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Title: METAMORPHIC CORE COMPLEX FORMATION IN THE D'ENTRECASTEAUX ISLANDS, SE PAPUA NEW GUINEA

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Abstract: The Woodlark Basin of southeastern Papua New Guinea is a region of transition from rifting to seafloor spreading, where a seafloor spreading center has propagated from east to west since ~ 6 Ma. Thermochronologic data from Misima Island and the D'Entrecasteaux Islands (Goodenough, Fergusson, and Normanby) indicate that metamorphic core complex formation has progressed from east to west ahead of the propagating seafloor spreading center tip. Metamorphic core complex lower plates were exhumed from beneath predominantly low-angle top-to-the-north shear zones and northward-dipping detachment faults. Lower plate lithologies include retrogressed eclogites (Goodenough and Fergusson Islands) exhumed from > 70 km and blueschists (eastern Normanby Island) exhumed from ~ 20 km depth. Combined in situ ion microprobe U-Pb zircon age analyses and trace and rare earth element chemistry from variably retrogressed eclogites from Fergusson and Goodenough Islands document latest Miocene-Pliocene (~ 8,Äì2 Ma) eclogite-facies metamorphism. The presence of coesite within one sample from Fergusson indicates ultra-high pressure metamorphism. Radiometric dating suggests westward younging of eclogite-facies metamorphism from

Fergusson to Goodenough Island and requires exhumation rates > 2.5 cm/yr. Temperature estimates from in situ ion microprobe analyses of [Ti] in zircon and electron microprobe analyses of [Zr] in rutile constrain temperatures for eclogite-facies metamorphism at 611,Äì870ÀöC. 40Ar/39Ar white mica and plagioclase data from retrogressed blueschist- and greenschist-facies rocks from the Prevost Range of eastern Normanby Island constrain Pliocene exhumation and cooling of the lower plate. In combination with structural analyses, these data support an interpretation of a rolling hinge mechanism for the exhumation of the Prevost Range metamorphic core complex. 40Ar/39Ar analyses of mineral separates from andesites and granodiorites from central Normanby, and from felsic gneiss on northwestern Normanby Island document intrusion, volcanism, rapid exhumation and cooling from ~ 2.2,Äì1.8 Ma. The east to west progression of exhumation is associated with counterclockwise rotation of the Woodlark microplate, resulting in unloading of previously subducted continental crust, extension and metamorphic core complex formation.