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Anomalous weakness of feldspar compared to quartz in deformed porphyritic granitoids: implications for rheology of felsic middle - lower crust.

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The deformation study of deformed porphyritic granite at mid-crustal conditions reveal extreme weakness of feldspars compared to strong quartz. The rheological inversion is manifested by significantly higher strain intensities of feldspar aggregates compared to quartz. Three types of microstructures corresponding to evolutionary stages of deformed granite were recognized: 1) The metagranite marked by viscous flow of plagioclase around strong alkali feldspar and quartz, 2) quartz augen orthogneiss characterized by development of banded mylonitic structure of recrystallized plagioclase and K-feldspar surrounding augens of quartz and 3) banded mylonite characterized by alternation of quartz ribbons and mixed aggregate of feldspars and quartz. The original weakening of alkali feldspar is achieved by decomposition into albite chains and K-feldspar resulting from heterogeneous nucleation process. The development of albite lamellae in feldspar was followed by recrystallization of albite probably using albite twinning structure during subsequent coarsening and deformation. Extreme deformation of feldspars and their progressive mixing are attributed to syn-deformational melting of Mu-Bi rich layers associated with production of 2% melt by dehydration melting and later by higher melt production due possible introduction of external water. The syn-deformational melting is associated with grain boundary slid-

ing controlled diffusion creep of feldspars. It is suggested that small amount of melt is responsible for extreme weakening of feldspar due to Melt Connectivity Threshold effect triggering grain boundary sliding deformation mechanisms. Grain boundary sliding controlled diffusion creep leads to development of cavitation process at high stress and small melt fractions, which evolves to particulate flow at high melt fractions. Strong quartz show dislocation creep deformation mechanisms throughout the whole deformation history marked by variations in activity of slip systems, which are attributed to variations in stress and strain rate partitioning with regard to changing rheological properties of deforming feldspars.