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^{187}Re – ^{232}Th – ^{238}U nuclear geochronometry: constraining magmatism in East-Antarctica and the break-up of Gondwana

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^{187}Re – ^{232}Th – ^{238}U nuclear geochronometry is a new dating method for astronomy, earth and planetary sciences [1-4]. Nucleogeochronometric Rhenium-Osmium two-point-isochron (TPI) ages are calculated using a nuclear geochronometer as one data point in a two-point-isochron diagram [5-7]. The IVREA chronometer, for example, is one of five terrestrial nuclear geochronometers identified so far [8]. Here, it is used to constrain the magmatism of the Ferrar flood basalt province, which has been related to continental rifting and the break-up of Gondwana in the Jurassic.TPI ages for seven (basaltic) andesite whole rock samples from the Prince Albert Mountains (Victoria Land, Antarctica) are calculated. An isochron age of 172 ± 5 Ma (^{187}Os/^{188}Os$_i$ = 0.194 ± 0.023) has previously been published for these rocks [9]. Initial TPI ^{187}Os/^{188}Os$_i$ ratios show only minor scatter between ^{187}Os/^{188}Os$_i$ = 0.2149 ± 0.0064 and ^{187}Os/^{188}Os$_i$ = 0.22231 ± 0.00080, in agreement with the enigmatic, suprachondritic ^{187}Os/^{188}Os$_i$ = 0.194 ± 0.023 from the isochron [9]. TPI ages for the Mount Joyce samples range from 125.4 ± 9.9 Ma to 139 ± 17 Ma and thus constrain the youngest magmatic event(s) in the Transantarctic Mountains. For the Thumb Point basalt, a TPI age of 219 ± 81 Ma is calculated. Despite of its large uncertainty, the age itself is in agreement with the Triassic 224 Ma and 240 Ma events reported from North Patagonia [10]. The TPI age of 186.1 ± 8.1 Ma from the Ricker Hill basalt can be clearly distinguished from the Mount Murray TPI age of 158 ± 14 Ma, while at Brimstone Peak two TPI age groups of 155 ± 14 Ma and 175.3 ± 3.1 Ma are observed. From this it may be concluded that the seven TPI ages indicate episodic magmatic activity in East-Antarctica between 125 Ma and 219 Ma, leading to the break-up of Gondwana. This picture is consistent with the geochronology of the Antarctic Peninsula, Patagonia, the Karoo and the Ferrar mafic rocks [10]. Thus, besides constraining planetary crust formation in general, nuclear geochronometry may also become an additional powerful tool in constraining not only magmatic activity in Antarctica but also the assembly and break-up of Pangaea and subsequently Gondwana from the Carboniferous on, as revealed by means of nuclear geochronometry for the ultramafic dykes within the Balmuccia peridotite (Ivrea Zone, NW Italy).

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