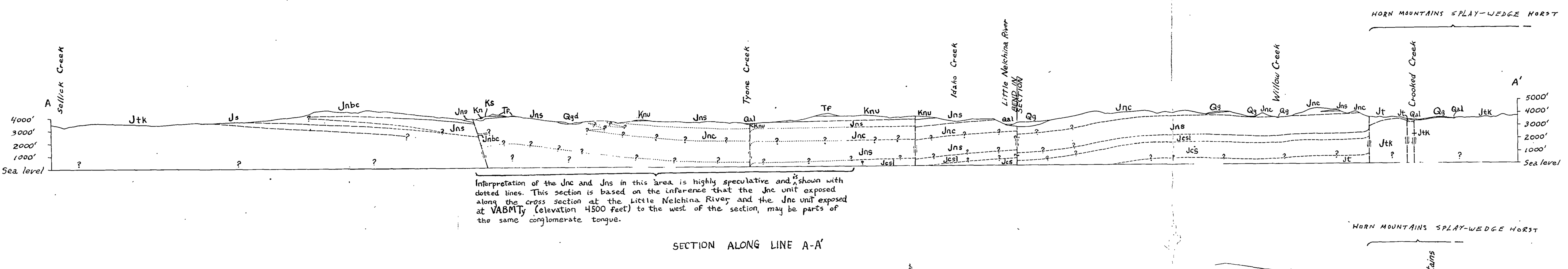
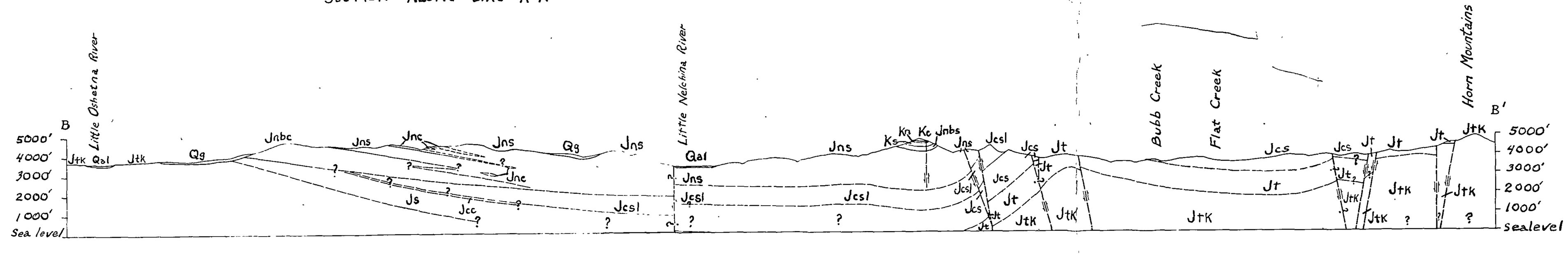
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN FILE MAP
SHEET 3 OF 4
(CROSS SECTIONS, INDEX MAPS, AND EXPLANATORY NOTE)



SECTION ALONG LINE A-A'



