U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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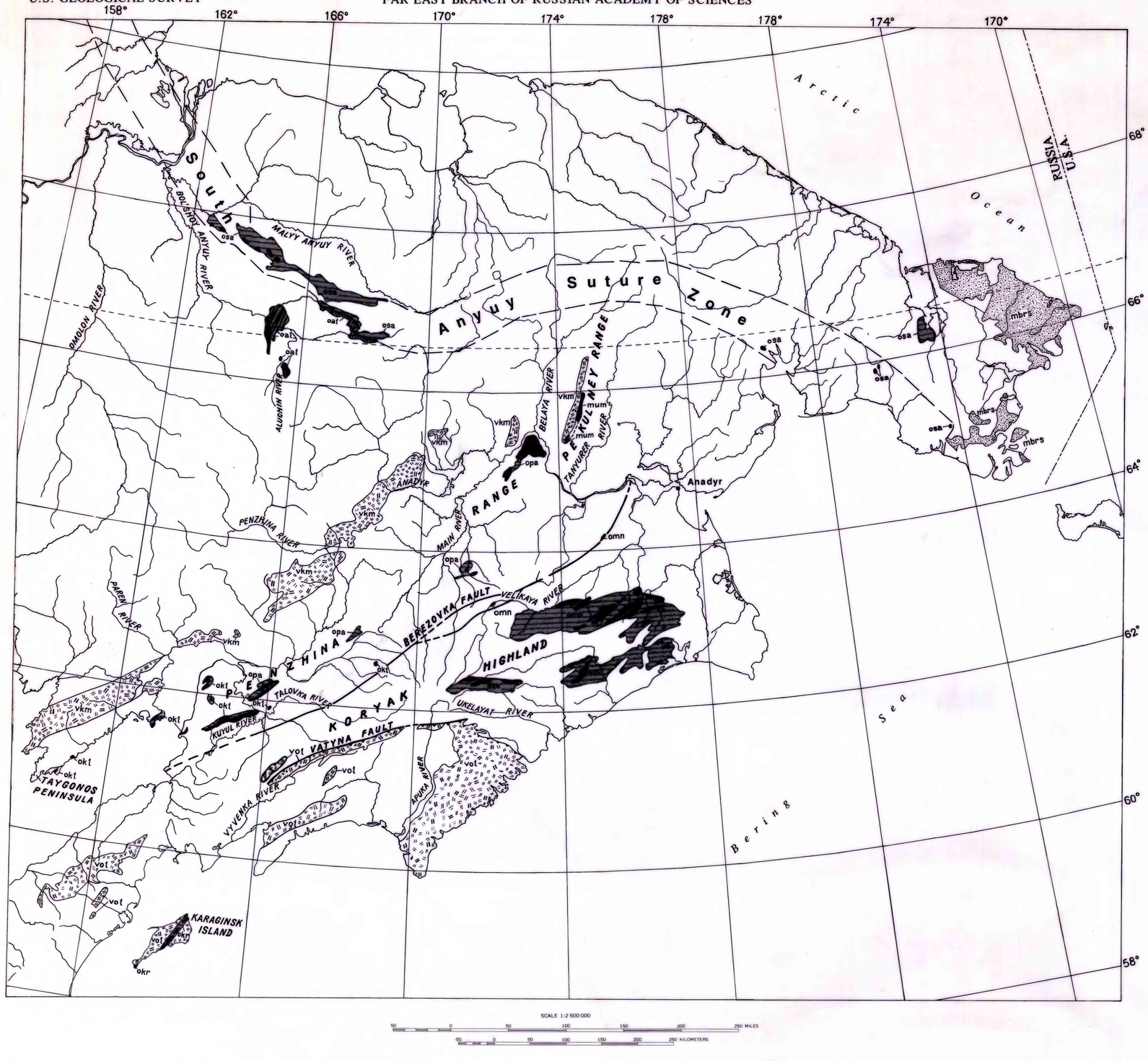
FAR EAST BRANCH OF RUSSIAN ACADEMY OF SCIENCES

OPEN FILE REPORT 92-20H



SCALE 1:2 500 000

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GEOLOGIC MAP OF OPHIOLITE COMPLEXES AND ASSOCIATED VOLCANIC ARC AND METAMORPHIC TERRANES OF NORTHEASTERN RUSSIA

by

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1994

NORTHERN AND WESTERN CHUKOTKA

OPHIOLITIC COMPLEXES OF THE SOUTH-ANYUY SUTURE ZONE

Late Jurassic to Paleozoic(?) oceanic rocks of South-Anyuy terrane of Parfenov and others (1993).

Black pattern represents allochthonous Alpine-type mafic-ultramafic complexes, composed of a lower mantle suite of serpentinized harzburgite and dunite and an upper plutonic suite of layered and nonlayered gabbro.

Gray pattern represents an imbricate oceanic assemblage of pillow basalt, radiolarian chert, argillite, and graywacke. Prehnite-pumpellyite and locally transitional blueschist-greenschist metamorphic facies. Fossils of Late and Middle Jurassic and Late Triassic ages. Basalts yield a Sm-Nd age of 290 +/- 80 Ma.

