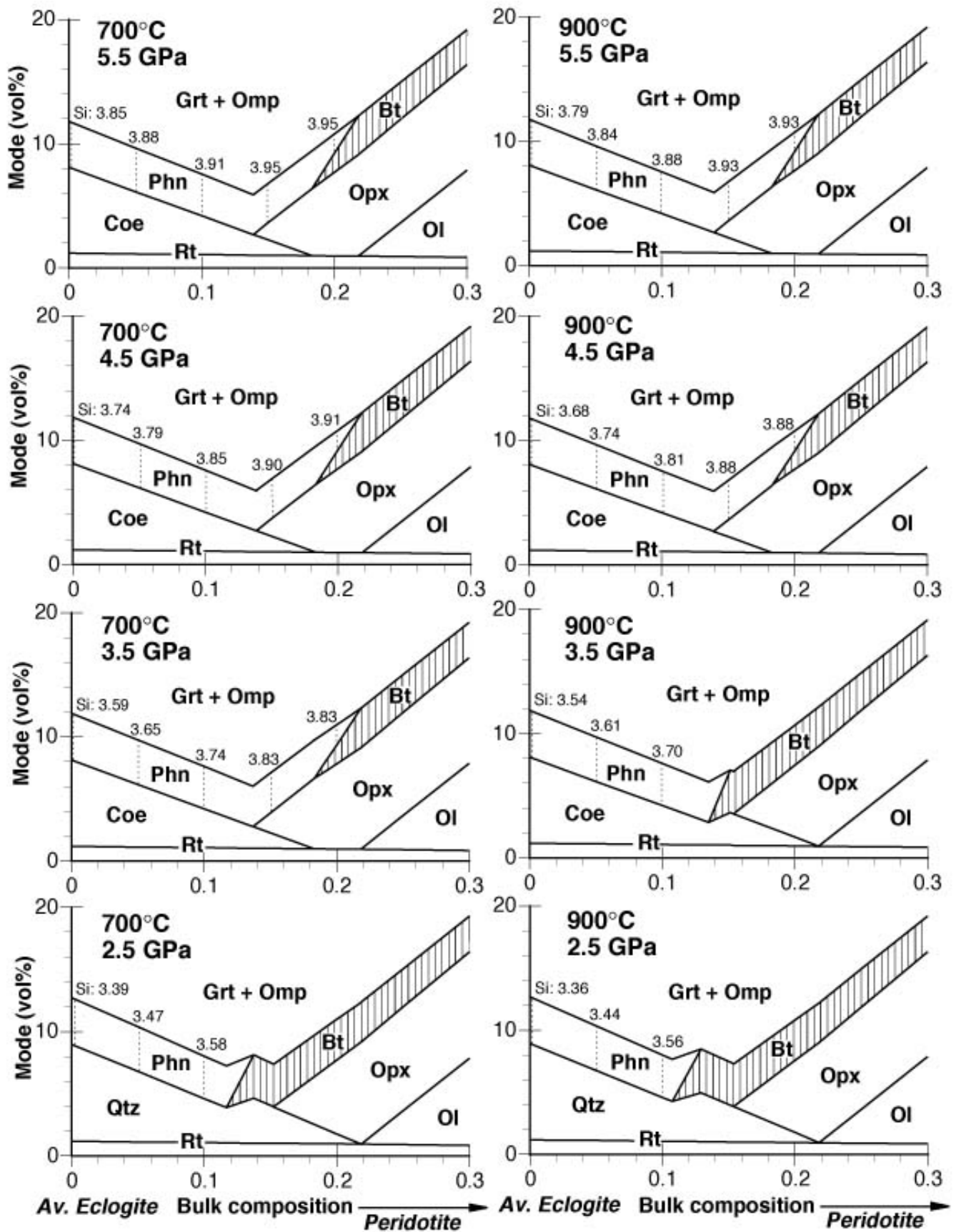


Stability of phengite and biotite in eclogite-peridotite system

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The stability of K-bearing sheet silicates was evaluated with thermodynamic calculations in multi-component system. Generally, phengite is a major K phase in natural eclogite. However, in eclogites from the Norwegian Caledonides, biotite occurs as a stable eclogite-facies mineral, and is often associated with orthopyroxene. Bulk compositions of such biotite- or orthopyroxene-bearing eclogites are rich in a peridotite component compared with normal basalts, and are similar to picrite basaltic compositions. Thermodynamic calculations in conjunction with mass-balance calculations revealed that phengite should be stable in eclogite close to mid-ocean ridge basalt in composition, whereas biotite and orthopyroxene should be stable in picrite basaltic compositions. In addition, the model calculation showed that biotite + coesite + garnet association was stable only up to 3-4 GPa at 700-900 degree C, above which biotite should be replaced by phengite. However, in picrite basalt eclogite without excess coesite, biotite should not be replaced by phengite and would be stable at least up to 5 GPa (figure). Thus, mineral assemblage in picrite basalt system should be completely different from that in normal basaltic system. Depending on bulk compositions, biotite is stabilized instead of phengite even in basaltic compositions. Previous experimental works have shown that phengite should be stable up to about 10 GPa in basaltic system, but this result is not applicable to any basaltic rocks.



Grt: garnet, Omp: omphacite, Phn: phengite, Bt: biotite, Qtz: quartz, Coe: coesite, Opx: orthopyroxene, Ol: olivine, Rt: rutile