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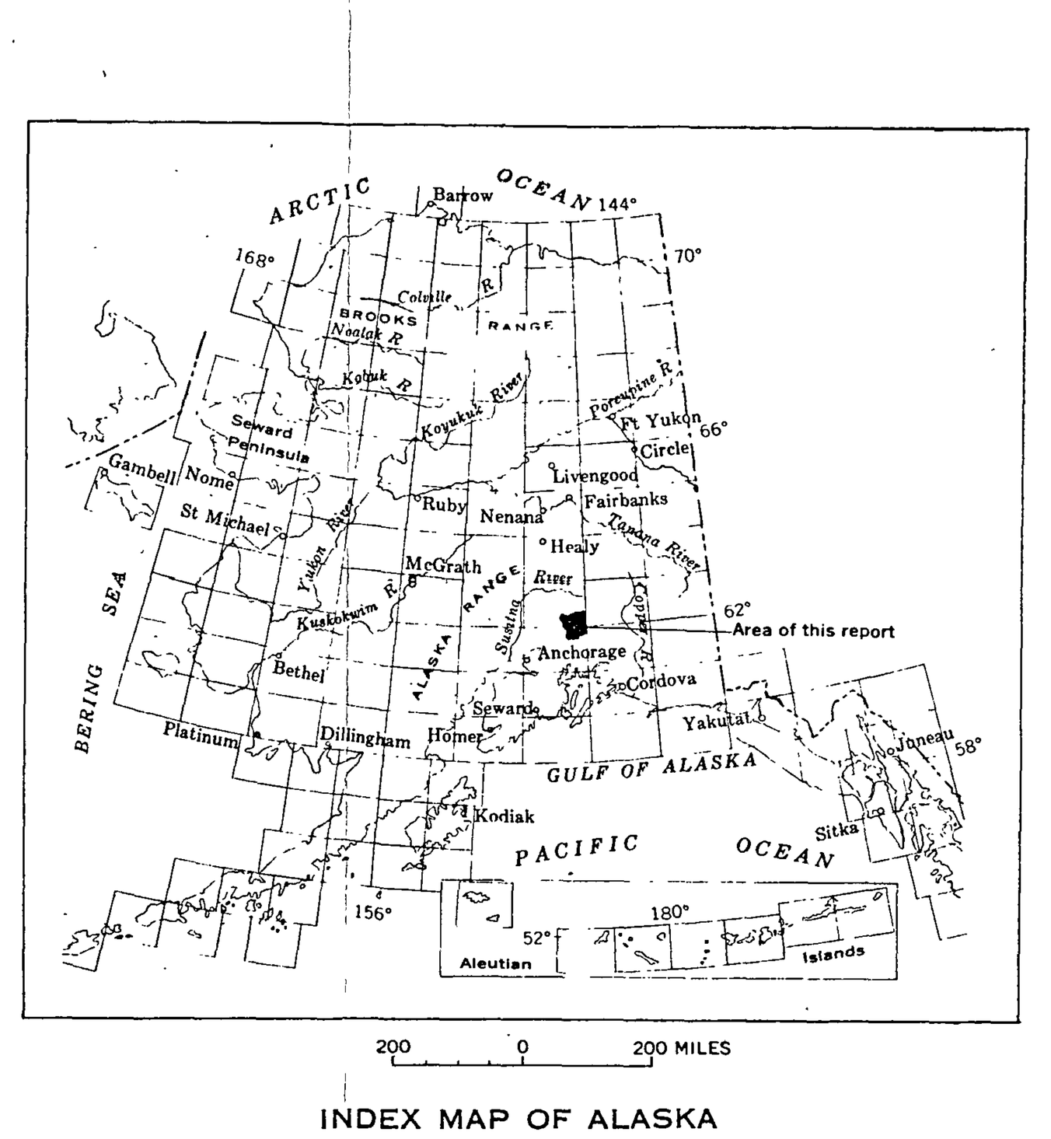
