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# Rigid polygons in shear

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Clasts, inclusions, and intrusions in shear are potential recorders of strain, stress, rheology, and metamorphism. In order to extract the recorded information, it is essential to have analytical and numerical theories that describe the deformation mechanics of such bodies. To overcome the simplifications of the commonly employed ellipsoid based shape approximation, a combination of Muskhelishvili-type analytical solutions and finite element method calculations is used to study the behaviour of (quasi) rigid polygons in shear. The results confirm that the polygon rotation and the pressure perturbation outside rigid polygonal clasts are well approximated by ellipse-based theories. However, this observation does not hold for the inside of these polygons, which show strongly varying values of pressure perturbation and maximum shear stress. For example, pressure perturbations inside the polygons are usually the opposite of the neighbouring matrix values across the polygon-matrix interface. This complex behaviour is summarized in the ellipse decomposition rule that allows for a qualitative understanding of the pressure perturbation in and around a wide range of polygons in shear. Other quantities studied include maximum values of overpressure relative to the shortening stress, and the area that undergoes overpressure with respect to the clast size. The results demonstrate that overpressure can be twice as large as the rock strength.