

DEPARTMENT OF THE INTERIOR
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MESOZOIC AND CENOZOIC TECTONIC ELEMENTS OF ALASKA
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DESCRIPTION OF TECTONIC ELEMENTS

(Age of negative elements refers to time of subsidence and to age of sediments accumulated therein. Age of positive elements refers to time of erosion or little or no accumulation.)

1. ARCTIC PLATFORM. Age: Paleozoic, Tr, J, K1.
A pre-Albian tectonic feature that occupied the northern part of the present Arctic coastal plain and the adjacent area of the present Arctic Ocean. Southern border of platform shown on map. Source area during Paleozoic time. Paleozoic formations wedge out northward toward platform. Thin accumulation of Tr and J sediments of platform facies, including fossiliferous limestone, glauconite, and limestone oolite.
2. ARCTIC COASTAL PLAIN. Age: Cenozoic.
Quaternary deposits throughout. Pliocene(?), Miocene, and possibly earlier deposits reported in thick Tertiary sequence north of Romanzof uplift. A later-studied lowland except in eastern area, where Quaternary and Tertiary deposits have been slightly uplifted.
3. BEAUFORT SHELF. Age: K3 and Cenozoic.
Thick Cretaceous (K3) sequence in Cape Simons area, east of Point Barrow, extends into shelf, as does also thick Tertiary sequence north of Romanzof uplift (see above). Shelf constructed by out-building of these deposits into Arctic Ocean basin.
4. BARROW ARCH. Age: Mesozoic.
Buried structure on which basement slates, possibly pre-Cambrian, are at shallow depth over which Tr, J, and K rocks thin or pinch out.
5. COLVILLE GEOSYNCLINE. Age: Tr, J, K1-3.
Greatest thickness where geosynclinal axis is shown. Sequence of Tr, J, and K1 rocks thins northward toward Arctic Platform. Platform, as well as geosyncline, subsided in K2 time, and a shelf composed of K2 sediments was built northward across the geosyncline and approximately to the present coast line east of Point Barrow. Deep water of the Arctic Ocean lay north of this shelf.
6. UMIAT BASIN. Age: K3 and Paleocene(?).
7. CHUKCHI BASIN. Age: K3 and Paleocene(?).
8. MEADE ARCH. Age: K3 and Paleocene(?).
9. TIGARA UPLIFT. Age: Tertiary(?).
Paleozoic and Tr rocks uplifted and lying adjacent to great thickness of Mesozoic rocks.
10. ROMANZOF UPLIFT. Age: Tertiary.
Exposes mostly Paleozoic and pre-Cambrian rocks. Originally part of Colville geosyncline but uplifted in Tertiary time along east-striking thrust faults resulted in removal of Mesozoic rocks.
11. BROOKS RANGE GEANTICLINE. Age: J, K, Paleocene.
Exposes mostly Paleozoic rocks; some pre-Cambrian and Triassic. Source of sediments in 5, 6, 7, and 15.
12. KOBUK TROUGH. Age: K1-2.
13. COLEEN TROUGH. Age: Eocene.
14. CHUKOTSKIY-SEWARD UPLIFT. Age: Mesozoic.
Exposes mostly Paleozoic, pre-Cambrian, and K1 intrusives. Source of sediments in 15.
15. YUKON-KOYUKUK GEOSYNCLINE. Age: K1-2; possibly Tr-J.
HOGATZA ARCH. Age: K2-3 or Tertiary.* Exposes K1 and older (?) sedimentary and volcanic rocks and granitic intrusives.
16. GALENA BASIN. Age: Cenozoic.
17. SELAWIK BASIN. Age: Cenozoic.
18. NORTON BASIN. Age: Cenozoic.
19. RUBY GEANTICLINE. Age: J(?) and K.
20. RUBY GEANTICLINE. Age: J(?) and K.
