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THE SKEENA FOLD BELT; IMPLICATIONS FOR INTRA-TERRANE AND CORDILLERA-WIDE SHORTENING IN THE NORTHERN CANADIAN CORDILLERA

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The five morphogeological belts (Fig. 1) of the Canadian Cordillera correspond to either groups of terranes or the products of terrane accretion (Monger et al. 1982; Wheeler et al. 1988; Gabrielse and Yorath, 1989). Intra-terrane shortening across Stikinia, the largest of the terranes that make up the Intermontane Belt, is expressed by the Skeena Fold Belt. Contractional structures in the fold belt are part of Cordillera-wide phase of shortening in mid- and Late Cretaceous time. Shortening is represented by deep level, ductile structures in the Coast and Omineca belts, and by shallow level structures in the Intermontane and Foreland belts.

The Skeena Fold Belt involves subgreenschist facies rocks of Stikinia and its overlap assemblages, Bowser and Sustut basins. Stikinia, with Devonian to Middle Jurassic carbonates, island arc volcanics, and related sedimentary and plutonic rocks, is represented most commonly by thick massive volcanic rocks within the Skeena Fold Belt. As part of the Intermontane Superterrane, Stikinia was accreted to North America in mid Mesozoic time, and subsequently was overlain by Middle Jurassic to Early Cretaceous marine to nonmarine clastic rocks of the Bowser Basin, and by mid- to Late Cretaceous nonmarine clastic rocks of the Sustut Basin. The Sustut Basin is considered to be in part a foreland basin to the Skeena Fold Belt. Strata in its western half were involved in Skeena Fold Belt deformation. Most of the structures at the erosion surface, however, are in Bowser Basin strata. The fold belt is characterized by northeast verging folds and thrust faults. Thrust faults can be defined in competent volcanic units of Stikinia, but are difficult to document in the thick, monotonous clastic facies of the Bowser Basin. The faults are inferred to be part of a regional blind thrust system, with shortening across the thrust faults accomodated by folds in the thinly layered clastic successions. The wide variety of fold geometries in the Skeena Fold Belt are the consequence of a highly variable mechanical stratigraphy.

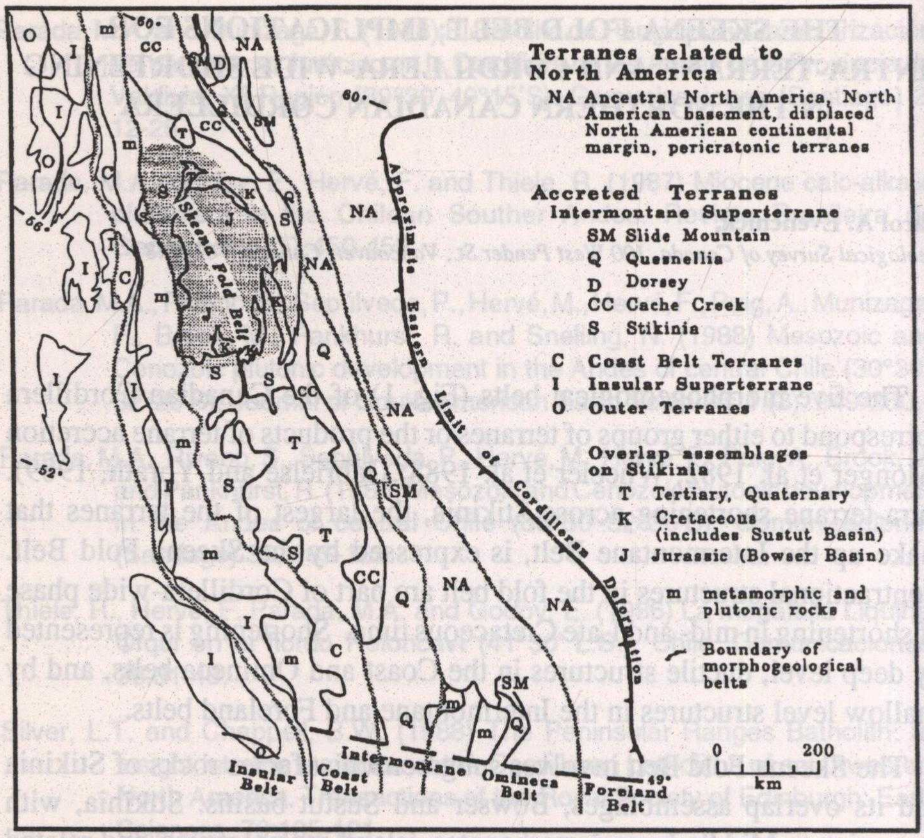

Figure 1: Location of the Skeena Fold Belt with respect to morphogeological belts and major terranes of the Canadian Cordillera (Gabrielse and Yorath, 1989; Wheeler et al., 1988).

