

MESOZOIC AND CENOZOIC TECTONIC ELEMENTS OF ALASKA

Compiled by Thomas G. Payne  
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DESCRIPTION OF TECTONIC ELEMENTS

(For further details and abbreviations see table, Sheet 2. Age of negative elements refers to time of subsidence and to age of rocks accumulated therein. Age of positive elements refers to time of erosion or little or no accumulation.)

1. ARCTIC PLATFORM. Age: Pal., Tr., J., K1.
2. ARCTIC OCEAN BASIN. Age: K2 to Recent.
3. BEAUFORT SHELF. Age: K3 to Recent.
4. BARROW ARCH. Age: Mesozoic.
5. COLVILLE GEOSYNCLINE. Age: Tr., J., K1-2.
6. UMAT BASIN. Age: K3 and Paleocene(?).
7. CHUKCHI BASIN. Age: K3 and Paleocene(?).
8. MEADE ARCH. Age: K3 and Paleocene(?).
9. TIGARA UPLIFT. Age: Tert. (?)
10. ROMANZOF UPLIFT. Age: Tert.
11. BROOKS RANGE GEANTICLINE. Age: J., K, Paleocene.
12. KOBUK TROUGH. Age: Eocene(?).
13. COLEEN BASIN. Age: Eocene.
14. CHUKOTSKIY-SEWARD UPLIFT. Age: Mesozoic.
15. KOYUKUK GEOSYNCLINE. Age: K2-3, possibly Tr.-J.
16. HOGATZA UPLIFT. Age: K2-3 or Tert.
17. RAMPART TROUGH. Age: Eocene.
18. KOTZEBUE BASIN. Age: Eocene.
19. NORTON BASIN. Age: Eocene.
20. RUBY GEANTICLINE. Age: J and K.
21. SALENA BASIN. Age: J and K.
22. YUKON PLATS. Age: Eocene.
23. TANANA BASIN. Age: Eocene.
24. HEALY TROUGH. Age: Tert.
25. STERNA BASIN. Age: Eocene.
26. KUSKOKWIM GEOSYNCLINE. Age: Tr., J., K1-3.
27. GOODNEWS ARCH. Age: K2-3.
28. EUREKA SEGMENT. Age: K1-2; Tr.-J(?).
29. KANDIK SEGMENT. Age: K1-2; Tr.-J(?).
30. NATION ARCH. Age: Tert.
31. EAGLE TROUGH. Age: Tert.
32. CORDOVA GEANTICLINE. Age: K2-3.
33. UPPER TANANA BASIN. Age: Eocene.
34. HEALY TROUGH. Age: Tert.
35. MIDDLE TANANA BASIN. Age: Eocene.
36. TANANA GEANTICLINE. Age: K2-3.
37. NUTZOTIN SEGMENT. Age: K2-3.
38. COPPER RIVER BASIN. Age: Eocene.
39. MOUNTAINS. Age: Tert.
40. SEYMOUR GEANTICLINE. Age: Tert.
41. ALEUTIAN TRENCH. Age: Quaternary and Tert. (?)
42. NUSHAGAK BASIN. Age: Eocene.
43. MOUNTAINS. Age: Tert.
44. CHUGACH GEANTICLINE. Age: Tert.
45. MOUNTAINS. Age: Tert.
46. MOUNTAINS. Age: Tert.
47. MOUNTAINS. Age: Tert.
48. MOUNTAINS. Age: Tert.
49. MOUNTAINS. Age: Tert.
50. MOUNTAINS. Age: Tert.
51. MOUNTAINS. Age: Tert.
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53. MOUNTAINS. Age: Tert.
54. MOUNTAINS. Age: Tert.
55. MOUNTAINS. Age: Tert.

CENOZOIC BASINS: 17, 18, 19, 22, 23, 24, 25, 35, 36, 37, 38, 42, 45, 49.  
History of basins described below in 6 stages. For some stages two interpretations are possible, indicated as (a) or (b). For some basins (a) and for others (b), may be applicable.