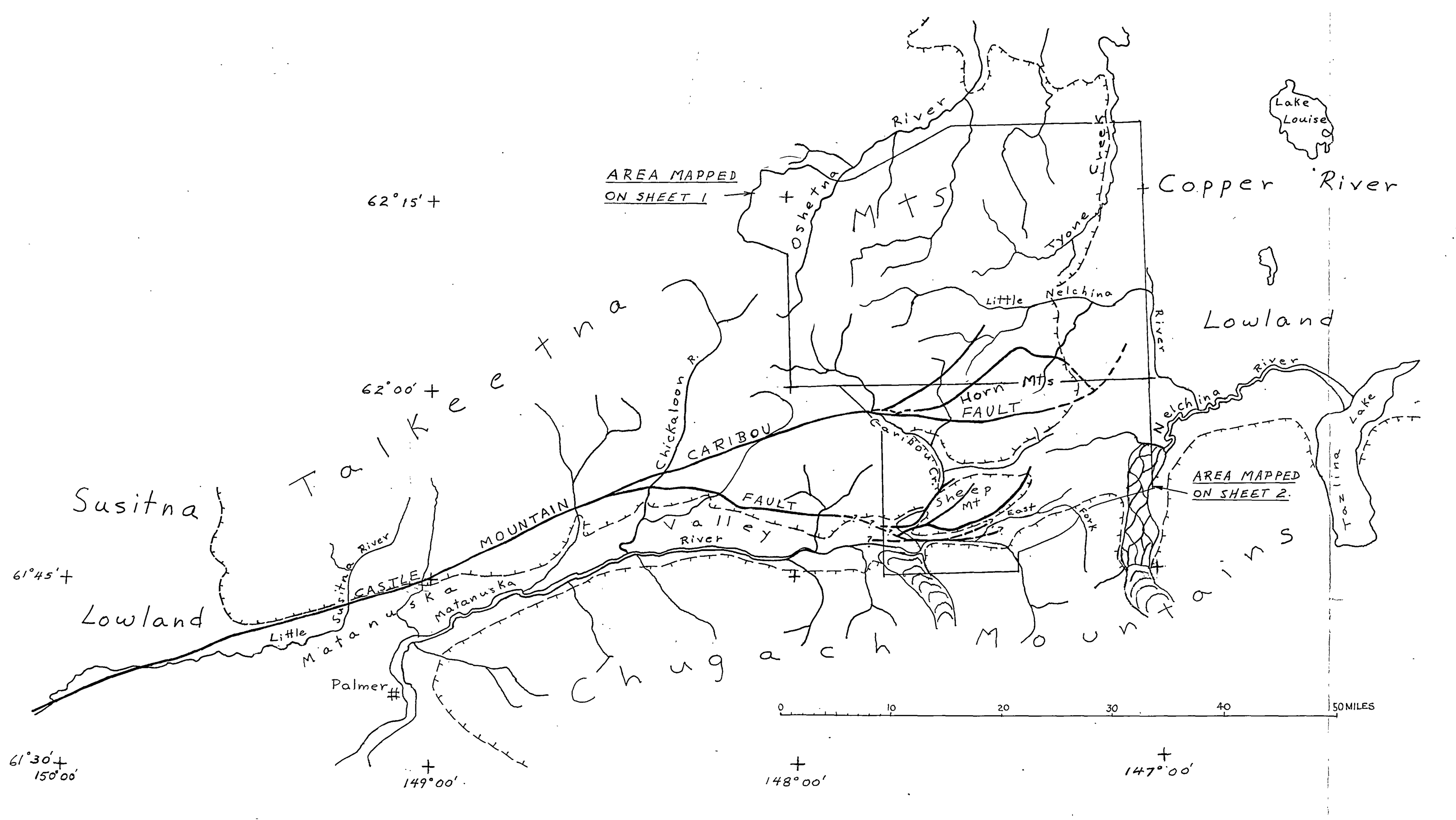
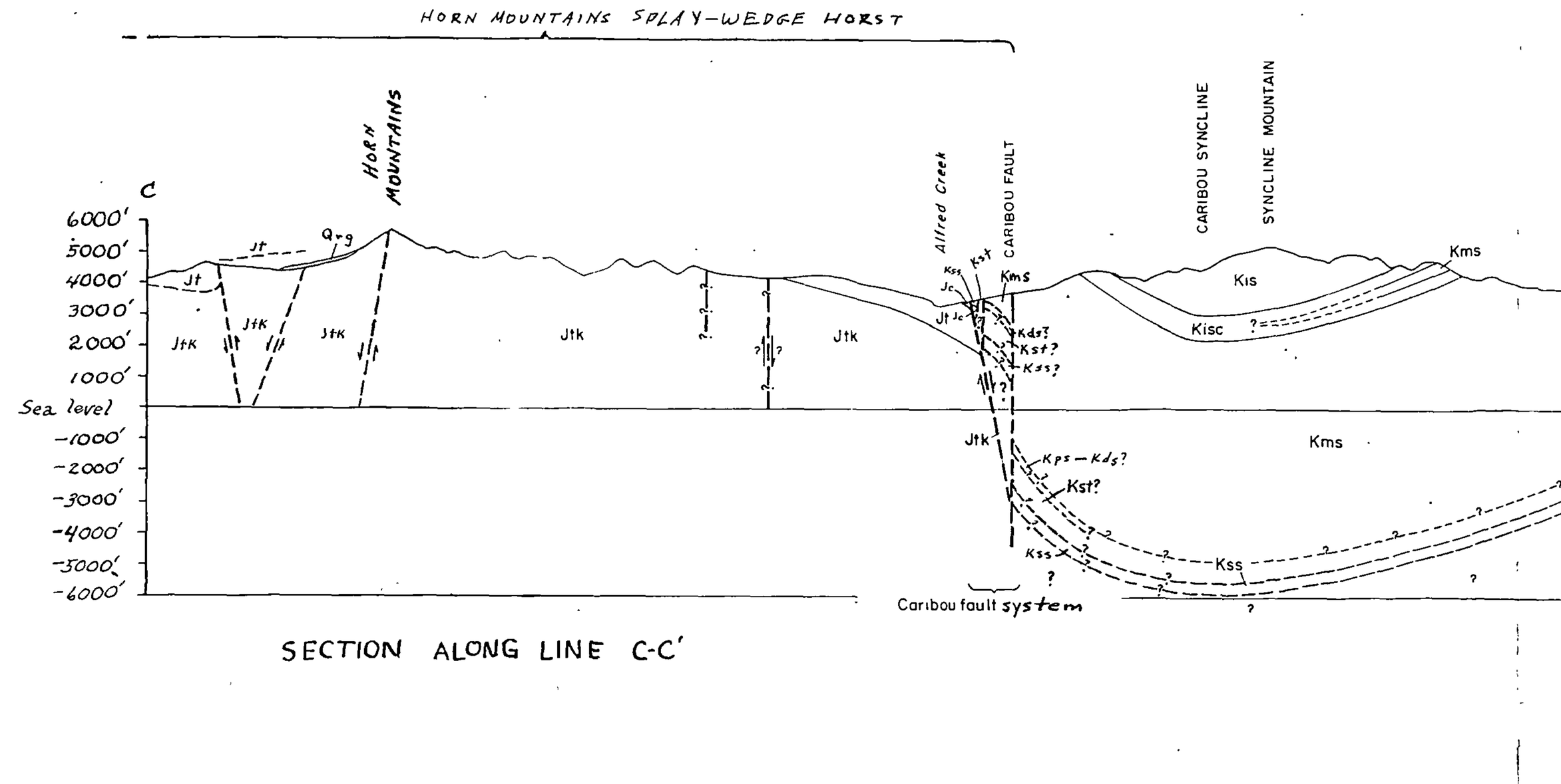


