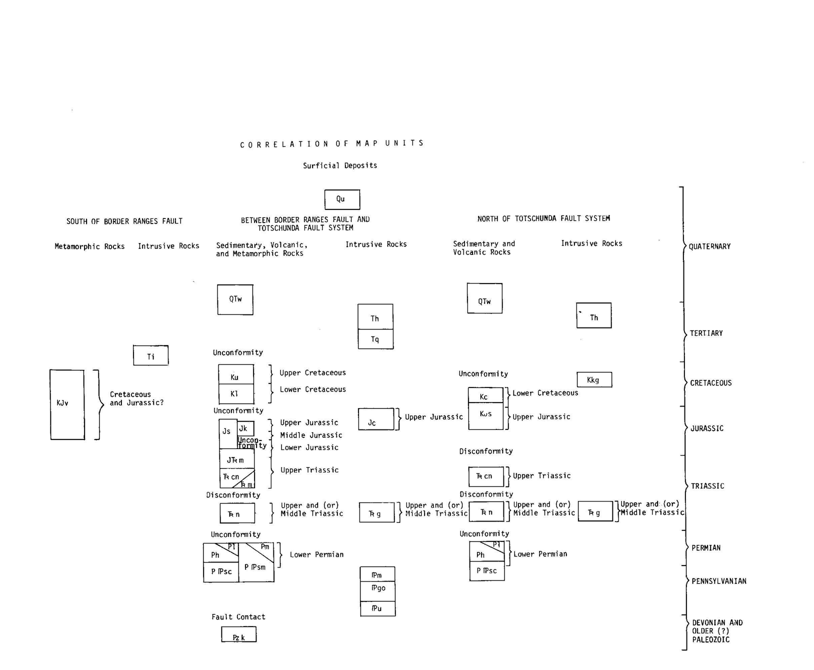
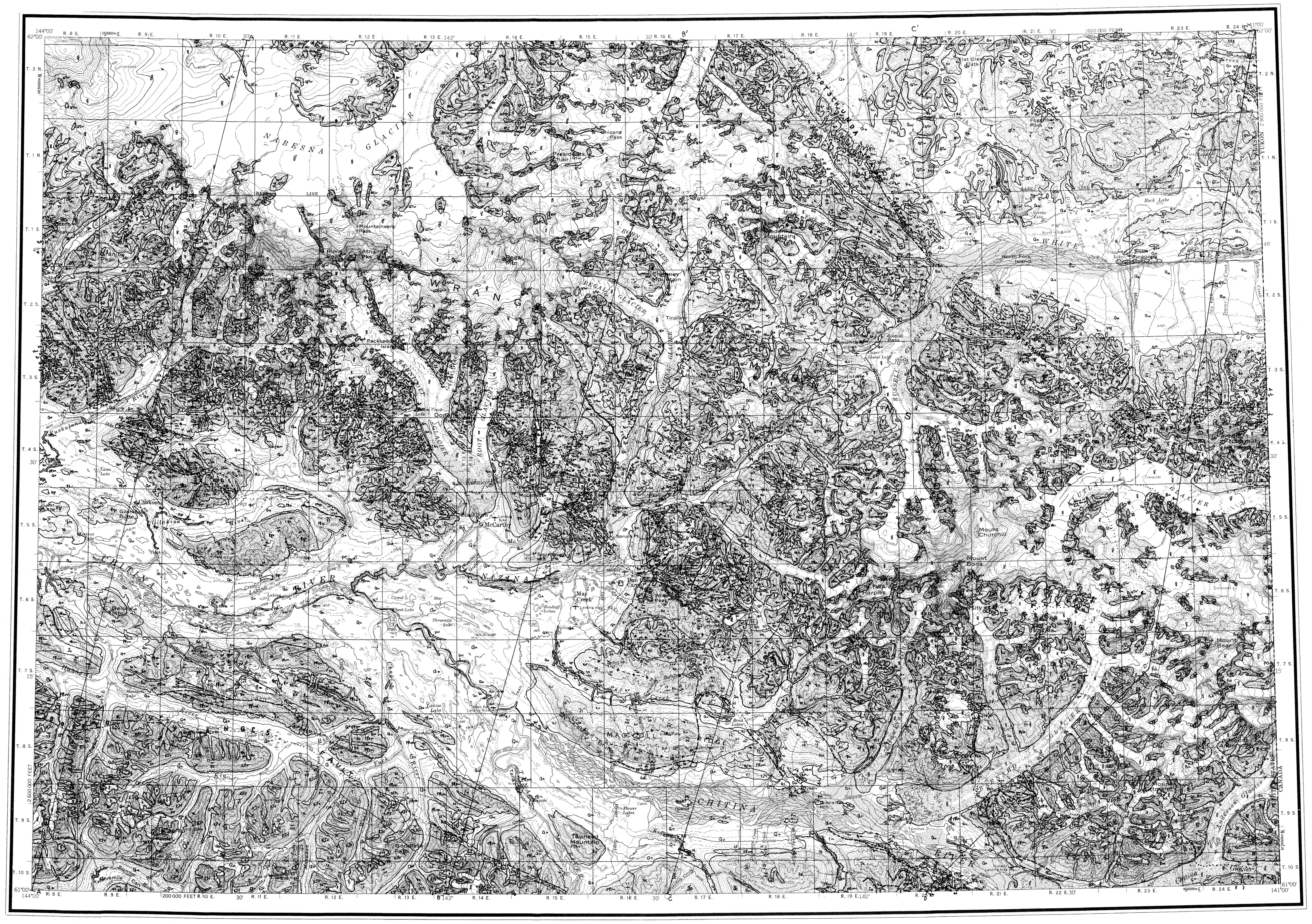
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE McCARTHY QUADRANGLE, ALASKA