The Skeena Fold Belt is similar to the Rocky Mountain Fold and Thrust Belt to the east in that it is thin skinned, its eastern limit is marked by a triangle zone, it has an associated foreland basin on its eastern side, and a kinematically related metamorphic/plutonic belt on its western side (Evenchick 1991a, b). A conservative estimate of shortening for the northeast margin of the fold belt is 44% (Evenchick, 1991a). When extrapolated to the width of the fold belt the magnitude of shortening (160 km) is comparable to that in the Rocky Mountain Fold and Thrust Belt. In addition, the timing of formation, as constrained by unconformities and by the sedimentary record of the foreland basin (Eisbacher, 1974; Evenchick, 1991a), illustrate that the Skeena Fold Belt also formed largely in mid- to Late Cretaceous time. The Skeena Fold Belt differs from the Rocky Mountain Fold and Thrust Belt in that its structures deform accreted terranes and their overlap assemblages, rather than strata deposited on the continental margin of ancestral North America.

Using an estimate of 160 km of shortening for the Skeena Fold Belt and the interpretation that Stikinia was involved in the thin-skinned deformation, it can be inferred that volcanic rocks at the western side of the fold belt were in a position west of the present day Coast Belt prior to shortening. Because these volcanic rocks are part of Stikinia, it can also be inferred that Stikinia extended to the present west side of the Coast Belt. Assuming that the basal detachment of the Skeena Fold Belt roots within Stikinia, it follows that Stikinia must underlie much of the northern Coast Belt (Fig. 2). Mid-crustal shortening and metamorphism in the Coast Belt are mid- to Late Cretaceous in age (Rusmore and Woodsworth, 1991, and references therein), and are an expression of large scale crustal thickening which was coeval with deformation in the Skeena Fold Belt. The Skeena Fold Belt is an obvious candidate for the high level counterpart to the Coast Belt orogen.

With recognition of the Skeena Fold Belt and its inferred kinematic association with the Coast Belt, the Canadian Cordillera can be viewed as a composite orogen made up of two parallel, broadly contemporaneous contractional systems, each with a metamorphic plutonic core zone, a kinematically related higher level northeast-verging fold and thrust belt, and a foreland basin. The crustal response to terrane accretion and tightening in mid to Late Cretaceous time is recognized across the width of the Cordillera, but the geometry and mechanism for transmitting strain across the Cordillera is poorly understood. One possibility is that subduction below the Coast Belt fed detachments into the Skeena Fold Belt via the Coast Belt, and also eastward into the Omineca Belt and Rocky Mountain Fold and Thrust Belt as shown in Figure 2.

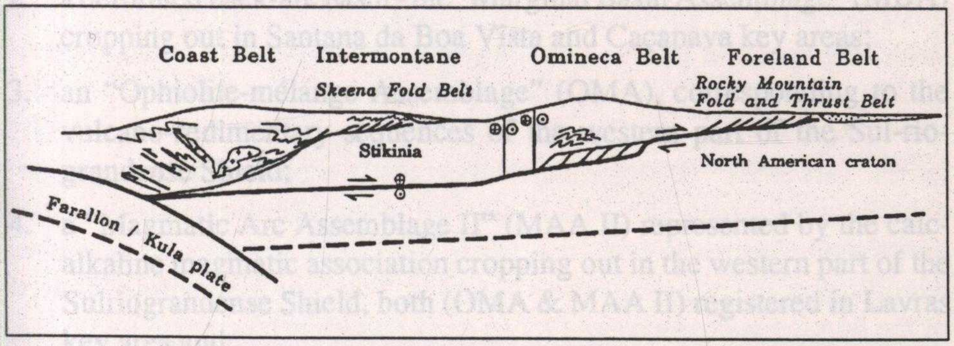

Figure 2: Schematic cross section of the northern Cordillera in Late Cretaceous time showing the possible detachment linking Cordillera-wide late Cretaceous shortening, and its relationship to dextral strike slip faults (Evenchick, 1991a).

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