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Scientific Investigations Map 3238
Pamphlet accompanies map

Geologic Strip Map Along the Hines Creek Fault Showing Evidence for Cenozoic Displacement in the Western Mount Hayes and Northeastern Healy Quadrangles, Eastern Alaska Range, Alaska

By
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2013

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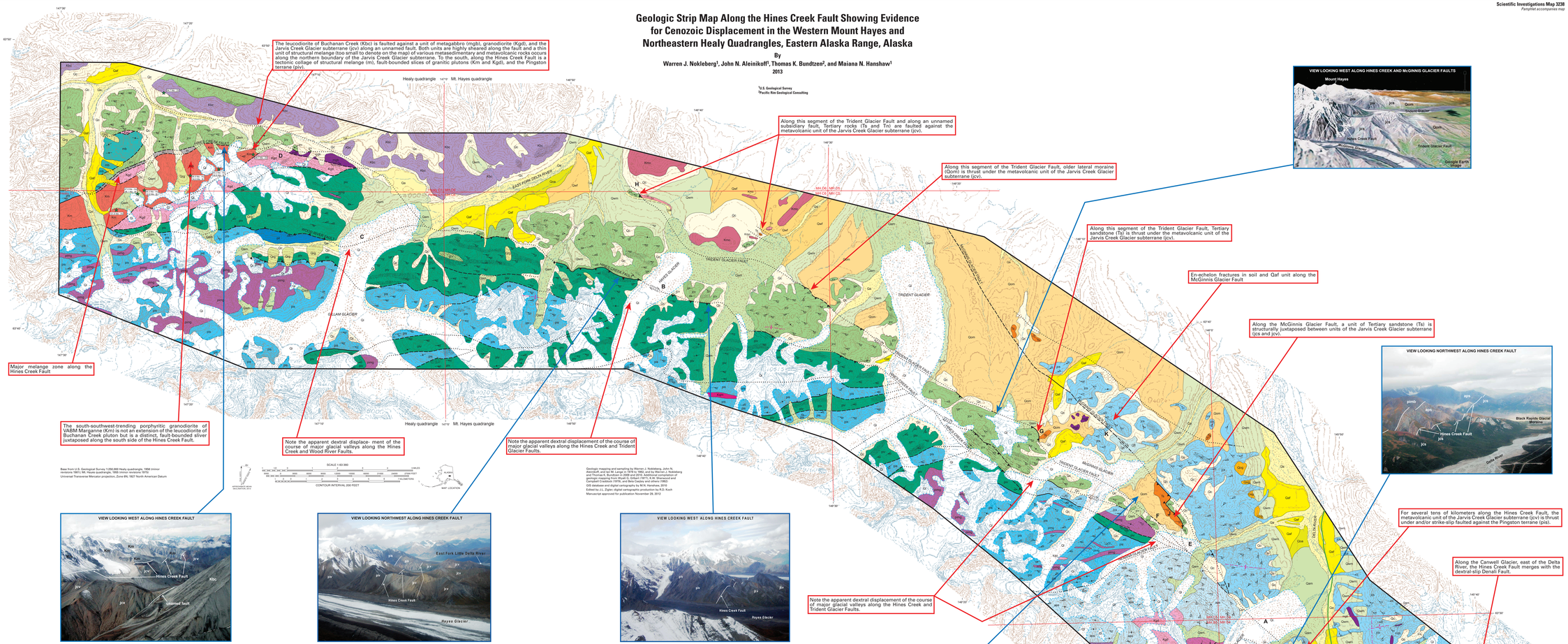

Base from U.S. Geological Survey 1:250,000 Healy quadrangle, 1958 (minor revisions 1961); Mt. Hayes quadrangle, 1956 (minor revisions 1970)
Universal Transverse Mercator projection, Zone 6N, 1927 North American Datum

Geologic mapping and sampling by Warren J. Nokleberg, John N. Aleinikoff, and Ian M. Lange in 1979 to 1982, and by Warren J. Nokleberg and Thomas K. Bundtzen in 2006 and 2010. Additional compilation of geologic mapping from Wyatt G. Gilbert (1977), K.W. Sherwood and Ronald D. Craig (1974), Richard A. Lanphere (unpublished data), Campbell Craddock (1979), and Bela Csejtey and others (1992).
GIS database and digital cartography by M.N. Hanshaw, 2010
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CORRELATION OF MAP UNITS

[See Description of Map Units (in pamphlet) for precise unit ages]

SURFICIAL UNITS

Qi, Qa, Qc, Qaf, Qom, Qrg, Qff, Qda, Qam, Qcaf, Qom, Qdg — Holocene; Holocene and Pleistocene; lower Pleistocene or upper Pleiocene — CENOZOIC

SEDIMENTARY UNITS

Tn — lower Pliocene to upper Miocene
Ts — Pliocene to Oligocene

MELANGE

m — Holocene to Paleocene — CENOZOIC

POST-ACCRETIONARY PLUTONIC UNITS

Kbc, Km, Kdg, Kgd, Kg — lower Tertiary to Upper Cretaceous; Upper Cretaceous; Upper Triassic — MESOZOIC