MAP MF-773A

MACKEVETT--GEOLOGIC MAP





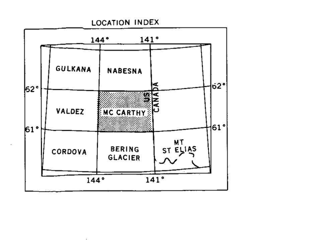
BASE FROM U. S. GEOLOGICAL SURVEY, 1960

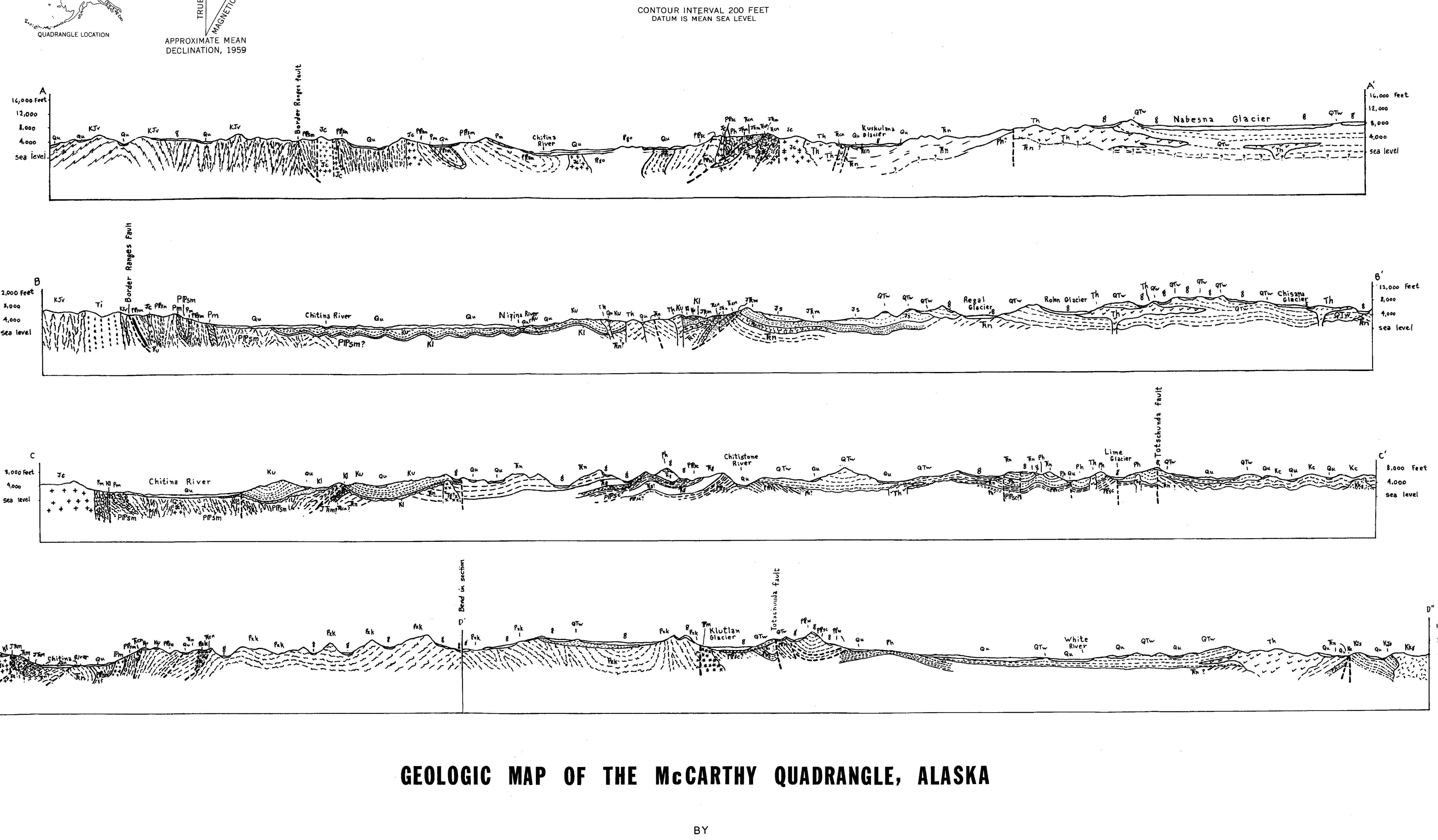
SCALE 1:250000

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1959

GEOLOGY MAPPED BY R. L. APPLEGATE, 1964; H. C. BERG, 1962; W. C. BLAKE, 1961; A. B. FORD, 1971; TRAVIS HUDSON, 1973; D. L. JONES, 1962, 65, 67, 69, 1970-74; E. M. MACKEVETT, JR., 1962-65, 67, 69, 1970-74; GEORGE PLAFKER, 1962, 1971-72; D. H. RICHTER, 1972, 73; J. G. SMITH, 1967, 1970-71; J. H. STOUT, 1963; R. G. TYSDAL, 1973; D. P. WHISTLER, 1963; G. R. WINKLER, 1964, 65, 67, 69, 1974





GEOLOGIC MAP OF THE McCARTHY QUADRANGLE, ALASKA

BY

E. M. MACKEVETT, JR.

1976

BACKGROUND INFORMATION FOR THIS MAP IS PUBLISHED AS U. S. GEOLOGICAL SURVEY CIRCULAR 739, AVAILABLE FREE OF CHARGE FROM THE U. S. GEOLOGICAL SURVEY, RESTON, VA 22092

EXPLANATION

g	Glacier
	Contact, showing dip; dotted where concealed
	Overturned contact, showing dip; dotted where concealed
	High-angle fault, showing dip of fault plane. Dashed where approximate; queried where doubtful; dotted where concealed. U, upthrown side; D, downthrown side
	Thrust fault, showing dip of fault plane. Dashed where approximate; dotted where concealed. Saw teeth on upper plate
	Syncline, approximately located, showing trace of axial surface
	Anticline, approximately located, showing trace of axial surface
	Overturned syncline
	Overturned anticline
	Strike and dip of beds
	Strike and dip of overturned beds
	Vertical beds
	Horizontal beds
	Strike and dip of lava flows
	Strike and dip of foliation
	Strike of vertical foliation

Note: Mines, prospects, and main mineral occurrences are shown and briefly described on a separate map of this folio (MF 773-B).