INDEX MAP OF ALASKA



INDEX MAP OF THE MATANUSKA VALLEY REGION, SHOWING MAJOR FAULTS AND AREAS MAPPED (SHEETS 1 AND 2)



SECTION ALONG LINE C-C'

SECTION ALONG LINE D-D'

OPEN FILE MAP
SHEET 3 OF 4
CROSS SECTIONS, INDEX MAPS, AND EXPLANATORY NOTE

CROSS SECTIONS OF THE NELCHINA AREA, SOUTH-CENTRAL ALASKA

By
Arthur Grantz

Scale 1:63,360

DATUM IS MEAN SEA LEVEL

1965

255

This map is preliminary, and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature

EXPLANATORY NOTE

The geologic map and cross sections are a considerably revised and consolidated version of earlier geologic maps of the Nelchina area (Grantz, 1960b, 1960c, 1961a, 1961b). The revisions have been made possible by more detailed paleontologic and stratigraphic information, particularly on the Cretaceous and Tertiary rocks of the area. The age assignments of the stratigraphic units described in this report are based mainly on studies of their Jurassic mollusks by Ralph W. Imlay, their Cretaceous mollusks by Imlay and D. L. Jones, their Cretaceous foraminifers by H. R. Bergquist, and their Tertiary plants by J. A. Wolfe.

The unifying geologic interpretation upon which the geologic map and cross sections are based is that two major right-lateral strike-slip fault systems trend eastwardly across the Nelchina area and divide it into three blocks with notably different stratigraphic sequences. These systems, the Caribou and Castle Mountain faults and their related splays, experienced large lateral displacements in post-Cretaceous time, and earlier movements may also have occurred. Large lateral movements ceased by late Oligocene or early Miocene time, but significant vertical movement occurred on both faults in post-Oligocene time. The Caribou Fault also had some post-Oligocene lateral movement. The Caribou Fault merges with the Castle Mountain Fault in the central Matanuska Valley, west of the mapped area, and the combined fault bounds the north side of the lower Matanuska Valley.

The principal basis for the interpretations cited above is briefly outlined below; a more detailed report is in preparation.

1. The Caribou and Castle Mountain faults and their related splay faults, thrust faults, and folds have a geometric arrangement and symmetry which is typical of large right-lateral strike slip fault systems elsewhere.

2. High-angle mafic dikes and sills in the western part of the Nelchina area, which are genetically related to the basalt flows and volcaniclastic rocks of late Oligocene or early Miocene age, strike predominantly west-northwest (Grantz, 1960a). The orientation of these tensional features with respect to the Caribou fault is compatible with, and indeed suggests, right lateral displacement on the Caribou fault system.

