

## INCIPIENT ECLOGITIZATION BELOW 300 °C PRESERVED IN GUATEMALAN LAWSONITE-ECLOGITE

TSUJIMORI, T.<sup>1</sup>, LIOU, J. G.<sup>1</sup>, SISSON, V. B.<sup>2</sup>, HARLOW, G. E.<sup>2</sup> & SORENSEN, S. S.<sup>3</sup>

<sup>1</sup>Dept. of Geological and Environmental Sci., Stanford Univ., Stanford, CA 94305, USA

<sup>2</sup>Dept. of Earth Planet. Sci., American Museum of Natural History, New York, New York 10024, USA

<sup>3</sup>Dept. of Mineral Sci., National Museum of Natural History, Smithsonian Inst., Washington, DC 20560, USA

e-mail: tatsukix@pangea.Stanford.EDU

Early Cretaceous lawsonite-eclogites and related HP rocks occur as tectonic inclusions within serpentinite mélangé south of the Motagua fault zone, Guatemala (HARLOW et al., 2004; TSUJIMORI et al., 2005). Petrologic and microtextural analyses of four types of mafic HP rocks – jadeite-bearing lawsonite eclogite (JdEC), Type I, II lawsonite-eclogites (Type I LwEC, Type II LwEC), and garnet-bearing lawsonite-blueschist (Grt-LwBS) – reveals three metamorphic stages formed during four deformational phases. The prograde stage represents an incipient eclogitization and is preserved mainly in prograde garnet of all rock types along with older S<sub>1</sub>-S<sub>2</sub> foliations. Rarely it occurs in the matrix of the JdEC and Type II LwEC with S<sub>2</sub>. The assemblage is Grt [X<sub>Mg</sub> = ~ 0.22] + Omp [~ 52 % Jd] (or Jd [~ 83 % Jd]) + Lws + Rt + Qtz ± Phe [3.6 Si pfu]; some also have Chl, Ilm, and rare Fgl. Primary impure jadeite occurs in the JdEC. Lawsonite inclusions in garnet of Type I LwEC contain rare pumpellyite inclusions. The presence of syn-metamorphic brittle deformation, inclusion of precursor pumpellyite, the Fe-Mg distribution coefficient between omphacite inclusions and adjacent garnet ( $\ln(K_D) = 2.7$  4.5), and the Grt-Cpx-Phe thermobarometry suggest that the eclogitization initiated at  $T = \sim 300$  °C and  $P > 1.1$  GPa, and continued to  $T = \sim 480$  °C and  $P = \sim 2.6$  GPa. In contrast, retrograde eclogite-facies assemblage is best preserved in the Type II LwEC and is characterized by reversely zoned rims of garnet and Omp + Gln + Lws + Rt + Qtz ± Phe [3.5 Si pfu] within S<sub>3</sub> foliation; this Gln and Lws contain rutile inclusions. The Grt-Cpx-Phe thermobarometry yields  $P = \sim 1.8$  GPa and  $T = \sim 400$  °C. Intense deformation and recrystallization along with a PT drop and hydration may have been caused by initiation of exhumation. Furthermore, the latest blueschist-facies assemblage (Gln + Lws + Chl + Ttn + Qtz ± Phe ± Ab) along S<sub>4</sub> crenulations locally replaces earlier mineral assemblages as observed in the Grt-LwBS. In summary, these petrologic characteristics indicate: (1) the basalt-eclogite transformation may have occurred at  $T = \sim 300$  °C in a cold subduction zone, and (2) formation of a lawsonite-bearing eclogite assemblage that may not have passed through precursor blueschist-facies. During subduction, dehydration of Chl + Ab + Lws ± Pmp to form Grt + Omp within the lawsonite stability field may be more effective than the glaucophane-forming reaction; lawsonite-eclogitic mineral assemblage may form directly from altered basalt. Instead abundant retrograde glaucophane was formed by hydration during exhumation.

### References

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