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Diverse Quaternary surficial deposits are abundant in the quadrangle. Quaternary processes of deposition and erosion strongly influenced the landscape, producing many of the scenic and physiographic features. Some surficial deposits are exceptionally well developed. Surficial deposits, only cursorily studied during our investigations, afford an excellent basis for potentially important future studies

Qu UNDIFFERENTIATED SURFICIAL DEPOSITS--Includes alluvium, older alluvium, colluvium, talus, landslides, rock glaciers, glaciofluvial deposits, and a variety of moraines; briefly described by MacKevett (1970a; 1970c, p. 24, 25; 1971, p. 27, 28; 1974). Many deposits are glacier related and (or) reflect the region's rigorous climate. Alluvium and older alluvium widespread along the streams and rivers; alluvium most conspicuous as ephemeral bars along flood plains of major rivers, such as the Nizina and Chitina; older alluvium commonly forms terraces that flank the rivers and larger streams. Colluvium, slope wash, and similar deposits constitute thin veneers on many hillsides. Talus is well developed on some steep bedrock slopes, typically forms thin elongate cones whose lower extents coalesce into talus aprons. Most landslides localized below abrupt topographic breaks, forming irregular masses characterized by hummocky surfaces and chaotic assemblages of angular and subangular blocks. Both inactive and active rock glaciers are exceptionally well developed in the quadrangle; they form sinuous or lobate, mainly elongate masses that head in cirques; many of the most spectacular rock glaciers are composed of fragmented, silica-rich Tertiary hypabyssal rocks. The glaciofluvial deposits include glaciolacustrine deposits, some glacial outwash, and a few kames and eskers. Glaciolacustrine deposits formed in a large periglacial lake that covered much of the Chitina Valley and Copper River Lowland during the last major glaciation mantle most of the Chitina Valley and valleys of rivers and larger streams tributary to the Chitina River. Ferrians (1963) describes glaciolacustrine deposits of the Copper River Basin part of the lake, and cites radiocarbon data indicating their age ranges between at least 38,000 years B.P. (before present) and 9,400±300 years B.P. Glacial outwash widely dispersed over flood plains of rivers that emanate from large valley glaciers; kames and eskers locally developed in the Chitina Valley; lateral, medial, end, and ground moraines widely, and in places, strikingly, developed. Many deposits merge and are partly contemporaneous; many represent products of deposition that recurred intermittently throughout the Quaternary history of the region; several types of surficial deposits are still actively forming. In general, the glaciofluvial deposits are among the oldest of the surficial deposits. Surficial deposits similar to those in the McCarthy quadrangle are widespread in nearby parts of Alaska and Canada; deposits in the Nabesna quadrangle have been mapped and described in some detail by Richter (1975)

SOUTH OF THE BORDER RANGES FAULT

METAMORPHIC ROCKS

KJv VALDEZ GROUP (Cretaceous and Jurassic?)--Originally named Valdes Series by Schrader (1900); revised to Valdez Group by Grant and Higgens (1910, p. 11) on the basis of their work in the Gulf of Alaska region. Dominant rock unit in southwestern part of quadrangle south of Border Ranges fault (MacKevett and Plafker, 1974), which marks the northern boundary of the Valdez; base and top unexposed. Cut by Tertiary plutons; thin- to medium-bedded metamorphosed flysch at least several thousand metres thick that consists of interlayered metagraywacke and argillite and minor schist, slate, and phyllite; metamorphosed to chlorite- or biotite-grade greenschist facies metamorphic mineral assemblages; mainly marked by steep northwest-striking foliation and by northwest-striking lineaments. Probably represents turbidite deposits that formed extensive deep sea fans. Valdez Group and similar rocks occupy an arcuate belt that extends at least from the western St. Elias Mountains, throughout the Chugach Mountains, westward to the Shumagin Islands. The

