

Major tectonic processes illustrated in a Phanerozoic model for Alaska and the Canadian Cordillera

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Abstract: Six tectonic processes were responsible for formation of the collage of terranes and overlap assemblages in Alaska and the Canadian Cordillera. (1) In the Late Devonian and Early Mississippian, a major period of rifting occurred along the ancestral continental margin of North America. The rifting resulted in formation of an ocean basin that contained cratonic and passive continental-margin terranes that eventually migrated and accreted at other sites along the evolving margin of the continent. (2) From about the Late Triassic through the mid-Cretaceous, a succession of island arcs and tectonically paired subduction zones formed near the continental margin. (3) From about mainly the mid-Cretaceous through the present, a succession of igneous arcs and tectonically paired subduction zones formed along the continental margin. (4) From about the Jurassic to the present, oblique convergence and rotations caused orogen-parallel sinistral and then dextral displacements within the upper plate margins of the North American Craton. The oblique convergences and rotations resulted in the fragmentation, displacement, and duplication of formerly more-continuous arcs, subduction zones, and passive continental margins. These fragments were subsequently displaced along the margins of the expanding continental margin. (5) From the Early Jurassic through Tertiary, movement of the upper continental plates toward subduction zones resulted in strong plate coupling and accretion of the former, separate island arcs and subduction zones to continental margins. Accretions were accompanied and followed by crustal thickening, anatexis, metamorphism, and uplift. The accretions resulted in the substantial growth of the North American continent. (6) In the middle and late Cenozoic, oblique to orthogonal convergence of the Pacific Plate with present-day Alaska resulted in formation of the modern-day ring of volcanoes around continental margin. The oblique convergence between the Pacific Plate and Alaska also resulted in major dextral-slip faulting in interior and Southern Alaska and along the western part of the Aleutian-Wrangell arc. Associated with dextral-slip faulting was crustal extrusion of terranes from Western Alaska into the Bering Sea.