TERRANES

YUKON-TANANA TERRANE
Jarvis Creek Glacier Subterrane
jcs — Devonian and older
jcv — Upper Devonian
Fault
PINGSTON TERRANE
pzmg — Cretaceous?
pzv — Triassic
pzms, pzs — Triassic to Silurian
Fault
AURORA PEAK TERRANE
apg — lower Tertiary to middle Cretaceous
apm, apms — Triassic to Silurian
Fault
WINDY TERRANE
wp — Cretaceous
Fault
MACLAREN TERRANE
mmg — lower Tertiary and Upper Cretaceous
mu — Upper Jurassic?
Fault
WRANGELLIA TERRANE
wpm — Cretaceous to Triassic?
wls — Lower Permian to Middle Pennsylvanian

LIST OF MAP UNITS

[See Description of Map Units (in pamphlet) for complete unit descriptions]

SURFICIAL UNITS

- Qi — **Icefield, glacier, and lesser unconsolidated deposits of Alaska glaciation (Holocene)**
- Qa — **Alluvial deposits (Holocene)**
- Qc — **Colluvial deposits and minor lateral moraine (Holocene)**
- Qaf — **Alluvial fan (Holocene)**
- Qam — **Alaskan neoglaciation lateral and terminal moraine and glacial debris from Alaskan glaciation (Holocene)**
- Qrg — **Rock glacier (Holocene)**
- Qff — **Flavialacustrine deposits (Holocene)**
- Qda — **Older, uplifted alluvium and minor lateral moraine (Holocene and Pleistocene)**
- Qom — **Wisconsin stage glaciation lateral moraine (Holocene and Pleistocene)**
- Qcaf — **Wisconsin stage glaciation glaciofluvial deposits (Holocene and Pleistocene)**
- Qdm — **Illinoian stage or early Wisconsin stage lateral moraine (lower Pleistocene or upper Pliocene)**
- Qrg — **Drift of older glaciations (lower Pleistocene or upper Pliocene)**

SEDIMENTARY UNITS

- Tn — **Nenana Gravel (lower Pliocene to upper Miocene)**
- Ts — **Sandstone, siltstone, and lower conglomerate (Pliocene to Oligocene)**

MÉLANGE

- m — **Structural melange along Hines Creek Fault (Holocene to Paleocene)**

POST-ACCRETIONARY PLUTONIC ROCKS

- Kbc — **Leucodiorite and granodiorite of Buchanan Creek (lower Tertiary to Upper Cretaceous)**
- Km — **Porphyritic granodiorite of VABM Marganne (lower Tertiary to Upper Cretaceous)**
- Kmo — **Granodiorite of Molybdenum Ridge (lower Tertiary to Upper Cretaceous)**
- Kgd — **Unnamed granodiorite (Upper Cretaceous)**
- Kg — **Unnamed granite (Upper Cretaceous)**
- mgb — **Metamorphosed gabbro and diabase (Upper Triassic)**

TERRANES (NORTH TO SOUTH)

YUKON-TANANA TERRANE
Jarvis Creek Glacier Subterrane

- jcs — **Fine-grained metasedimentary rocks (Devonian and older)**
- jcv — **Fine-grained schistose metavolcanic rocks and metasedimentary rocks (Upper Devonian)**

PINGSTON TERRANE

- pzmg — **Gabbro and lesser diabase of Mount Moffit (Cretaceous?)**
- pzl — **Limestone, calcareous sandstone, and phyllite (Triassic)**
- pzmb — **Metabasalt (Triassic to Silurian)**
- pzs — **Metasedimentary rock, chiefly phyllite (Triassic to Silurian)**
- pzms — **Mafic to siliceous metavolcanic rock with lesser phyllite, metasiltstone, and chert (Triassic to Silurian)**

AURORA PEAK TERRANE

- apg — **Metamorphosed granitic rock (lower Tertiary to middle Cretaceous)**
- apmg — **Metagabbro (lower Tertiary to middle Cretaceous)**
- apls — **High-grade metasedimentary schist and carbonate (Triassic to Silurian)**

WINDY TERRANE

- wp — **Phyllite, argillite, and minor metagraywacke and marl (Cretaceous)**
- wa — **Andesite, dacite, and volcanic graywacke (Cretaceous)**
- wg — **Metagraywacke and lesser phyllite (Cretaceous)**

MACLAREN TERRANE

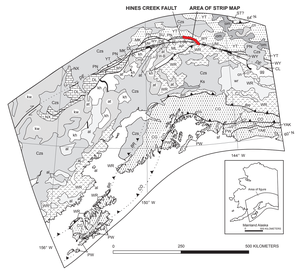
- mmg — **East Susina batholith (lower Tertiary and Upper Cretaceous)**
- mu — **Maclaren Glacier metamorphic belt (Upper Jurassic?)**

WRANGELLIA TERRANE

- wpmm — **Ultramafic plutonic rock (Cretaceous to Triassic?)**
- wpm — **Gabbro and metagabbro (Cretaceous to Triassic?)**
- wls — **Nisna Spur Formation (Lower Permian to Middle Pennsylvanian)**