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individual tillite sequences are as much as 70 m thick. Radiometric (potassium-argon) dates indicate that these tillites were deposited between 2.7 and 10 million years ago (Denton and Armstrong, 1969, p. 1135)

Wrangell Lava volcanism probably resulted from northward oblique underthrusting of the Pacific plate beneath the continent; older parts of Wrangell Lava at least 10 m.y. old (Richter, 1975); the youngest radiometrically dated Wrangell Lava in the quadrangle, the White River ash of local usage, is 1400-1500 years old (Stuiver and others, 1964). Wrangell Lava volcanism is still locally active at Mount Wrangell, a few kilometres northwest of the quadrangle. Wrangell Lava is coextensive with its counterparts in the Nabesna quadrangle (Richter, 1975) and throughout parts of the Wrangell Mountains west of the quadrangle; Probable correlatives of the Wrangell Lava occur in the Talkeetna Mountains, the Alaska Peninsula and Aleutian Islands; correlatives of the Wrangell Lava and the Frederika Formation occur discontinuously in the Yukon Territory (Muller, 1967, p. 80-92; Souther and Stanciu, 1975)

Ku PREDOMINANTLY UPPER CRETACEOUS SEDIMENTARY ROCKS--Upper Cretaceous sedimentary rocks that are parts of the Matanuska-Wrangell terrane (Berg and others, 1972, p. D17) and that locally include a few lower Cretaceous strata were subdivided into the Moonshine Creek, Schulze, Chititu, and MacColl Ridge Formations by Jones and MacKevett (1969); widely distributed along southern flank of the Wrangell Mountains and in Chitina Valley; disconformably overlie Kennicott Formation or unconformably overlie pre-Cretaceous rocks; unconformably overlain by Tertiary rocks and cut by Tertiary plutons; where observed, interformational contacts are disconformities; estimated maximum thicknesses of individual formations: Moonshine Creek, 1,100 m; Schulze, 75 m; Chititu, 1,700 m; MacColl Ridge, 770 m; thin to thick bedded. Lithologies: Moonshine Creek, siltstone and sandstone with minor conglomerate; Schulze, porcellanite with minor sandstone and conglomerate; Chititu, mudstone and shale, subordinate porcellanite, sandstone, and impure limestone; MacColl Ridge, coarse sandstone, minor granule and pebble conglomerate; the Upper Cretaceous sedimentary rocks formed at shallow to moderate depths in local basins in marginal seas; parts of the Moonshine Creek, Schulze, and Chititu are coeval. Abundant fossils indicate an age span from late Albian to Maestrichtian; late Albian fossils are restricted to a few basal strata; and because the sequence is predominantly post Albian, the entire sequence is designated as predominantly Upper Cretaceous; paleontologic and other relevant data given in Jones and MacKevett (1969) and MacKevett (1970c, p. 19-23; 1971, p. 19-21, 32; 1974). Correlates with part of the Matanuska Formation in the Talkeetna Mountains and Matanuska Valley (Grantz, 1964) and probably with some other rocks in western parts of the Matanuska geosyncline (Payne, 1955)

