The Baja–British Columbia controversy

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Based on lithology, fossils and paleomagnetism, many geologists have come to believe that much of North America (west of the Rocky Mountains), most of China, and parts of Australia, New Zealand, South America and other Pacific Rim countries are made up of accreted or exotic terranes.[1] More than 50 allochthonous terranes (rock masses displaced considerable distances by tectonic forces) are postulated for western North America, including practically all of Alaska.[2,3] These terranes are thought to be made up of fragments of continental and ocean crust, which originated elsewhere and were transported, rotated, broken, stretched and eventually plastered to older cratons by plate movements over eons of time. By definition, allochthonous terranes are bounded by extensive faults. They are regional in extent, ranging in size from 1 km^2 to many hundreds of km^2 and vary in depth from a few thousand metres to 50 to 70 km, all the way to the mantle.

The terrane controversy

Although the concept of allochthonous terranes is well accepted by most geologists, there are some controversial elements within the plate tectonics paradigm.[4–6] Some geologists dispute that certain blocks of rock are allochthonous; for instance, the central block of Salinia, California,[7] and the Kootenay 'terrane' of south-west Canada.[8] Furthermore, some researchers cannot find the bounding faults for particular terranes, so have ended up interpreting normal geological contacts as faults.[9] The terrane concept has produced some strange results, such as the idea that the 100,000 km^2 Alexander terrane of south-east Alaska originated from close to the northern Ural Mountains,[10] when it had previously been thought to have originated from near Australia.

After defining a *terrane*, geologists must *accurately date* it. This is done by a combination of radiometric and biostratigraphic methods. Many of the biostratigraphic systems utilize index fossils of micro-organisms, some of which are catalogued in standard monographs. However, often a particular paleontological specialist must be consulted, not only to save time (probably because monographs are difficult to apply) but also because much knowledge of fossil biostratigraphy is not published. Le Grand and Glen reveal a significant amount of juggling and what appears to be arbitrary designations of biostratigraphic dates to terranes, based on such unpublished data.[11]

These biostratigraphic proce-dures do not seem to be rigorously defined, and it would be difficult for the skeptic to check the dates, as well as the taxonomy of the index fossils. For example, Le Grand and Glen reveal that conodont fossils dated a particular terrane as Devonian, but later the date was changed to Carboniferous with the excuse that the conodonts were *re-worked*.[12] Similarily, bits of the map of Alaska changed from Cretaceous to being early Carboniferous, based on a reassessment of radiolarian fossils.[13] The same huge dating changes were implemented elsewhere along the Pacific Rim.[13] Such revisions do not inspire confidence in biostratigraphy.

The specialists that assign dates to terranes sometimes base their results on a biostratigraphy that is in their head. For example, a strong impetus to the terrane concept was provided by the biostratigraphy of radiolarians from the Radiolarian Laboratory of the US Geological Survey in Menlo Park, California, headed by David L. Jones.[11] Le Grand and Glen claim that Jones used *unpublished* biostratigraphic methods *from memory* with Paleozoic radiolarians to classify terranes according to Jones's own social and cognitive special interests. They further state that Jones also applied draconian methods in applying his agenda and choking alternative interpretations.

The Baja–B.C. controversy

Much can be said about the terrane concept and its problems, but I want to focus on one particular aspect and try to deduce what it tells us. This is the three-decade-old Baja–British Columbia, or Baja–B.C., controversy, which is the belief that well after the amalgamation of exotic terranes to western North America, the terranes were transported northward 1,000 to 5,000 km along strike slip faults (fig. 2). Thus, many terranes travelled from off Baja, California, to western British Columbia and south-east Alaska in the late Cretaceous and early Tertiary.[14–16] (The intrusion of the Peninsular Range batholith of coastal southern California and Baja California also took place during this time.)

