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COMMENT on "Serpentine seamounts of Pacific fore-arcs drilled by the Ocean Drilling Program: Dr. Hess would be pleased"

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COMMENT on "Serpentine seamounts of Pacific fore-arcs drilled by the Ocean Drilling Program: Dr. Hess would be pleased"

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In the subduction-protrusion model of Jack Lockwood (1971, 1972, fig. 5), serpentinite derived from subducting oceanic crust is protruded in the form of a diatreme some distance in-board of the trench. Upon reaching the surface, "the serpentinite slides downslope, accumulating in the trench area as slide blocks, olistostromes, and detrital beds", subsequently to be "buried in a mélange of greywacke, deep-sea chert, and spilite". Certain aspects of Lockwood's model have now been confirmed with the finding of subduction-protrusion serpentinite diapirs in the fore-arc region of the Mariana arc (see also Fryer *et al.*, 1985), and it is understandably tempting to ask, as Keen *et al.* (1989) have done, whether "serpentinite-rich sediments are the products of ancient seamounts in Appalachian ophiolites", and whether the mélanges of western Newfoundland represent the remnants of oceanic serpentinite seamounts.

The serpentinite mélange at Shoal Brook in western Newfoundland, mentioned by Keen *et al.* as an example of sedimentary serpentinite, was reported (Neale, 1972, p. 64) to be formed of serpentinite blocks and slivers of sandstone in crushed shale. Neale suggested that the Shoal Brook occurrence might correlate with the mélange underlying the allochthonous Curling Group at Frenchman's Head (Neale, 1972, p. 72), which is composed of blocks of "slope and rise" and foreland basin sandstone and shale in a phacoidally cleaved green shale matrix. It is important to note that exotic ophiolitic material, although quite certainly present, is not common in the mélange. Stevens (1970) explained the mélanges as "exogeosynclinal" foreland basin debris derived from an obducting ophiolitic nappe, "bulldozed" slope and rise sediment of continental derivation, and cannibalized sandstones and shales laid down in front of the advancing allochthon. The turbiditic sediments deposited in the foreland basin (Mainland Sandstone; Tourelle Sandstone) and their cannibalized equivalents (Lower Head Formation) tend consequently to be quartz-rich and characterized by the enigmatic association of chromite and K-feldspar (Stevens, 1969; Hiscott, 1984). The usual explanation given for Appalachian serpentinite-bearing mélanges is that they are debris flows fed from eroding upthrust masses of obducting oceanic crust, and/or tectonic mélanges developed along the soles of the obducting massif. There would appear to be no cogent reasons for disavowing this hypothesis.

Serpentinite mélanges composed of serpentinite blocks in a matrix of the same material were described by Williams (1971) from mélanges underlying the Coastal Complex at Bear Cove and other nearby localities in the Little Port region of western Newfoundland. Even here, however, the serpentinite mélanges, which underlie gabbro and contain gabbro blocks, and grade down into sedimentary mélange with serpentinite and sandstone blocks, are more likely *tectonic* mélanges formed at the base of the obducting Bay of Islands Ophiolite Complex rather than pre-obduction, frontal-arc, sedimentary serpentinite mass flows. While there is some evidence (arc volcanic rocks of Gregory Island: Baker, 1978; low-Ti dykes cutting the Blow-Me-Down ophiolite: Coish, 1978; the ol-cpx-plag crystallization sequence of the lower part of the North Arm cumulate sequence: Church and Riccio, 1977) to allow the view that the Coastal Complex may include some arc material — and much more research remains to be done in this respect — there is no hint of the presence of a fore-arc basin dominated by arc volcanogenic sediments, including an ubiquitous component of tuff (Turnbull and Craw, 1988).

In the case of the Internal Ophiolite belt of the Appalachians, the ophiolite debris-bearing sediments (*e.g.*, the Coleraine Breccia of the Thetford Mines area) overlying the ophiolites include schistose quartzo-feldspathic material (Church, 1977) similar to the underlying basement unit, and are therefore more likely to represent a *successor* basin developed on the back of the obducted ophiolite rather than an *in situ*, diapir-fed, fore-arc basin.

Lockwood (1972, p. 283) warned that his subduction-protrusion model "cannot explain allochthonous gravity-slide ophiolite masses which include relatively undeformed spilite and chert (as in the Apennines); such ophiolites must have slid into their present locations directly from high-standing blocks of oceanic crust that were tectonically elevated by some means in adjacent areas." Lockwood's warning is likely appropriate to the ophiolitic rocks of the Bay of Islands and elsewhere in the Appalachian system. The case for fore-arc serpentinite seamounts in the Appalachians remains to be made.

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