LATE MIOCENE–PLIOCENE ECLOGITES OF EASTERN PAPUA NEW GUINEA: THE YOUNGEST KNOWN HP/UHP TERRANE ON EARTH

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Eastern Papua New Guinea (PNG) evolved within the rapid (10 - 11 cm / a) obliquely convergent Australian-Pacific (AUS–PAC) plate boundary zone. Presently the Woodlark Basin of eastern PNG forms the plate boundary between AUS and the Woodlark microplate, and at its western end is undergoing the transition from distributed rifting to seafloor spreading as part of the most rapidly extending (~ 2 - 4 cm / a at 151.5 °E) rift system on Earth. The Cenozoic evolution of this complex plate boundary zone involved northwards subduction of the northern Australian continental margin beneath oceanic lithosphere, a collision that led to HP metamorphism of Jurassic – Cretaceous sediments and basalts, and southward obduction of PAC oceanic crust and mantle. Relics of this subduction event occur as variably retrogressed eclogites subsequently exhumed within the lower plates of the D'Entrecasteaux Islands metamorphic core complexes, located west of the active seafloor spreading rift tip. Results of P-T-t studies demonstrate that this is the youngest exhumed HP/UHP terrane presently known on Earth. Eclogites occur as cross-cutting dikes and layers/lenses within gneisses, and as xenoliths in granodiorites and preserve peak assemblages of Omp + Grt + Rt + Ky + Phn + Qtz. *In situ* ion probe analysis of zircons that occur primarily as inclusions in garnet yielded $^{238}U/^{206}Pb$ ages for six samples ranging from 7.9 - 2.0 Ma. *In situ* ion probe garnet and zircon trace and REE patterns and Grt/Zrc distribution coefficients are similar to those reported for Alpine eclogites and indicate coeval growth of these phases under eclogite facies conditions. We report the first documented occurrence of coesite in eastern PNG, recognized petrographically and confirmed by *in situ* Raman spectroscopy, from a 7.9 Ma eclogite xenolith. The 150 µm diameter SiO_2 inclusion exhibits partial transformation to palisade quartz which led to radial fracturing of its omphacite host grain. Six Raman spectra for this bimineralic inclusion yielded diagnostic Raman bands for coesite at 520, 354 - 356, 270 and 176 cm^{-1} and diagnostic Raman bands for quartz at 463 - 465 cm^{-1}. Results extend the depths of metamorphism for these eclogites and indicate that some were metamorphosed under UHP conditions. Eclogite exhumation from HP/UHP conditions occurred at plate tectonic rates (cm / a) and was facilitated by removal of upper plate rocks during microplate rotation, movement from beneath kilometer scale mylonitic shear zones, and partial transport within magmatic rocks. In this active plate boundary zone it is likely that HP/UHP rocks are still in the process of being exhumed from depth, and structures that facilitate exhumation are still in their geodynamic configuration. Thus, eastern PNG represents the best opportunity globally for finding HP/UHP rocks at depth and unraveling their *in situ* exhumation.