DEFORMATION MECHANISM PATHS FOR BASEMENT THRUST BELT DETACHMENT

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Recent microstructural work on granitic fault zones deformed at shallow to mid-crustal conditions has shown a cause and effect relationship with fluid flow. Fluid-assisted micromechanical and geochemical processes occurring during deformation affect the later permeability and strength evolution of the fault zone, both of which control future fluid flow and deformation. Of particular importance in the upper and middle crust appears to be the role of fluid-induced alteration of feldspars to phyllosilicates, causing weakening. This process is common in foreland basement thrust zones where deformation accommodating slip over several 10's of kilometres has occurred on relatively narrow (1-5 metres thick) fault zones rich in secondary mica. Such deformation mechanisms could cause strain focusing in basement thrust belts to initiate a detachment, otherwise difficult to achieve in the absence of subhorizontal weak layers.This presentation shows the correlation between syn-faulting mica generation and basement thrust detachment faulting. Examples will be taken mainly from the Moine Thrust Zone and the external French Alps from where feldspar-to-muscovite reactions have been evidenced. This relationship is used to consider how such geochemical processes aid detachment. Deformation mechanism paths are proposed for granitic fault zones acting as thrust belt detachments, taking into account the evolution of permeability and the interdependence of fluid flow and deformation mechanisms.