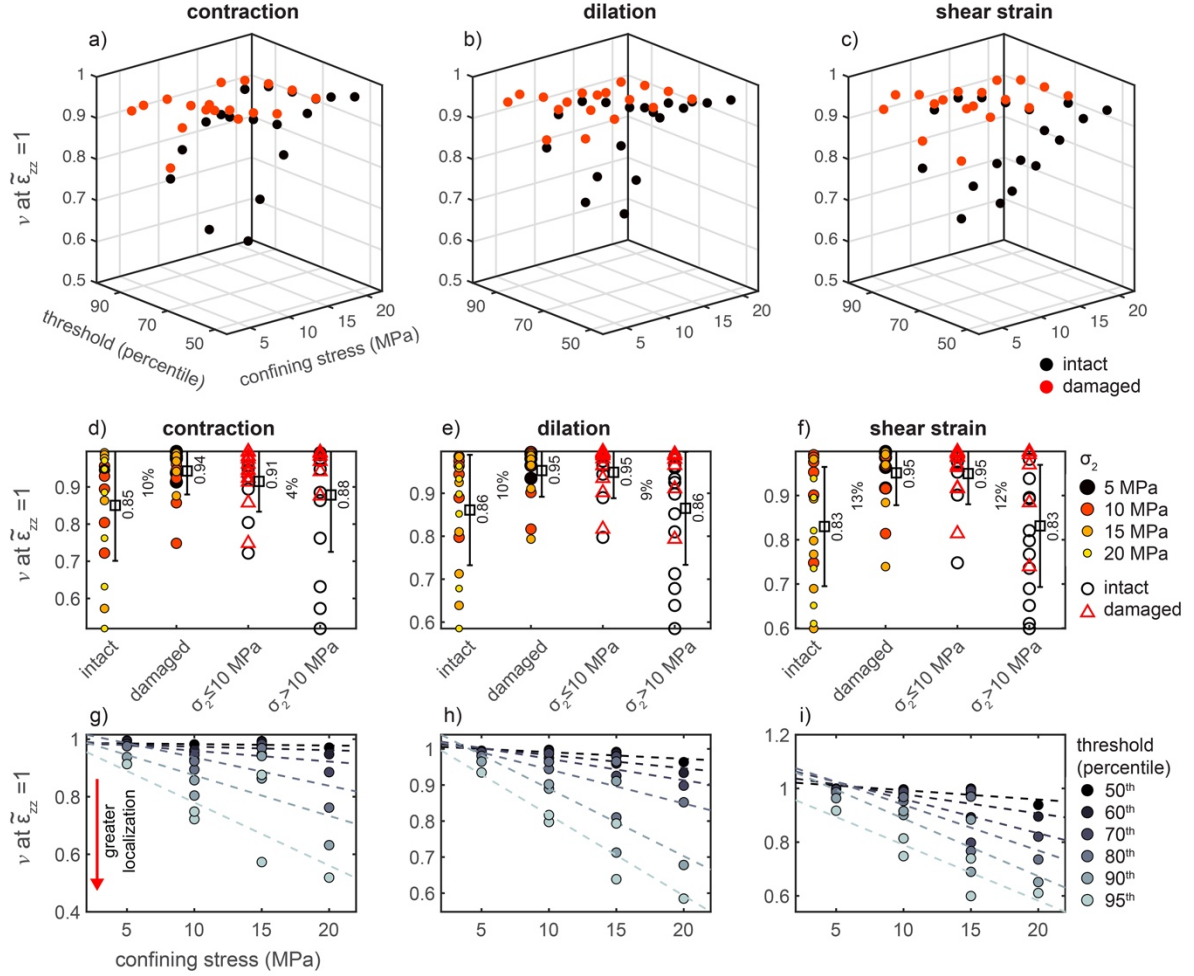
Figure S4. The spatial clustering, v, of the high strain events immediately preceding failure, when $\widetilde{\varepsilon_{zz}}$ is one. Format is the same as **Figure 6**. The trends shown here are similar to those observed for the cumulative localization (**Figure 6**), and localization from when $\widetilde{\varepsilon_{zz}}$ is 0.5, 0.8 or 0.9, to macroscopic failure (**Figures S2-S3**).
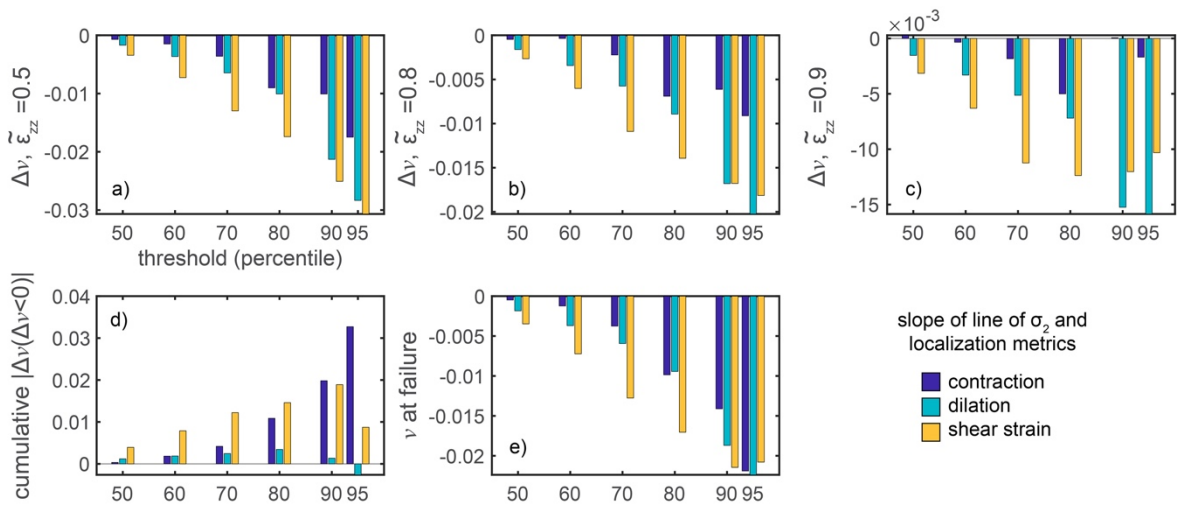

