Discussion and reply: West African proximity of the Avalon terrane in the latest Precambrian: Discussion

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**Notes**
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Discussion

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The paper of McNamara et al. (2001) presents high-quality paleomagnetic data from the ca. 580–570 Ma volcanic and interbedded clastic rocks of the Marystown Group in the Avalon terrane of southern Newfoundland (western Avalonia) and is a welcome addition to the literature. We agree that their results indicate that the rocks of the Marystown Group were deposited at a paleolatitude of 34°+8°/−7°. However, we do not think that this paleolatitude necessarily implies proximity of western Avalonia to West Africa in the “latest Precambrian” as McNamara et al. suggest. Instead, we consider that the balance of the available evidence still supports a position for western Avalonia along the periphery of Amazonia and Oaxaquia (Mexico) during the late Neoproterozoic (e.g., Nance and Murphy, 1999; Keppie and Ramos, 1999). The location of Amazonia and Oaxaquia (Mexico) during the late Neoproterozoic (e.g., Nance and Murphy, 1999; Keppie and Ramos, 1999). The current width of these blocks (500–1000 km) implies that the late Neoproterozoic margin of Amazonia-Oaxaquia-Chortis-Yucatán lay sufficiently farther north to bring Avalonia close to, if not within, the 34°+8°/−7° latitude determinined by McNamara et al. (2001) even in a peri-Amazonian position (Fig. 1).

1 Ga SIGNATURES IN WEST AVALONIA

Detrital zircons of Grenville age (1223–977 Ma) in western Avalonia are euhedral and occur in ca. 610 Ma sedimentary rocks whose geochemistry and isotopic signature indicate a local provenance (Keppie et al., 1998; Murphy and MacDonald, 1993). Crust-derived, Neoproterozoic–Silurian felsic igneous rocks in western Avalonia are characterized by positive initial εNd values (t = 610) and depleted-mantle model ages (TDM) between 1.1 and 0.8 Ga (Murphy et al., 1996). These data indicate a juvenile ca. 1 Ga basement beneath western Avalonia and a local Grenvillian source. Potential source rocks that could yield these iso-

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tropic signatures may be found in Oaxaquía (Keppie and Ortega-Gutiérrez, 1995) and the Tocantins province of central Brazil (Pimental et al., 1999). However, ca. 1.0 Ga age provinces that might provide such a provenance are notably absent in West Africa. Indeed, peri-Gondwanan terranes, such as Cadomia, that are considered to have been proximal to West Africa in the late Neoproterozoic are devoid of Grenvillian detrital zircons (e.g., Wortman et al., 2000) and show strongly negative εNd values and ca. 2.1 Ga TDM model ages that closely match those of the Eburnian basement of the West African craton (e.g., Samson and D’Lemos, 1998).

POSSIBLE RESOLUTIONS TO THE PROBLEM

Clearly, paleomagnetic data for Amazonia, West Africa, and western Avalonia, at various intervals in the late Neoproterozoic and early Paleozoic, are needed to resolve the problem. The Neoproterozoic arc-platform transition characteristic of the peri-Gondwanan terranes is interpreted to reflect the development of a continental-margin transform fault (Murphy et al., 1999). In such a setting, accreted terranes may be translated laterally considerable distances, and their motion relative to the Gondwana margin could be determined by comparing paleomagnetic data from western Avalonia, Amazonia, and West Africa during this time interval.

A second test may lie in a more comprehensive survey of ages of detrital zircons and of inherited igneous zircon cores in western Avalonia. If lateral movement of western Avalonia took place, determination of (1) the age of detrital zircons in younger Neoproterozoic and early Paleozoic assemblages, and (2) the age of inherited zircon cores in coeval igneous bodies in various parts of western Avalonia would indicate a change in basement source with time.

REFERENCES CITED


Figure 1. Two reconstructions: (A) After Dalziel et al. (1994). (B) After Hoffman (1991) and Weil et al. (1998); used by McNamara et al. (2001) to propose the proximity of the West African craton (W.A.) to Avalonia. These diagrams now show the locations of the Marañón belt (see Ramos and Aleman, 2000), and Chortis, Oaxaquia, and Yucatán terranes. Avalonia would be located outboard of these terranes.