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Epidote-rich talc-kyanite-phengite eclogites, Sulu terrane, eastern China: *P-T-f*$_{O_2}$ estimates and the significance of the epidote-talc assemblage in eclogite

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ABSTRACT

Eclogites interlayered with gneiss and minor quartzite in the Qinglongshan near Donghai are characterized by unusually abundant (15–40 vol%) hydrous phases including talc, phengite, and epidote; many also contain kyanite. Garnet hosts both prograde (paragonite, amphibole, epidote) and peak stage (omphacite, epidote, phengite, kyanite) mineral inclusions. Several eclogites contain talc rimmed by barroisite; optically and compositionally similar coarse-grained amphibole in other samples indicates that the reaction Omp + Tlc = Amp has completely consumed talc. Estimated peak conditions of 30–35 kbar, 600–700 °C, are consistent with polycrystalline quartz pseudomorphs after coesite included in garnet, omphacite, epidote, and kyanite, and up to 3.6 Si pfu (11 O atom basis) in phengite. Garnet-epidote oxygen barometry on the peak metamorphic assemblage indicates oxygen fugacities above the Hem-Mag buffer, consistent with the epidote + talc assemblage and 5–20 mol% aegerine component in omphacite. The high oxygen fugacity calculated in this study as well as previously documented negative oxygen isotope values recorded by these rocks may both reflect alteration by oxidizing, meteoric water in a hydrothermal system. Oxidized conditions during peak metamorphism may explain the extreme scarcity of microdiamond in this area. The Ep + Tlc assemblage is stabilized by high oxygen fugacity, and demonstrates that talc-bearing eclogites are not restricted only to unusually Mg-rich bulk compositions.