THE TRANS-ALASKA CRUSTAL TRANSECT AND CONTINENTAL EVOLUTION INVOLVING SUBDUCTION UNDERPLATING AND SYNCHRONOUS FORELAND THRUSTING

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We investigate the crustal structure and tectonic evolution of the North American continent in Alaska, where the continent has grown through magmatism, accretion, and tectonic underplating. In the 1980's and early 1990's, we conducted a geological and geophysical investigation, known as the Trans-Alaska Crustal Transect (TACT), along a 1350-km-long corridor from the Aleutian Trench to the Arctic coast.

The most distinctive crustal structures and the deepest Moho along the transect are located near the Pacific and Arctic margins. Near the Pacific margin, we infer a stack of tectonically underplated oceanic layers interpreted as remnants of the extinct Kula (or Resurrection) Plate. Continental Moho just north of this underplated stack is more than 55 km deep. Near the Arctic margin, the Brooks Range is underlain by large-scale duplex structures that overlie a tectonic wedge of North Slope crust and mantle. There, Moho has been depressed to nearly 50-km depth. In contrast, the Moho of central Alaska is on average 32 km deep.

In the Paleogene, tectonic underplating of Kula- (or Resurrection-) Plate fragments overlapped in time with duplexing in the Brooks Range. Possible tectonic models linking these two regions include "flat-slab" subduction and an "orogenic-float" model. In the Neogene, the tectonics of the accreting Yakutat terrane (YAK) have differed across a newly interpreted tear in the subducting Pacific oceanic lithosphere (POL). East of the tear, POL subducts steeply and alone beneath the Wrangell volcanoes, because the overlying YAK has been left behind as underplated rocks beneath the rising St. Elias Range, in the coastal region. West of the tear, the YAK and POL subduct together at a gentle angle, and this thickened package inhibits volcanism.