Exposes pre-Cambrian and possibly Paleozoic metamorphic rocks and J-K intrusives. Source of sediments in 15 and 26.
21. RAMPART TROUGH. Age: Eocene.
A tectonic trench, occupied by Yukon River and Hess Creek, in which are remnants of Eocene rocks.
22. YUKON FLATS BASIN. Age: Cenozoic.
23. LOWER TANANA BASIN. Age: Cenozoic.
24. INNOKO BASIN. Age: Cenozoic.
25. BETHEL BASIN. Age: Cenozoic.
26. KUSKOKWIM GEOSYNCLINE. Age: Tr, J, K1-3.
27. GOODNEWS ARCH. Age: K2-3.
Exposes pre-Cambrian, Paleozoic, Tr, J, and K1 rocks. Source of K2-3 sediments in adjacent forks of Kuskokwim geosyncline.
28. TUPITY SEGMENT (OF 26). Age: K1-2; Tr-J(?).
29. KANDIK SEGMENT (OF 26). Age: Tr, J, K1-2; J(?).
30. KANDIK SEGMENT (OF 26). Age: Tr, J, K1-2; J(?).
31. NATION ARCH. Age: K or Tertiary.
Exposes Paleozoic and pre-Cambrian rocks.
32. EAGLE TROUGH. Age: Eocene.
33. TANANA GEANTICLINE. Age: J-K.
Exposes pre-Cambrian, Paleozoic, and J-K batholithic intrusives. Source of sediments in 26, 28, 29, and 39.
34. HEALY TROUGH. Age: Tertiary.
Coal-bearing Eocene sequence and younger gravels.
35. UPPER TANANA BASIN. Age: Cenozoic.
36. MIDDLE TANANA BASIN. Age: Cenozoic.
37. MINCHUMINA BASIN. Age: Cenozoic.
38. HOLITNA BASIN. Age: Cenozoic.
39. ALASKA RANGE GEOSYNCLINE. Age: Tr, J, K1-3.
40. NUTZOTIN SEGMENT (OF 39). Age: Tr, J, K1-3.
41. SEYMOUR GEOSYNCLINE. Age: Tr, J, K1.
Some trend as Alaska Range geosyncline.
42. NUSHAGAK BASIN. Age: Cenozoic.
43. TALKEETNA GEANTICLINE. Age: Jmu, K1-3.
Exposes Paleozoic, Tr, J, J-K batholithic intrusives. Source of sediments in 39, 40, and 47.
44. PRINCE OF WALES GEANTICLINE. Age: Jmu, K1-3.
Exposes Paleozoic, and J-K batholithic intrusives. Source of sediments in 41 and in belt of Mesozoic rocks bordering Gulf of Alaska.
45. COPPER RIVER BASIN. Age: Cenozoic.
46. ADMIRALTY TROUGH. Age: Eocene.
47. MATANUSKA GEOSYNCLINE. Age: Tr, Jmu, K1-3, and Paleocene(?).
Paleocene(?) reported only in Matanuska Valley but may underlie Eocene in Cook Inlet basin.
48. SHELIKOF TROUGH. Age: Tertiary.
Contains nonmarine Eocene, continuing northward under Quaternary of Cook Inlet basin. Marine Eocene, Miocene and Pliocene(?) overlying nonmarine Eocene, reported only in southwestern part (area of Pt. Barrow and Herald Bay and Unga Island).
49. COOK INLET BASIN. Age: Cenozoic.
50. SELDOVIA GEANTICLINE. Age: Jmu, K1-3(?).
Possibly not developed until Tertiary. Exposes Paleozoic, Tr, and J1 rocks.
51. CHUGACH MOUNTAINS GEOSYNCLINE. Age: K2(?) K3.
Faunal evidence of K3 rocks. K2 possibly represented in thick slate-graywacke-conglomerate sequence.
52. MESOZOIC GREENSTONE-GRAYWACKE-SLATE SEQUENCE BORDERING GULF OF ALASKA. See note in Gulf of Alaska area of map.
53. YAKATAGA GEOSYNCLINE. Age: Tertiary.
Includes Eocene, Oligocene, Miocene, and Pliocene. Maximum thickness about 25,000 feet.
54. MIDDLETON SHELF. Age: Tertiary.
Probably composed of Tertiary deposits built southward in shelf form. Continuous with but probably thinner than Tertiary in Yakataga geosyncline.
55. SHUMAGIN SHELF. Age: Tertiary(?).
56. ALEUTIAN TRENCH. Age: Quaternary and Tertiary(?).
Part adjacent to Middleton shelf believed to be area of thick Quaternary sedimentary accumulation. Subsidence and accumulation may have begun in Tertiary time.