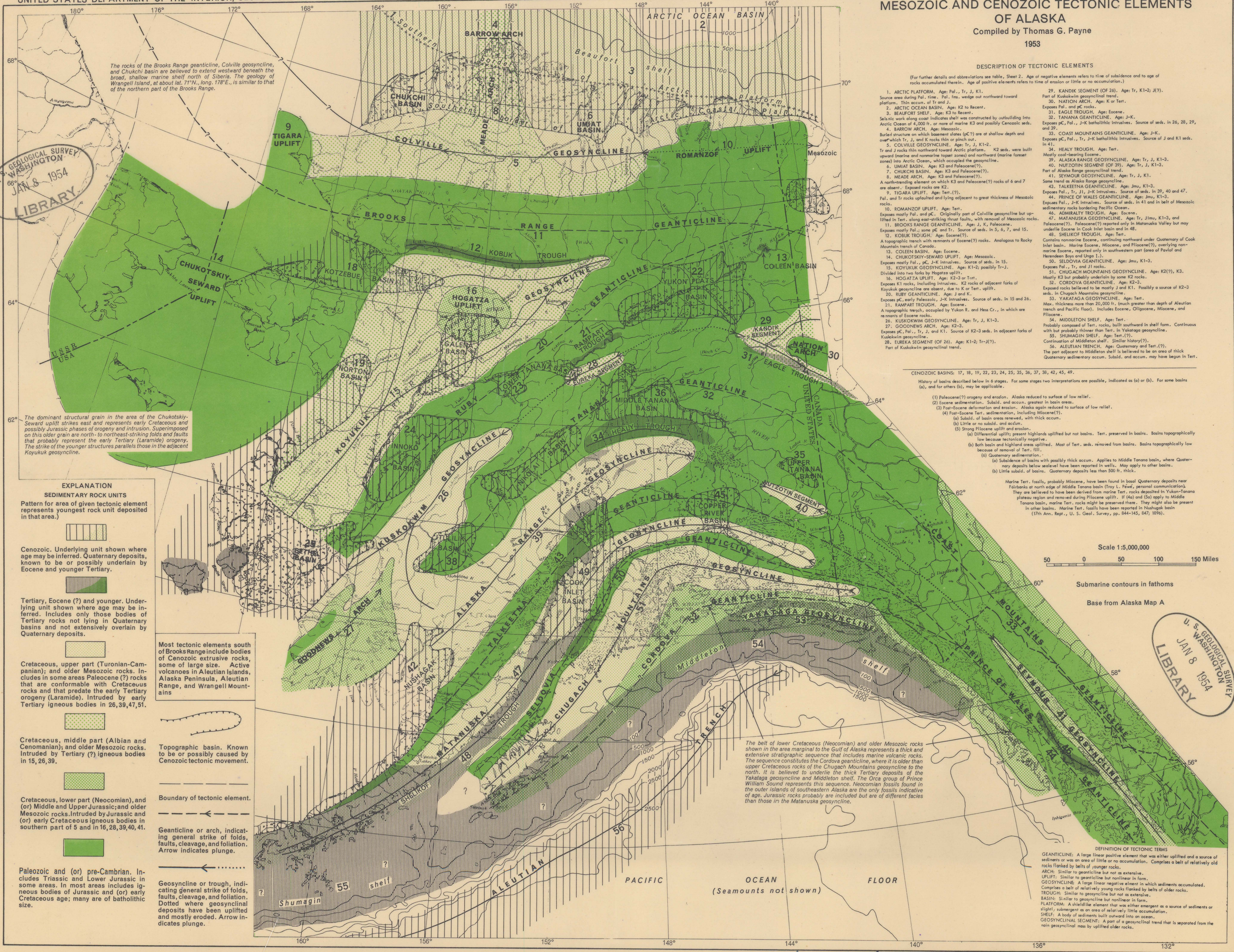
- (1) Paleocene (?) orogeny and erosion. Alaska reduced to surface of low relief.
- (2) Eocene sedimentation. Subsid. and accum. greatest in basin areas.
- (3) Post-Eocene deformation and erosion. Alaska again reduced to surface of low relief.
- (4) Post-Eocene Tert. sedimentation, including Miocene(?).
- (a) Subsid. of basin areas renewed, with thick accum.
- (b) Little or no subsid. and accum.
- (5) Strong Pliocene uplift and erosion.
- (a) Differential uplift; present highlands uplifted but not basins. Tert. preserved in basins. Basins topographically low because tectonically negative.
- (b) Both basin and highland areas uplifted. Most of Tert. sed. removed from basins. Basins topographically low because of removal of Tert. fill.
- (6) Quaternary sedimentation.
- (a) Subsidence of basins with possibly thick accum. Applies to Middle Tanana basin, where Quaternary deposits below sea level have been reported in wells. May apply to other basins.
- (b) Little subsid. of basins. Quaternary deposits less than 500 ft. thick.

Scale 1:5,000,000  
Submarine contours in fathoms  
Base from Alaska Map A

Marine Tert. fossils, probably Miocene, have been found in basal Quaternary deposits near Fairbanks at north edge of Middle Tanana basin (Troy L. Pewé, personal communication). They are believed to have been derived from marine Tert. rocks deposited in Yukon-Tanana plateau region and removed during Pliocene uplift. If (4a) and (5a) apply to Middle Tanana basin, marine Tert. rocks might be preserved there. They might also be present in other basins. Marine Tert. fossils have been reported in Nuliguk basin (17th Ann. Rept., U. S. Geol. Survey, pp. 844-145, 847, 1896).

The belt of lower Cretaceous (Neocomian) and older Mesozoic rocks shown in the area marginal to the Gulf of Alaska represents a thick and extensive stratigraphic sequence that includes marine volcanic rocks. The sequence constitutes the Cordova geanticline, where it is older than upper Cretaceous rocks of the Chugach Mountains geanticline to the north. It is believed to underlie the thick Tertiary deposits of the Yakutat geanticline and Middleton shelf. The Orca group of Prince William Sound represents this sequence. Neocomian fossils found in the outer islands of southeastern Alaska are the only fossils indicative of age. Jurassic rocks probably are included but are of different facies than those in the Matanuska geanticline.

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 slight, submergent 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.

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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**  
Pattern for area of given tectonic element represents youngest rock unit deposited in that area.
- Cenozoic. Underlying unit shown where age may be inferred. Quaternary deposits, known to be or possibly underlain by Eocene and younger Tertiary.
  - Tertiary, Eocene (?) and younger. Underlying unit shown where age may be inferred. Includes only those bodies of Tertiary rocks not lying in Quaternary basins and not extensively overlain by Quaternary deposits.
  - Cretaceous, upper part (Turonian-Campanian); and older Mesozoic rocks. Includes in some areas Paleocene (?) rocks that are conformable with Cretaceous rocks and that predate the early Tertiary orogeny (Laramide). Intruded by early Tertiary igneous bodies in 26, 39, 47, 51.
  - Cretaceous, middle part (Albian and Cenomanian); and older Mesozoic rocks. Intruded by Tertiary (?) igneous bodies in 15, 26, 39.
  - Cretaceous, lower part (Neocomian), and (or) Middle and Upper Jurassic; and older Mesozoic rocks. Intruded by Jurassic and (or) early Cretaceous igneous bodies in southern part of 5 and in 16, 28, 39, 40, 41.
  - 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 are of batholithic size.
- TECTONIC ELEMENTS**
- 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.

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