Such claimed movements are based

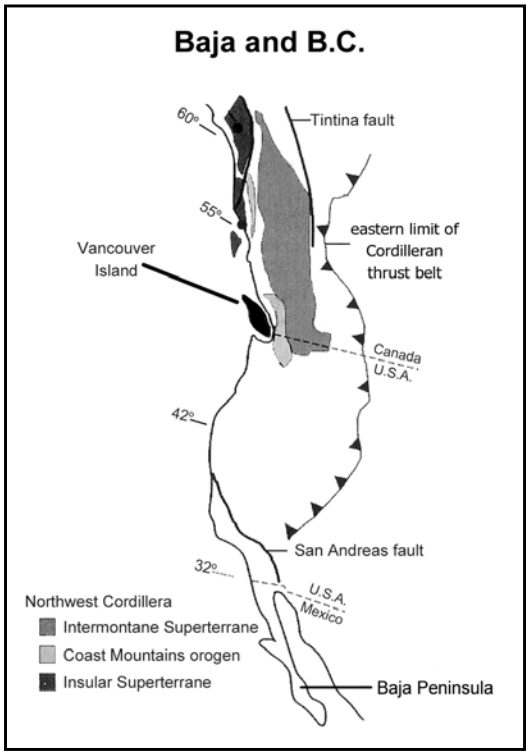

Figure 1. *The hypothesized Intermontane and Insular Superterranes, along with the Coastal Mountains orogen, as envisoned by secular geologists (present day locations).*

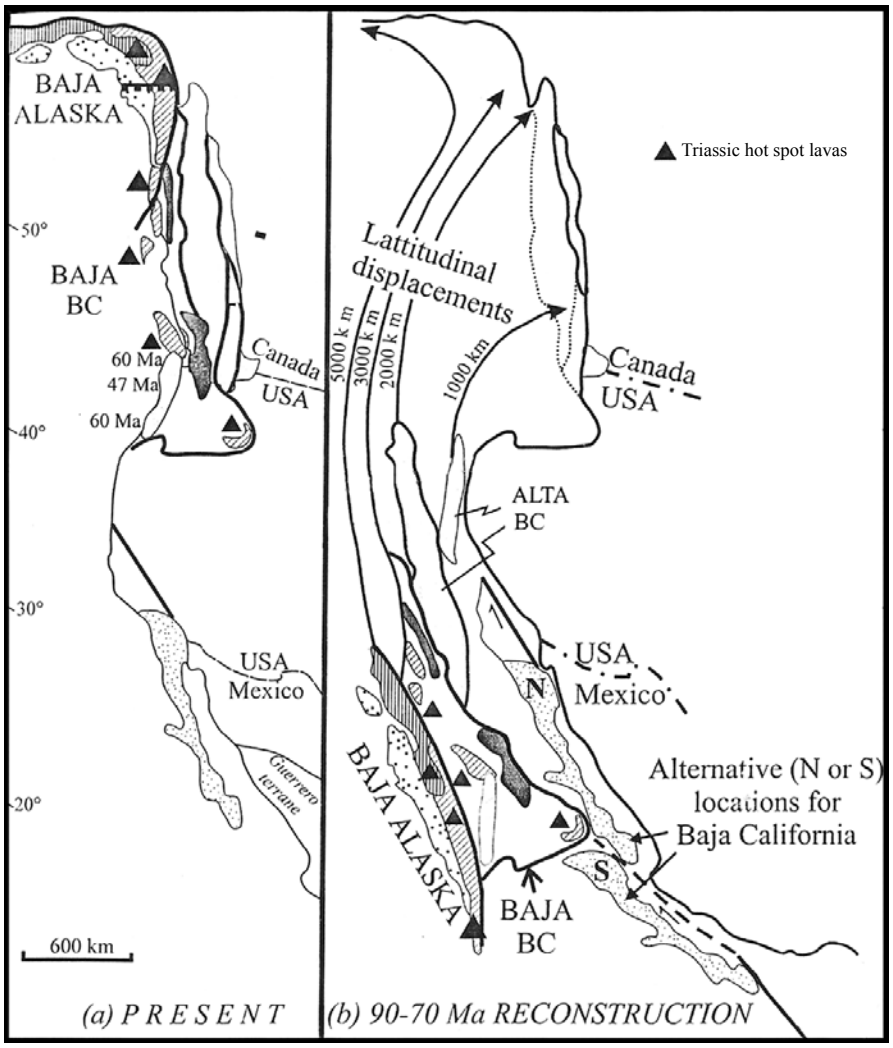

Figure 2. *Locations of various superterranes 70 to 90 million years ago in accordance with the standard geological timescale as suggested by Keppie and Dostal (ref. 16, p. 429). Note that the Alta B.C. (Alberta–Eastern British Columbia) part of the Intermontane Superterrane was displaced north-east by about 1,000 to 2,000 km. Haskin (ref. 26) and Enkin (ref. 27) now claim additional prior movements for the Intermontane Superterrane of 1,000 to 2,000 km, south and then back north, before moving to their current position.*

on paleomagnetic inclination measurements that are much shallower than expected for the late Cretaceous and early Tertiary.[17] (The inclination is the component of magnetism in the vertical direction, and should be steep near the poles and flat near the equator).

