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# Stress distribution in samples from solid confining medium deformation experiments: An experimental and numerical study

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Shear experiments for the Calcite-Aragonite system were performed in a (Griggs-Type) solid medium deformation apparatus at 600°C. The confining pressure ($\sigma_3$) was maintained 0.1 – 0.2GPa below the Calcite-Aragonite transition which occurs at 1.47GPa. The first principal stress ($\sigma_1$) reached 1.55 – 1.8GPa, depending on the sample strength. Thus the bulk sample pressure, approximated by $P_{2D} = (\sigma_1 + \sigma_3)/2$ or $P_{3D} = (\sigma_1 + 2*\sigma_3)/3$ was closely varying around the transition pressure.

Raman spectroscopic data show a strong, systematic heterogeneity in the distribution of the phase transformation in the shear plane ($\sigma_1$-$\sigma_3$ plane). Light microscopy reveals heterogeneous, strain and grain-size distribution. The phase transition is complete at the center and thinned parts of the experimental shear zone, while regions close to the corners of the pistons confining the shear and around those show minor transformation. This is interpreted as being a result of stress, strain and pressure variations within the shear zone.

To further investigate different mechanisms contributing to the phase transition, the local distribution of first order parameters as pressure, stress and strain in the experiment must be understood. To achieve this, numerical modelling based on a finite difference code in Matlab is used (2D and 3D). The modelling results are then compared to experiments, analyzed in the $\sigma_1$-$\sigma_3$ and the $\sigma_1$-$\sigma_2$ plane.