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Ohio University College of Arts & Sciences

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Dr. Damian Nance

Dr. Damian Nance, Distinguished Professor of Geological Sciences at Ohio University, presents at talk on "Interpretation of Ophiolite Complexes: A Tweeter in Woofer's Clothing?" at the Geological Society of America annual meeting Nov. 1-4 in Baltimore.

His co-presenters are Brendan Murphy, John Waldron.

Abstract: Typically, the oldest crystallization age obtained from supra-subduction zone (SSZ) ophiolites is interpreted to reflect the onset of subduction associated with convergence, possibly leading to closure of the oceanic tract in which the ophiolite was formed. But there are no adequate mechanisms to explain why SSZ ophiolites are obducted so soon after the ocean they formed in originated. For example, subduction in both the Iapetus and Rheic oceans, the two Paleozoic oceans whose closure produced the Appalachian-Caledonide-Variscan orogen, began relatively soon after their opening. Vestiges of the oceanic lithospheres of both oceans are preserved as SSZ ophiolites and related mafic complexes.

Published Sm–Nd isotopic data from these complexes indicate (i) derivation from highly depleted (HD) mantle with time-integrated depletion in Nd relative to Sm, (ii) that the extent of this depletion requires a melting event that occurred before either ocean existed, which implies (iii) that the HD mantle source was inherited from an older ocean (e.g. the Paleopacific) and captured within these Paleozoic oceans. Variation in density produced by Fe-Mg partitioning during this melting event would have rendered the older lithosphere more buoyant than the surrounding lithosphere, facilitating both its transfer from the older Paleopacific to the younger Paleozoic oceans, and the preferential development of oceanic arcs and future ophiolite complexes around this buoyant core. Such lithospheric capture is broadly analogous to the Mesozoic–Cenozoic capture of the Caribbean plate by the Atlantic realm, and may be the preferred site for oceanic arc development and ophiolite obduction. More generally, this mechanism of "plate capture" may (i) be an artifact of the geometry of supercontinent breakup, and (ii) explain the onset of subduction in an ocean soon after its formation. This analysis suggests that there is an important earlier history in many ophiolite complexes that has been previously unrecognized.