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Pressure variations in viscous boudinage

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Boudinage is a common structural observation observed at different scales and occurs in a variety of geological environments. Mechanical studies conclude that boudinage is the outcome of the different stresses experienced by relative competent layers in a viscous matrix. Viscosity variations will inevitably generate stress and pressure variations. Pressure variations are important for a variety of phenomena such as fluid flow and mass transfer in metamorphic rocks. Calculated results for the pressure variations that develop during the evolution of ductile boudinage are presented in this work. The pressure variations are of similar magnitude like the stresses that are applied in the layers. This result is demonstrated by simple analytical solutions and verified by numerical calculations. The calculations agree with previously published results which suggest that necking is a strong function of the power-law exponent for rocks that are characterized by non-linear viscosities. Pressure variations that develop in the necking regions are a first-order feature as a result of the stress concentrations due to geometrical reasons and therefore high-power law exponents do not only lead to accelerated necking but also to accelerated pressure variations. The distribution of pressure variations in ductile boudinage explains a variety of geological observations related to mass transfer in metamorphic rocks.