Figure S5. Slopes of the linear fit of different localization metrics for strains >90th percentile and σ_2 of the experiments for each strain component: contraction (dark blue), dilation (light blue), and shear strain (yellow). The horizontal axis indicates strain threshold used to calculate the slope. Each plot shows the slopes for different localization metrics: a-c) Δv using $\widetilde{\varepsilon_{zz}}$=0.5, $\widetilde{\varepsilon_{zz}}$=0.8, and $\widetilde{\varepsilon_{zz}}$=0.9,

d) the cumulative localization, and e) v at failure. Larger magnitudes indicate a stronger influence of σ_2 on localization. The lines that produce each slope are shown in **Figure** 6, **Figure** 7, **Figure** S2, **Figure** S3, and **Figure** S4.

The confining stress	σ_2
The fluid pressure	P_F
The effective stress, $\sigma_2 - P_f$	P_e
The macroscopic cumulative axial strain measured from the change in height of the rock core observed in the tomogram	ε_{zz}
The normalized ε_{zz}. $\widetilde{\varepsilon_{zz}}$ is calculated from the ε_{zz} calculated for the given tomogram, the ε_{zz} of the tomogram acquired immediately preceding macroscopic failure, ε_{zz}^F, and the ε_{zz} of the first tomogram acquired at the onset of the linear phase early in loading, ε_{zz}^0, as $\widetilde{\varepsilon_{zz}} = (\varepsilon_{zz} - \varepsilon_{zz}^0)/(\varepsilon_{zz}^F - \varepsilon_{zz}^0)$	$\widetilde{\varepsilon_{zz}}$
The divergence of the incremental displacement field, the volumetric strain. Negative is contractive and positive is dilative.	$I1$
The second invariant of the deviatoric strain tensor derived from the displacement field, indicative of shear strain.	$J2$
The volume of the polyhedron that surrounds high values of each strain component	v_h
The volume of the polyhedron that surrounds all of the values of the given strain component	v_t
The volume proportion occupied by high strain events, $v = v_h/v_t$	v
The absolute value of the sum of the negative values of the change in v from one digital volume correlation calculation to the next, when $\widetilde{\varepsilon_{zz}} > 0.5$, $\sum_{\widetilde{\varepsilon_{zz}}=0.5}^{\widetilde{\varepsilon_{zz}}=1} \lvert \Delta v (\Delta v < 0) \rvert$. Increasing values indicate higher magnitudes of localization.	Cumulative localization
Change in v from DVC calculation n+1 to n, as $v_{n+1} - v_n$, or change in v from $\widetilde{\varepsilon_{zz}}$=1 to an earlier $\widetilde{\varepsilon_{zz}}$, such as 0.5, 0.8, or 0.9. Negative Δv indicates localization towards macroscopic failure.	Δv

Table S1. Symbols and notation used in the manuscript.