Implications of structural studies in eastern Notre Dame Bay: evidence for an allochtonous Dunnage Zone

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Many workers have interpreted Newfoundland's Dunnage Zone as "rooted", believing it to be an authochthonous remnant of the Paleozoic Iapetus Ocean preserved due to "incomplete suturing" during plate collision. We consider this interpretation to be incompatible with both structural and geophysical evidence.

Our structural studies in northeastern Newfoundland indicate that F_1 deformation of Ordovician and Silurian rocks involved macroscopic thrust faulting. When combined with published evidence for Silurian-Devonian thrusting along the Baie Verte-Brompton Line, along the Lobster Cove Fault in Western Notre Dame Bay, and in the Bay d'Espoir area of southern Newfoundland, these findings indicate major post-Lower Silurian orogenesis throughout the Dunnage Zone. Significantly, Silurian rocks on the Port Albert Peninsula previously interpreted to be post-orogenic subaerial units were also involved in thrusting. Our interpretation of the structural style of eastern Notre Dame Bay is that of a series of refolded nappes. At least major portions of the Dunnage Zone are allochthonous.

Gravity data indicate that the Dunnage Zone as a whole cannot be autochthonous. The observed Bouguer anomaly over the zone has maximum values of 30 - 40 mgals and local highs within the zone correspond closely with surface exposures of ophiolite. Published gravity models account for the observed anomalies using slabs of ophiolitic material (density 2.9 - 3.0 gm/cm^3) both at the surface and extending to maximum depths of 5-10 km. The important point is that these ophiolites must be decoupled from most of the oceanic mantle on which they formed and now rest on rocks with densities corresponding to continental crust (2.7 - 2.8 gm/cm^3).

Calculated gravity anomalies based on published cartoons of a "rooted" Dunnage Zone (e.g. showing more than 5-10 km of oceanic crust or appreciable volumes of oceanic mantle below the Dunnage Zone), are hundreds of mgals too large.

The most reasonable interpretation is that oceanic rocks of the Dunnage Zone are confined to the upper 5-10 km of crust and are in thrust contact with underlying continental crust. The asymmetry of observed anomalies can be fit by models involving a southeast-dipping basal decollement overlain by a sequence of thrust slices.