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The Triassic of the Antarctic Peninsula

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West Antarctica is composed of four former fragments of Gondwana, which are the Antarctic Peninsula, Thurston Island, Marie Byrd Land and the Ellsworth-Whitmore blocks, all of which were probably dispersed along the Terra Australis margin of southern Gondwana. We present geochronological (zircon U-Pb obtained using LA-ICPMS), geochemical (whole rock) and isotopic (whole rock Nd, Sr; zircon O, Hf) data acquired from Triassic igneous units exposed in the Antarctic Peninsula (Graham and Palmer Land), which are combined with U-Pb dates of detrital zircons extracted from Mesozoic sedimentary units. The igneous rocks are mainly orthogneisses that crop out in remote locations that were i) sampled during two field seasons that were funded for this study, and ii) were donated by the British Antarctic Survey. These data are used to constrain the geological evolution of rocks of the Antarctic Peninsula during the disassembly of southern Gondwana, and the subsequent assembly of West Antarctica. U-Pb zircon concordia ages (magmatic zircon rims) of seven gneissic, calk-alkaline granites and granodiorites that range between 223.0±1.8 – 203.3±0.6 Ma are interpreted as crystallisation ages of Triassic magmas. These plutons are dispersed throughout southern Grahamland and Palmerland. The mainly calc-alkaline orthogneisses plot along the metaluminous-peraluminous boundary of Maniar and Piccoli (1989), yield Na2O/K2O ratios that range between 0.50 to 1.17, and yield upper continental crust normalised multi-element abundances that are close to unity. Trace element concentrations reveal the substantial presence of a subduction derived component, and it is likely that these rocks formed within a continental arc setting. εHft zircon (-8.7 to 1.21), and 87Sr/86Sri whole rock (0.7061-0.7140), εNdt whole rock (-6.22 to -3.33) and Pb isotopic compositions yield no distinct trends with time through the Triassic. Furthermore, these compositions do not reveal any direct input from depleted mantle sources, corroborating the high SiO_2 contents of the rocks. The values and large range in the Hf (zircon), Sr and Nd (whole rock) isotopic compositions supports a derivation from mixed sources that resided within the continental crust, corroborating the geochemical compositions of the rocks. These data suggest that the Late Triassic magmas formed by melting both sedimentary and igneous crustal sources, which mixed to various degrees, forming the large scatter in time-corrected isotopic compositions, and geochemical compositions that straddle I- and S-type criteria (e.g Chappel and White, 1974, 1992; Clemens, 2003; Clemens et al., 2011; Gao et al., 2016). The average age of extraction from the depleted mantle was between 0.73 Ga and 1.37 Ga, with no particular trend with time throughout the Late Triassic. These data suggest that Triassic igneous rocks within the Antarctic Peninsula mainly recycled what was originally Mesoproterozoic to Neoproterozoic crust, which underwent several cycles of anatexis. The timing of melt extraction from the depleted mantle reservoir approximately coincides with the temporally protracted Sunsas belt of South America (1.3 – 0.95 Ga; Cordani et al., 2009), which may host the precursor rocks to the Triassic orthogneisses in the Antarctic Peninsula. A potential tectonic solution for the Triassic will be presented.