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PLUTONIC BELTS OF CENTRAL AND SOUTHERN ALASKA RANGE AND ALASKA PENINSULA

Potassium-argon mineral ages and reconnaissance mapping of approximately 30,000 sq mi of the central and southern Alaska Range and Alaska Peninsula indicate that there were 3 major plutonic episodes during the Mesozoic and Tertiary. The first began in the Early Jurassic (about 180 m.y. ago) and continued for about 25 m.y. No plutonic rocks older than Jurassic have been recognized. Plutons of Jurassic age form an arcuate belt about 600 mi long which roughly parallels the Talkeetna geanticline and Matanuska geosyncline, major tectonic elements of south-central Alaska. Jurassic plutonic rocks are largely diorite and quartz diorite with minor granodiorite. Late Cretaceous and early Tertiary plutons (83–55 m.y.) occur locally within this belt, but in the southern Alaska Range these plutons characteristically form north-trending belts transverse to the earlier tectonic elements and locally extend out into what was probably a more stable area bordering the earlier tectonic features. Composition of these plutons ranges from diorite through granite, but granodiorite and quartz monzonite predominate. Isolated granitic stocks of this age also extend eastward into the central Alaska Range. The data suggest that this period of magma generation and emplacement may be separated into Late Cretaceous (70–85 m.y.) and early Tertiary (50–65 m.y.) plutonic episodes. Middle Tertiary plutons (34–41 m.y.) form a north-trending belt about 100 mi long in the central part of the southern Alaska Range. These rocks, characteristically granites and quartz monzonites, are flanked by more mafic early Tertiary and Late Cretaceous plutons. Small plutons of middle Tertiary age also are present locally in the central part of the Alaska Peninsula. A still younger plutonic episode (25–30 m.y.), perhaps a later phase of the middle Tertiary episode, is represented by small isolated granitic stocks. The plutonic rocks of the central and southern Alaska Range and Alaska Peninsula are more silicic with decreasing age.

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STRUCTURE AND STRATIGRAPHY OF EASTERN ALASKA RANGE, ALASKA

The eastern Alaska Range, between 141°W (international boundary) and 145°W in south-central Alaska, provides clues to the tectonic development of northwest North America.

The Denali fault system, a major structural feature extending in an arcuate path from the Bering Sea to the Gulf of Alaska, transects the eastern Alaska Range and separates extremely diverse geologic terranes. North of the Denali fault lies a widespread terrane of highly deformed metamorphosed sedimentary and minor igneous rocks, Precambrian to Devonian in age. South of the Denali fault system these rocks are absent and the oldest rocks exposed are a heterogeneous series of Pennsylvanian(?) or Permian volcanics and volcaniclastics derived from a late Paleozoic volcanic island arc probably built directly on oceanic crust. These rocks are overlain by a succession of Permian marine sediments and limestones, Triassic carbonaceous shales, subaerial tholeiitic basalt flows and marine limestones and Jurassic-Cretaceous argillite, graywacke, and conglomerate with a cumulative thickness locally exceeding 10,000 ft. Sedimentation culminated in middle(?) Cretaceous time with a short-lived and restricted episode of andesitic volcanism. Relatively undeformed continental sedimentary rocks of Cretaceous age or younger and late Cenozoic terrestrial volcanic flows overlie the older rocks with marked angular unconformity.

Linear bodies of serpentinized ultramafics occur with the Permian rocks on the west in the central Alaska Range and on the east in Canada. In the eastern Alaska Range ultramafic rocks have not been observed south of the Denali fault but they are present locally along the fault zone and in the older terrane directly north of the fault.

All rocks older than Late Cretaceous south of the Denali fault system have been cut by steep normal faults and by numerous reverse and thrust faults that dip north toward the Denali fault. The Jurassic-Cretaceous marine sedimentary rocks also exhibit complex folding, locally isoclinal, with fold axes plunging at shallow angles generally northwest.

The geologic data suggest that the oceanic terrane south of the Denali fault collapsed against and was added to the continental American plate, probably in Early Triassic time. Since then this terrane has been deformed many times as later oceanic plates impinged against the continental margin. The Denali fault, which is an ancient subduction zone, has been reactivated as a ridge-arc dextral transform fault, probably during the early Pliocene in response to a change in the direction of spreading in the North Pacific oceanic plate. The Totschunda fault system, which diverges from the Denali structure near 144°W and trends southeasterly toward the Fairweather fault in the Gulf of Alaska, is another major right-lateral strike-slip structure that may have developed as recently as in the middle Pleistocene. The Denali fault system appears to be presently inactive southeast of the Denali-Totschunda junction.

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STRUCTURE, STRATIGRAPHY, AND ISOTOPIC COMPOSITION OF ROCKS OF SEWARD PENINSULA, ALASKA

The Seward Peninsula consists principally of metamorphic rocks of Precambrian age, of less metamorphosed pelitic and carbonate rocks of late Precambrian age, and of thick carbonate rocks of Paleozoic age. These rocks are intermixed in extensive thrust plates of two ages: the earlier (eastward thrusting) is probably pre-middle Cretaceous, and the later (northward thrusting) is older than 74 m.y. Stocks and batholiths of granitic rocks, containing alkalic rocks locally, and gneissic phases intruded the older thrust plates, whereas stocks of biotite granite with associated tin and beryllium deposits intruded the younger thrust sheets. Extensive andesitic volcanic rocks on the eastern Seward Peninsula are of Late Jurassic to Early Cretaceous age; they grade upward into graywackes and siltstones of Cretaceous age which are tightly folded. Tertiary rocks are coal bearing and deformed and crop out in small areas; they are most probably of late Tertiary age. Extensive volcanic fields of latest Tertiary to Holocene age cover large areas of the central and eastern Seward Peninsula. Marine terraces older than Sangamon are warped, and a range-front fault along the Kigluaik Mountains offsets moraines of Wisconsin age.

Early attempts to date the Precambrian rocks by K-Ar and Rb-Sr dating of micas failed because of thei-