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# Numerical modelling of the evolution of conglomerate deformation up to high simple-shear strain

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Deformed conglomerates have been widely used to investigate deformation history and structural analysis, using strain analyses techniques, such as the Rf-Φ and Fry methods on deformed pebbles. Although geologists have focused on the study of deformed conglomerates for several decades, some problems of the process and mechanism of deformation, such as the development of structures in pebbles and matrix, are still not understand well. Numerical modelling provides a method to investigate the process of deformation, as a function of different controlling parameters, up to high strains at conditions that cannot be achieved in the laboratory. We use the 2D numerical modelling platform Elle coupled to the full field crystal visco-plasticity code (VPFFT) to simulate the deformation of conglomerates under simple shear conditions, achieving high finite strains of $\geq$10. Probably for the first time, we included the effect of an anisotropy, i.e. mica-rich matrix.

Our simulations show the deformation of pebbles not only depends on the viscosity contrast between pebbles and matrix but emphasises the importance of interaction between neighbouring pebbles. Under the same finite strain shearing the pebbles of conglomerates with high pebble densities show higher Rf and lower Φ than those of conglomerates with a low density pebbles. Strain localisation can be observed at both the margin of strong pebbles and in the bridging area between the pebbles. At low to medium finite strain, local areas show the opposite (antithetic) shear sense because of the different relative rotation and movement of pebbles or clusters of pebbles. Very hard pebbles retain their original shape and may rotate, depending on the anisotropy of the matrix. $\sigma$-clasts are formed by pebbles with moderate viscosity contrast between pebble and a softer matrix. By contrast, $\delta$-clasts are not observed in our simulations with both isotropic and anisotropic matrices, which is consistent with their relative scarcity in natural mylonites. The formation of SC-fabrics is enhanced by anisotropy of the matrix, which facilitates strain partitioning in low-strain S-domains and high strain C-domains.