Contact—Solid where location is accurate; long-dashed where approximate
Fault—Solid where location is accurate; long-dashed where approximate; dotted where concealed
Thrust fault—Solid where location is accurate; long-dashed where approximate. Sawteeth on upper plate. Arrows show sense of relative motion
Strike-slip fault, right-lateral offset—Solid where location is accurate; long-dashed where approximate; dotted where concealed. Arrows show sense of relative motion
Fault, inferred
HCF—Hines Creek Thrust
MPF—Moose Peak Fault
Shear zone
Glacial limit or terminus—Long-dashed where location is approximate
Folds—Location approximate
Anticline—Formed in foliation and parallel schistosity
Syncline—Formed in foliation and parallel schistosity
Bedding
Inclined—Showing strike and dip
Vertical—Showing strike
Foliation and parallel schistosity
Inclined—Showing strike and dip
Vertical—Showing strike
Sample Locality—Isotopic age and analyzed mineral content: Bi, biotite; Ho, Hornblende; Zr, Zircon
Cenozoic faulting observation site—See Cenozoic Displacement Along the Hines Creek Fault in pamphlet
Richardson Highway

INDEX MAP



EXPLANATION

TECTONIC ENVIROMENTS FOR TERRANES (For terranes with varying geologic history, pattern indicates dominant tectonic environment)

PASSIVE CONTINENTAL MARGIN TERRANES
- DL, Dillinger; MY, Myatic; NS, Nixon Fork

METAMORPHOSED CONTINENTAL MARGIN TERRANES
- YT, Yukon-Tanana

ACCRETED ISLAND ARC TERRANES
- BTT, Siwash(?); WR, Wrangellia

ACCRETED CONTINENTAL MARGIN ARC TERRANES
- AP, Aurora Peak; CL, Clearwater; ML, Maclaren

JURASSIC OBTRUDED, AND EARLY TERTIARY ACCRETIONARY WEDGE AND OVERLAP ASSEMBLAGES (Dominantly subaerial)
- CG, Chugach; PW, Prince William; YAK, Yakutat

OCEANIC CRUST, SEAMOUNT, AND OPHIOLITE TERRANES
- MK, McKinley; Bsl, Susina

TURBIDITE BASIN TERRANES
- PN, Pingston; W-B, West Fork and Broad Pass

ULTRAMAFIC AND MAFIC TERRANE
- UM, Terrane of Ultramafic and Associated Rocks

MÉLANGE
- WY, Windy

OVERLAP ASSEMBLAGES
POSTACCRETIONARY (TRIASSIC, CENOZOIC AND CRETACEOUS) SEDIMENTARY, VOLCANIC, AND MAJOR SEDIMENTARY BASINS AND CONTINENTAL MARGIN ARCS

Quaternary
- Qal, Quaternary alluvium

Cenozoic
- Cen, undivided sedimentary and lesser volcanic rock units

Early Tertiary and Late Cretaceous
- Ka, Alaska Range-Talkeetna Mountains; ck, Coast-Nutzotin Cascade; Ha, Kuskokwim Mountains; sf, Sanak-Baranof

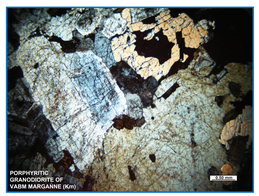
Cretaceous
- Ks, Undivided sedimentary and lesser volcanic rock units
- Cmsh

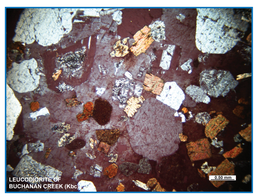
Early Cretaceous and Late Jurassic
- Bb, Cheena-Nutzotin-Gambier; Kh, Kahtna

CONTACTS AND FAULTS
- Contact
- Fault
- Strike-slip fault
- Thrust fault

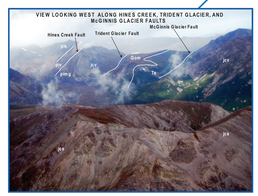
FAULT NAMES
- CG, Contact
- DR, Denali Ranges
- DE, Denali

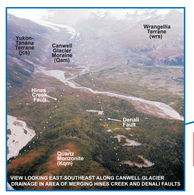
THIN SECTION MICROPHOTOGRAPHS (Crossed Nicols)





The leucodiorite of Buchanan Creek pluton (Kbc) is fine to medium grained with a low color index, contains abundant plagioclase and little to no K-feldspar, and is quartz-poor. In contrast, the porphyritic granodiorite of VABM Marganne (Km) is coarse to medium grained with a moderate color index, contains pink K-feldspar phenocrysts ranging to 2 cm diameter, and is quartz-rich. In addition to each pluton being compositionally hornogeneous, these two distinct plutons are separated by a fault-bounded wedge of structural mélange (m), metavolcanic and metasedimentary rocks of the Jarvis Creek Glacier subterrane (jcv), and part of the Yukon-Tanana terrane.





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