3. Dissimilar sequences of Cretaceous rocks are found in the northern, central and southern parts of the Nelchina area, and these sequences are separated, respectively, by the Caribou and Castle Mountain fault systems. The sequences are sufficiently different to indicate that there has been large lateral movement on these fault systems in post-Cretaceous time. The Cretaceous sequences of these three areas are shown separately in the explanation and cross sections, and are designated the Northern, Central, and Southern sequences of Cretaceous rocks, respectively.

The Cretaceous rocks of the Nelchina area and adjacent region are characterized by marked changes in facies and by many unconformities of locally variable time value. Lateral displacements of several miles to a few tens of miles along the Caribou and Castle Mountain fault systems would, in this area, suffice to produce the observed juxtaposition of dissimilar Cretaceous sequences at these faults.

4. The mafic dikes and sills of late Oligocene or early Miocene age occur mainly in the western part of the Nelchina area (Grantz, 1960a). The rather well-defined eastern limit of the area with abundant mafic dikes and sills strikes across the Caribou fault system without demonstrable lateral offset, although a lateral shift of perhaps 2 or 3 miles would not be discernible. This indicates that lateral movement on the Caribou fault system since the Oligocene did not exceed a few miles.

5. Wedges of Oligocene or Miocene basalt lying between the Caribou fault and its splays have been downdropped between Jurassic and Cretaceous rocks near Sheep Creek in a manner suggesting emplacement by lateral fault movements. Thus, although large lateral displacement on the Caribou fault since Oligocene time seems precluded by the data cited in item 4, there is evidence that at least some post-Oligocene lateral displacement did occur on this fault.

6. The Castle Mountain fault or one of its major splays intersects a felsic plug in the valley of the Matanuska River in the Nelchina area without offsetting it laterally. The plug is one of a group of felsic intrusives which cut the Chickaloon Formation and are cut by the mafic dikes and sills of late Oligocene or early Miocene age in the upper Matanuska Valley (Capps, 1927, p. 68). Therefore at least an important member of the Castle Mountain fault system in the southern part of the Nelchina area is interpreted to have had no lateral displacement since the Oligocene. However the Castle Mountain fault and some of its splays show large late Cenozoic vertical movements in the Matanuska Valley and the southeastern part of the Nelchina area, and movement along the projection of the Castle Mountain fault in the Susitna Lowland, west of the mapped area, has produced scarps in Pleistocene deposits.

The term splay-wedge horst is herein proposed for prominent wedge-shaped positive structural blocks like those bounded by the Caribou and Castle Mountain faults and some of their splays. In the Nelchina area and upper Matanuska Valley such blocks have risen 1 to 3 miles with respect to the adjacent terranes. Terms such as faulted anticline are inaccurate, and the unmodified term horst is inadequate, to describe these features. It is believed that the more specific term splay-wedge horst better describes these features in the Nelchina area and elsewhere, and that this term will call attention to their unique structural environment and origin.

REFERENCES

Capps, S. R., 1927, Geology of the upper Matanuska Valley, Alaska: U.S. Geol. Survey Bull. 791, 92 p., 16 pl.

Eckhart, R. A., 1953, Gypsiferous deposits on Sheep Mountain, Alaska: U.S. Geol. Survey Bull. 989-C, p. 39-61, pls. 4-5, figs. 12-17.

Grantz, Arthur, 1960a, Generalized geologic map of the Nelchina area, Alaska, showing igneous rocks and larger faults: U.S. Geol. Survey Misc. Geol. Inv. Map I-312, scale 1:96,000.

_____1960b, Geologic map of Talkeetna Mountains (A-2) quadrangle, Alaska and the contiguous area to the north and northwest: U.S. Geol. Survey Misc. Geol. Inv. Map I-313, scale 1:48,000.

_____1960c, Geologic map of Talkeetna Mountains (A-1) quadrangle, and the south third of Talkeetna Mountains (B-1) quadrangle, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I-314, scale 1:48,000.

_____1961a, Geologic map and cross sections of the Anchorage (D-2) quadrangle and northeasternmost part of the Anchorage (D-3) quadrangle, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I-342, scale 1:48,000.

_____1961b, Geologic map of the north two-thirds of Anchorage (D-1) quadrangle, Alaska: U.S. Geol. Survey Misc. Geol. Inv. Map I-343, scale 1:48,000.