

TEXTURAL RECORD OF STRESS IN MULTIPHASE ROCKS - THE METAMORPHIC APPROACH

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Measurements of palaeostress in rocks are usually restricted to the analysis of microstructural parameters in single-phase aggregates. In contrast, when studying polyphase metamorphic petrologists use them to infer depth-temperature paths - neglecting any contribution of palaeostresses to pressure. This is surprising since many observations attest of deviatoric stresses in polyphase rocks, for example pressure shadows. Here we present results of investigation of pressure dependent equilibria in polyphase metapelitic gneisses from shear zones in the Austroalpine nappe complex / Austria. We compare textural observations of metamorphic decompression reactions with calculated changes of modal abundance in pressure sensitive mineral equilibria. For example, we show that local stress differences of 100 MPa correspond to volumetric shifts between biotite and muscovite, that are observed in the rocks in pressure shadows behind garnet. Finite element modeling of real microstructures and reaction textures provide an independent constraint on the expected modal changes as a function of local stress changes.