Kl LOWER CRETACEOUS SEDIMENTARY ROCKS--The quadrangle's Lower Cretaceous sedimentary rocks of the informally designated Matanuska-Wrangell terrane (Berg and others, 1972, p. D17) consist of unnamed Neocomian rocks and the Albian Kennicott Formation as defined by Jones and MacKevett (1969, p. K7). Neocomian rocks are most abundant in western parts of the quadrangle and occur locally south of Chitina River in the south-central part of the quadrangle; the Kennicott occurs widely, but not extensively, throughout the southern parts of the quadrangle. Lower Cretaceous sedimentary rocks are separated from Jurassic or older rocks by a marked angular unconformity, and locally nonconformably overlie Jurassic granitic rocks; they are overlain disconformably by Upper Cretaceous rocks or unconformably by Tertiary rocks. Contacts between Neocomian and Albian rocks are disconformities or slightly angular unconformities. The Lower Cretaceous sedimentary rocks are cut by a few Tertiary plutons; their maximum aggregate thickness is about 450 m; thin to medium bedded. Neocomian and Albian successions are marked by basal conglomerate; the Neocomian contains sandstone, shale, and, in western parts of the quadrangle, abundant impure bioclastic limestone consisting largely of fragmented Inoceramus. The Kennicott consists of sandstone, siltsone, and minor basal and intraformational conglomerate, shale, and limy concretions; the Lower Cretaceous sedimentary rocks mainly reflect nearshore, high-energy deposition in a transgressive marginal sea. Fossils from the Neocomian rocks indicate Hauterivian and Barremian Stages of the Early Cretaceous (Grantz and others, 1966, p. C46). The Kennicott Formation can be subdivided into two well-defined early Albian faunal zones based on the ammonites Moffitites robustus and Brewericeras hulenense (Jones and MacKevett, 1969, p. K10, K11). Correlatives of the Lower Cretaceous sedimentary rocks occur widely throughout Payne's (1955) extensive Matanuska geosyncline; best represented by Nelchina Limestone and associated rocks (Grantz and others, 1966, p. C46) and lowermost parts of Grantz's revised Matanuska Formation in the Talkeetna Mountains and nearby regions (1964, p. I10), and by Neocomian rocks near the mouth of the Chitina River (Grantz and others, 1966, p. C46); older (pre-Hauterivian) Neocomian parts of the Lower Cretaceous sequence were not recognized in the quadrangle, but occur at scattered localities to the west, south, and east (Grantz and others, 1966, p. C46; D. L. Jones, oral commun., 1974; Sharp and Rigsby, 1956, p. 118, 119)

Js UNDIVIDED JURASSIC MARINE SEDIMENTARY ROCKS--Represents lower part of Matanuska-Wrangell terrane of Berg and others (1972, p. D17); subdivided into three formations, Lubbe Creek, Nizina Mountain, and Root Glacier, by MacKevett (1969, p. A35-A49); confined to south-central part of Wrangell Mountains, mainly Tps. 3 and 4 S., Rs. 13, 14, 15, and 16 E. Gradationally overlies the upper member of the McCarthy Formation and unconformably overlain by post-Jurrassic rocks; marked by interformational disconformities and local intraformational hiatuses; locally cut by Tertiary plutons; the sequence is more than 1,600 m in combined thickness; maximum thicknesses for the individual formations are: Lubbe Creek, 90 m; Nizina Mountain, 420 m; Root Glacier, 1,200 m; thin to medium bedded. Lithologies range from spiculite and minor coquina (Lubbe Creek), upward through graywacke (Nizina Mountain), to mudstone, siltstone, and subordinate sandstone, shale, and conglomerate (Root Glacier); largely products of intermittent, fairly rapid, sedimentation in a subsiding basin under shallow marine, locally littoral, conditions. Abundant fossils substantiate an age span of Early Jurassic (Pliensbachian Stage) to Late Jurassic (Kimmeridgian Stage); faunal data given in MacKevett (1969, p. A42, A45, A48, A49; 1971, p. 29-32); the undivided Jurassic marine sedimentary rocks broadly correlate with sparsely distributed Jurassic rocks in the Valdez quadrangle (Grantz and others, 1966, p. C40, C44), with similar rocks in the Talkeetna Mountains described by Grantz (1960a, b), and with some other Jurassic rocks in southern Alaska discussed by Imlay and Detterman (1973)