ABBREVIATIONS

Tr - Triassic; J - Jurassic
J1 - Lower Jurassic; Jm - Middle Jurassic
Ju - Upper Jurassic; K - Cretaceous
K1 - Lower part of Cretaceous
K2 - Middle part of Cretaceous
K3 - Upper part of Cretaceous

Most tectonic elements south of Brooks Range include bodies of Cenozoic extrusive rocks, some of large size. Active volcanoes in Aleutian Islands, Alaska Peninsula, Aleutian Range, and Wrangell Mountains.

* NOTE: Field investigations in the central part of the Yukon-Koyukuk geosyncline subsequent to the preparation of this illustration indicate that the location of the geosynclinal axis may be partly in error. North of Lat. 64° N. the axis appears to trend nearly due north rather than northeastward as shown in the illustration.

DEFINITION OF TECTONIC TERMS

GEANTICLINE: A large linear positive element that was either uplifted and a source of sediments or was an area of little or no accumulation. Comprises a belt of relatively old rocks flanked by belts of younger rocks.
ARCH: Similar to geanticline but not as extensive.
UPLIFT: Similar to geanticline but nonlinear in form.
GEOSYNCLINE: A large linear negative element in which sediments accumulated. Comprises a belt of relatively young rocks flanked by belts of older rocks.
TROUGH: Similar to geosyncline but not as extensive.
BASIN: Similar to geosyncline but nonlinear in form.
PLATFORM: A shieldlike element that was either emergent as a source of sediments or slightly submerged as an area of relatively little accumulation.
SHELF: A body of sediments built outward into an ocean.
GEOSYNCLINAL SEGMENT: A part of a geosynclinal trend that is separated from the main geosynclinal mass by uplifted older rocks.



The rocks of the Brooks Range geanticline, Colville geosyncline, and Chukchi basin are believed to extend westward beneath the broad, shallow marine shelf north of Siberia. The geology of Wrangell Island, at about lat. 71°N, long. 178°E, is similar to that of the northern part of the Brooks Range.

The dominant structural grain in the area of the Chukotskiy-Seward uplift strikes east and represents early Cretaceous and possibly Jurassic phases of orogeny and intrusion. Superimposed on this older grain are north- to northeast-striking folds and faults that probably represent the early Tertiary (Laramide) orogeny. The strike of the younger structures parallels those in the adjacent Koyukuk geosyncline.

EXPLANATION

SEDIMENTARY ROCK UNITS

Cenozoic of lowland basins and coastal plains. Quaternary deposits in all areas. Includes Tertiary exposures in or marginal to some basins, which indicate possible widespread occurrence Tertiary beneath Quaternary. Underlying unit shown by symbol where age may be inferred.

Tertiary, in areas where Quaternary deposits are thin or absent. Includes Eocene in most areas. Later Tertiary known in a few areas. Underlying unit shown by symbol where age may be inferred.

K3
Cretaceous, upper part, and older Mesozoic rocks. Youngest known Mesozoic rocks represent one or more of the stages Tortonian through Campanian. Includes in some areas Paleocene(?) rocks that are conformable with Cretaceous rocks and predate the Laramide orogeny.

K2
Cretaceous, middle part, and older Mesozoic rocks. Youngest known Mesozoic rocks are Albian or Cenomanian. Albian present regionally. Cenomanian definitely known only in Colville geosyncline, probably present elsewhere but faunal evidence lacking because of non-marine deposition or lack of detailed field studies.

K1
Cretaceous, lower part, and older Mesozoic rocks. Youngest known Mesozoic rocks are early Neocomian.

bc
Basement complex. Paleozoic and (or) pre-Cambrian. Includes Triassic and Lower Jurassic in some areas. In most areas includes igneous bodies of Jurassic and (or) early Cretaceous age; many of are batholithic size.

Topographic basin. Known to be or possibly caused by Cenozoic tectonic movement.

Boundary of tectonic element.

Geanticline or arch, indicating general strike of folds, faults, cleavage, and foliation. Arrow indicates plunge.

Geosyncline or trough, indicating general strike of folds, faults, cleavage, and foliation. Dotted where geosynclinal deposits have been uplifted and mostly eroded. Arrow indicates plunge.

Submarine contours in fathoms

Base from Alaska Map E