**Forum** Comment

doi: 10.1130/G37511C.1

# Mesoproterozoic Tasmania: Witness to the East Antarctica–Laurentia connection within Nuna

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I concur with the finding of Mulder et al. (2015) that the Rocky Cape Group was not sourced from Australia. However, the Rocky Cape Group is but one stratigraphic unit of the micro-continent of VanDieland (Cayley, 2011). For their proposed location for VanDieland to be valid, it must satisfy the constraints imposed by all of the units in the micro-continent, not just one from the period from ca. 1200–1450 Ma.

VanDieland also includes the east South Tasman Rise (Cayley, 2011; Mulder et al., 2015). Rocks there include granites with U/Pb zircon ages of 1120 ± 9 Ma (Fioretti et al., 2005) and with U/Th/Pb monazite ages of 1051 ± 8 Ma that were metamorphosed at ca. 1015 Ma and 920–930 Ma (Berry et al., 2008). Mulder et al.'s figure 2 offers two VanDieland positions near the USA-Canadian border, but neither fits these data. While there is evidence of Grenville-age zircon growth in the Belt Supergroup and adjacent rocks (Doughty and Chamberlain, 2008), there is a dearth of similar-aged granites known north of the Grenville Orogen in 'western' Laurentia (modern position) and in Victoria Land in East Antarctica, and metamorphism in the region of the Belt Supergroup and the corresponding regions in Antarctica appears to have ceased at ca. 1000 Ma (May et al., 2013; Rocchi et al., 2015). Rather, locating the east South Tasman Rise outboard of the southwestern Grenville Orogen, as suggested by Fioretti et al. (2005) and Moore et al. (2015), provides a more coherent fit than either offered by Mulder et al.

Mulder et al. dismiss the 1010 ± 45 Ma detrital zircon ages that Black et al. (2004) obtained from the Jacob Quartzite as resulting from Pb loss. Do they also dismiss results from the Wings Sandstone, another western Tasmanian marginal marine quartzite, where Black et al. (2004) obtained a population of 1022 ± 17 Ma (12 grains), and another as young as 914 ± 44 Ma? Moore et al. (2015, their figure 20) suggested that these come from the erosion of areas near the Grenville Orogen. How do Mulder et al. account for these younger populations? And where is the source for their ca. 1300 Ma upper Rocky Cape Group zircons? None is offered in their figure 4.

Mulder et al. describe the Rocky Cape Group as a "marine shelfal package." Similar modern and ancient packages lie on older cratonic basements (e.g., Jones et al., 2011). Black et al. (2010) found that the Paleozoic western Tasmanian granites had an excess of 1600 Ma zircons when compared to the Rocky Cape Group, implying a basement with excess zircons of that age. Two-stage Nd model ages on granites that intruded the Rocky Cape Group gave ages of 1530 and 1780 Ma, and all other granite model ages in western Tasmania are younger than 2100 Ma (Champion, 2013). Indeed, Mulder et al.'s Hf data suggest a highly juvenile zircon source, difficult to reconcile with their locations. The data imply that the basement under the Rocky Cape Group formed in the middle to late Paleoproterozoic, similar to that of the Cochise Block and the overlying quartzites in southern Arizona, and unlike the Archean to early Paleoproterozoic rocks likely to be outboard of the Belt Basin (Doe et al., 2013; Whitmeyer and Karlstrom, 2007). Leaving VanDieland unrotated, in the position suggested by Moore et al. (2015), would allow these correlations. How do Mulder et al. resolve these issues?

Like Mulder et al., I consider that VanDieland was once located outboard of Laurentia. However, they have failed to recognize the significance of the Grenville-age orogenic and sedimentary events and the concealed late Paleoproterozoic basement, constraints outside of the Rocky Cape Group. When these are considered, a Nuna/Rodinia position for VanDieland close to the USA–Mexican border, with the South Tasman Rise aligned with and outboard of the Grenville Orogen, seems more likely than one rotated and up to 1500 km further north.

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