Jk KOTSINA CONGLOMERATE (Upper or Middle Jurassic)--Named by Rohn (1900, p. 431). Restricted to western part of quadrangle (Tps. 2 and 3 S., R. 8 E.); unconformably overlies lower member of McCarthy Formation; top unexposed; cut by a few Upper Jurassic dikes; at least 500 m in maximum thickness; thin to thick bedded. Mainly well indurated conglomerate with locally derived pebbles and cobbles; subordinate sandstone and shale; mainly reflects rapid local marine deposition in response to orogenesis. No diagnostic fossils found in the Kotsina. Isotopic age determinations (Grantz and others, 1966, p. C43, C44) indicate a minimum age of Late Jurassic and suggest a Middle or Late Jurassic age for the Kotsina Conglomerate. The Kotsina extends westward into the northeastern part of the Valdez quadrangle; conglomeratic Jurassic rocks that are probable correlatives are known in the Talkeetna Mountains and elsewhere in southern Alaska (Imlay and Detterman, 1973, p. 10, 11)

JRm McCARTHY FORMATION (Lower Jurassic and Upper Triassic)--Originally named McCarthy Creek Shales by Rohn (1900, p. 426); after several revisions in nomenclature, MacKevett (1963) divided the McCarthy Formation into a lower and an upper member

Upper member--Confined to south-central flank of Wrangell Mountains, mainly Tps. 3 and 4 S., Rs. 14, 15, and 16 E.; slightly more than 600 m in maximum thickness. Grades downward into the lower member and upward into the Lower Jurassic Lubbe Creek Formation; where the Lubbe Creek is absent, overlain disconformably by Middle or Upper Jurassic rocks, or unconformably by Cretaceous rocks; dominantly thin bedded. Consists of very fine grained spiculite, impure chert, impure limestone, and shale; mainly formed at variable depths in a restricted sea where siliceous organisms flourished. Paleontologic evidence (cited in MacKevett, 1970a, b; 1971, p. 15, 29) documents Early Jurassic ages that range from Hettangian to Pliensbachian Stages; possibly the unfossiliferous lowermost parts of the member are as old as latest Triassic. No known correlatives in nearby regions, but parts of the Talkeetna Formation in the Talkeetna Mountains (west of the quadrangle) are temporal but not lithologic equivalents

Lower member--Occurs widely along southern flank of Wrangell Mountains and, locally, near headwaters of Chitina River; as much as 300 m thick; in gradational contact with underlying Nizina Limestone and overlying upper member; locally unconformably overlain by Kotsina Conglomerate (Jurassic) or by Cretaceous rocks; at a few places cut by plutons of Chitina Valley batholith or by Tertiary dikes and sills; characteristically thin bedded. Incompetent and readily susceptible to folding; forms subdued outcrops. Locally laterally grades with upper part of Nizina Limestone. Consists of impure limestone (mainly wackestone in the terminology of Dunham, 1962), calcareous carbonaceous shale, and impure, locally spiculitic, chert; formed in marine, partly starved basin, environments. Fossils from the lower member indicate the Norian, mainly late Norian, Stage of the Late Triassic; diagnostic fossils are restricted to the lower part of the member, thus its upper part may include some post-Norian Triassic and Lower Jurassic rocks; characteristic lower member fossils are pelecypods of the genus Monotis; paleontologic data for the lower member are given in Moffit (1938, p. 61, 62) and MacKevett (1971, p. 29; 1972). Probable correlatives of the lower member include Monotis-bearing Upper Triassic rocks in the Nabesna quadrangle (Richter, 1975), the Yukon Territory (Muller, 1967, p. 50), and at several other Alaskan localities (Martin, 1916, p. 686-718)

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