Many geologist see little evidence for such movements based on fossils and lithology across terrane faults.[17–19] They claim the paleomagnetic measurements are off because of 1) tilting plutons, 2) inclination shallowing during sediment compaction, or 3) remagnetization of volcanic rocks.[20–22] Geologists also claim that they cannot find the San Andreas-like fault or faults where thousands of kilometres of movement must have occurred.[19]

A recent report by Butler *et al.* supports the hypothesis of pluton tilting during uplift causing inclination changes,[23] and suggests that few plutons can provide well-determined paleomagnetic directions.[24] They found that the amount of tilting on part of a pluton south-east of Prince Rupert, British Columbia, was 70° in 8 million years. (According to these measurements and dates, the Baja–B.C. hypothesis would require the terranes to be transported ten times faster than the presumed plate movement.) The authors favour folding of the pluton to account for the shallow inclinations. Extrapolation of their folding results as a solution to the rest of the British Columbia terranes remains untested.

However, advo-cates of allocht-ho-nous terranes claim that these alternative explanations are inadequate to explain the large difference in inclination at many locations, and are not supported by the fossils in the strata.[21] They believe that the many paleomagnetic measurements are reliable and not the result of remagnetization, although it was found that a similar dispute for a terrane in the northern Appalachians was resolved when a paleomagnetic overprint was 'discovered'.[22]

The controversy is now more enigmatic

The three possible solutions (mentioned above) do not seem to solve the problem, except possibly at a local site. In the Baja–B.C. conundrum, the coastal terranes, called the Insular Superterrane, are supposed to have travelled a greater distance than the interior B.C. terranes, called the Intermontane Superterrane (figures 1 and 2).[25] However, this paleogeographic model has recently been revised, with the result that the Baja–B.C. problem is considerably more enigmatic.[26,27] Based on new paleomagnetic measurements, it is believed that the Insular and Intermontane Superterranes, making up a huge area of 1.25 million km^2, have been joined for 95 million years. The data suggests that both terranes have moved north by about 3,000 km since their coupling, contrary to previous paleomagnetic measurements on the Intermontane Superterrane that showed much less movement.

Furthermore, dating methods and other paleomagnetic data indicates that both superterranes were off present-day Oregon and California 105 million years ago and were not hooked together. Thus, the Insular and Intermontane Superterranes had to travel south 1,000 to 2,000 km in 10 million years. Then they became connected 95 million years ago and shifted north 3,000 km to current British Columbia! Those are radical deductions within the standard plate tec-

tonics paradigm. Hence the Baja–B.C. conundrum has only worsened with no solution in sight:

> 'The results of this investigation, instead of resolving the conflict between geologic and paleomagnetically determined paleogeographic models, sharpen the discrepancy between paleogeographic models … . The sheer size of the crustal block and complexity of translations makes reconciliation between geologic and paleomagnetic data sets increasingly difficult … . Rather than reconcile the discrepancies between paleogeographic models developed from the differing data sets, this investigation has resulted in a sharpening of the distinction between them.'[28]

Moreover, such a path for these superterranes would also have interfered with the subduction that was supposedly occurring at the same time in the vicinity of California. The authors also admit there is no supporting evidence for such south and then north translation of an enormous crustal block in Late Cretaceous and early Tertiary time in western North America.

What does the controversy mean to creationists?

There is something wrong somewhere in this geological controversy, but from a creationist point of view, it is difficult to know where the problem or problems lie because the various data sets are so complicated and depend upon many variables. Creationists of course do not accept the dates. If non-creationist scientists claim the many paleomagnetic dates that determined the recent permutation of the Baja–B.C. controversy are wrong, they would also have to conclude that previous paleomagnetic inclination measurements on the Intermontane Superterrane are wrong. What would such a deduction imply for all of paleomagnetism? Regardless, the Baja–B.C. controversy and the poor biostratigraphic research procedures shed doubt on the terrane concept.

Another possibility is that the late Cretaceous and early Tertiary paleopole positions (50–100 Ma) were really near the North Pole, assuming the long-age system for sake of argument, in contrast to the generally accepted model that these pole positions were around 70°N at these times. I noticed that many of the paleomagnetic inclination measurements (for various ages of rocks in B.C.) give a latitude near their current position. This would mean that the paleolatitude of B.C. has remained nearly constant since the rocks were formed. This would of course throw doubt on much previous paleomagnetic measurement, polar wander curves and plate tectonics itself.

Wherever the problem or problems lie, all the data sets are in need of a thorough examination by creationists to determine what is real data, what is mistaken data and what is long-age interpretation. Possibly such an analysis would provide more details of what happened during the Flood.

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