



ACTIVE CRUSTAL DYNAMICS IN THE BEND OF THE SOUTHERN ALASKA OROCLINE, USA

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The recent M7.9, Nov. 3, 2002 Denali earthquake ruptured along a slip surface extending over 300 km and involved several different faults. This event confirmed that the Totschunda Fault is the currently active strand in eastern Alaska, revealed that strike-slip offset up to 8 m occurs on the McKinley strand, and documented an associated thrust component along a previously unknown east-northeast-trending fault called the Susitna Glacier fault (e.g. Craw et al., 2002). This event supports a kinematic model (Glen, 2002) of oroclinal bending and subsequent advection of crust through the Alaska orocline.

In this model, major dextral shear zones, like the Denali and Tintina Faults transport blocks of crust through the bend of the orocline in response to stresses imposed on the western edge of North America by oblique subduction and transcurrent motion along the North American margin. Crustal shortening within the bend, resulting from both an initial bending of the crust to form the orocline and subsequent advection of crust through the orocline, is accommodated by a system of northeast-trending thrust faults.

The distribution of northeast trending faults shows a consistent pattern within the bend: the faults appear to intersect at or near, the major dextral shear zones and generally occur west of the orocline's axis. That these faults occur where deformation would be greatest to crust advected through the bend, indicates that the faults are directly related to crustal dynamics within the bend. This model furthermore predicts the expected sense and timing of motion along many faults (like the Susitna Glacier fault) which otherwise lack or have limited documented histories.

In southern Alaska the Yakutat terrane, which is actively accreting and working its way into the bend, likely represents a present-day analog for crustal deformation of interior Alaska. It may therefore provide further clues to the early stages (e.g. post mid-Cretaceous) of crustal deformation in central Alaska.