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Superimposed Neoarchaean and Paleoproterozoic tectonics in the Terre Adélie Craton (East Antarctica): Evidence from Th–U–Pb ages on monazite and $^{40}Ar/^{39}Ar$ ages

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ABSTRACT

In order to understand the tectonic behaviour of a stabilized Neoarchaean continental crust during subsequent tectonic activity, we investigated the composite metamorphic basement along the Terre Adélie and George Vth Land coastline, also known as the Terre Adélie Craton (East Antarctica). Two domains are recognized: (1) a Neoarchaean basement, composed of granulite rocks to the east and overlain to the west by amphibolites, and (2) two Paleoproterozoic detrital basins overly the Neoarchaean crust and extend further west. New geochronological data from the Terre Adélie Craton define a tectonic evolution with three major peaks' activity. Th–U–Pb electron probe analyses of monazite from the Neoarchaean granulites constrain the main structuration event at *ca.* 2.45 Ga in agreement with zircon ages from throughout the Neoarchaean domain. Local resetting together with low temperature recrystallization of monazites occurred at *ca.* 1.7 Ga along hydrated anastomozing metre-scale shear zones. New $^{40}Ar/^{39}Ar$ ages obtained by stepwise heating techniques on amphibole, biotite and muscovite from both the Neoarchaean basement and the Paleoproterozoic basins, illustrate the differential evolutions of basement and its sedimentary cover during the major 1.7 Ga transpressive event. A final event at *ca.* 1.55–1.50 Ga is only recognized close to the Mertz Shear Zone (145°E) bounding the Terre Adélie Craton to the East. The new data allow us to propose detailed geological pictures of the Terre Adélie Craton geodynamic evolution, from the Neoarchaean to the Mesoproterozoic.

1. Introduction

Throughout Earth history and its related secular cooling, the deformation style of continental crust evolved in response to the crustal thermal regime and its stress state (Rey and Houseman, 2006). In recent orogens, cool and strong plates accommodate convergence through a combination of crustal underthrusting along narrow mountain belts and lateral escape of continental blocks along lithospheric strike-slip faults (Tapponnier et al., 1982). In contrast, Archaean continental lithospheres were warmer and accommodated convergence through homogeneous thickening and lateral ductile flow (Rey and Houseman, 2006; Cruden et al., 2006; Cagnard et al., 2006). Subsequently, unloading of warm orogenic domains during the decrease of the converging tectonic force favored orogen-parallel constrictional flow of the crust and tangential motions (Duclaux et al., 2007). The transition from Archaean to modern style geodynamics would appear to take place at around 2.0 Ga (Hamilton, 1998), coincident with the first occurrence of high pressure-low temperature subduction-related eclogites (Collins et al., 2004). Composite Archaean and Paleoproterozoic cratons, which underwent minor subsequent tectonic reactivation, are ideal terrains to study this major geodynamic evolution.

The Terre Adélie Craton (TAC) (Fig. 1) is composed of two crustal domains (Monnier et al., 1996): (1) a Neoarchaean to Siderian

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