OPHIOLITIC COMPLEXES OF THE ALUCHIN RIVER

Ophiolitic complexes of probable Late Paleozoic age. Included in the Aluchin and Yarakvaam terranes by Parfenov and others (1993).

Black pattern represents ultramafic rocks including dunite, websterite, wehrlite, clinopyroxenite, and lesser amounts of harzburgite.

Gray-black pattern represents gabbro and basalt complexes including gabbro-norite, amphibole-pyroxene, and amphibole-gabbro, basalt and andesite. Intruded by quartz diorite and tonalite. Prehnite-pumpellyite metamorphic facies. Presence of glaucophane near base indicates local high-pressure metamorphism.

METAMORPHIC TERRANE OF CHUKOTKA PENINSULA

Chiefly Paleozoic and Proterozoic continental and continental-margin deposits of Seward terrane of Parfenov and others (1993). These areas of metamorphic rock believed to represents parts of the continental margin bordering the South Anyuy oceanic basin that were subducted during emplacement of the ophiolitic complexes of the South-Anyuy suture zone (Natal'in, 1984).

MAFIC AND ULTRAMAFIC COMPLEXES OF UNCERTAIN BUT POSSIBLE OPHIOLITIC AFFINITIES OF PEKUL'NEY RANGE

Ultramafic rocks including dunite, spinel clinopyroxenite, and garnet-amphibole gabbro of probable Mesozoic age.

SOUTHWESTERN CHUKOTKA, KORYAK HIGHLAND, AND TAIGONOS PENINSULA

OPHIOLITIC COMPLEXES OF THE NORTHERN PENZHINA RIDGE

Ordovician to Cambrian oceanic rocks of Ganychalan terrane of Khanchuk and others (1992) and Middle to Early Paleozoic oceanic rocks of Pezhina-Anadyr' terrane of Parfenov and others (1993).

Black pattern represents allochthonous Alpine-type mafic-ultramafic complexes composed of a lower mantle suite of serpentinized lherzolite and dunite, and lesser amounts of an upper plutonic suite of layered ultramafic rocks and layered and nonlayered gabbro. Ar-Ar age ranges mostly from Ordovician to Early Cambrian.

Gray pattern represents an imbricate oceanic assemblage of pillow-basalt, radiolarian chert, carbonate rock, argillite, and graywacke. Blueschist-greenschist and locally transitional amphibolite metamorphic facies. Fossils of Ordovician and Cambrian age.

OPHIOLITIC COMPLEXES OF THE SOUTHERN PENZHINA RIDGE AND TAIGONOS PENINSULA

Late Jurassic to Triassic oceanic rocks of Koyul terrane of Khanchuk and others (1990) and of Talovka terrane of Parfenov and others (1993).

Black pattern represents allochthonous Alpine-type mafic-ultramafic complexes composed of a lower mantle suite of serpentinized harzburgite and dunite, and lesser amounts of an upper plutonic suite of layered ultramafic rocks and layered and nonlayered gabbro, plagiogranite, sheeted dikes, and pillow basalt and andesite.

Gray pattern represents an imbricate oceanic assemblage of pillow-basalt, radiolarian chert, argillite, and graywacke. Prehnite-pumpellyite metamorphic facies. Fossil ages from Late Jurassic to Middle Triassic.

VOLCANIC ARC TERRANE OF KONY-MURGAL UPLAND

Early Cretaceous (Neocomian) to Late Permian andesitic volcanic and volcaniclastic rocks of Kony-Murgal terrane of Parfenov and others (1993). Subordinate tonalitic and trondhjemitic plutonic rocks. Interpreted to represent an intraoceanic volcanic arc that was active during emplacement of the Kuyul ophiolitic complex at the subduction zone. Geologic relationships suggest that the mafic-ultramafic complexes of the Pekul'ney Range (mum) formed in this volcanic arc setting.

NORTHWESTERN KORYAK HIGHLAND

OPHIOLITIC COMPLEXES OF THE MAINITS ZONE

Late Jurassic to Devonian oceanic rocks; middle Cretaceous to Triassic island arc rocks of the Mainits terrane of Parfenov and others (1993).

Black pattern represents serpentinite melange containing allochthonous Alpine-type mafic-ultramafic complexes composed of lower mantle suite of serpentinized harzburgite and dunite and upper plutonic suite of layered ultramafic rocks and layered and nonlayered gabbro and plagiogranite. K-Ar and Ar-Ar ages range mostly from middle Cretaceous to Jurassic.

Gray pattern represents an imbricate oceanic and island arc assemblages of pillow basalt, radiolarian chert, limestone, gabbro, tonalite, plagiogranite, andesite, rhyolite, tuff, argillite, and graywacke. Prehnite-pumpellyite metamorphic facies. Fossil ages range from middle Cretaceous to Devonian.

OPHIOLITIC COMPLEXES OF THE EKONAI ZONE

Cretaceous to Devonian oceanic rocks and Early Jurassic to Triassic island arc rocks of the Ekonai and Yanranay terranes of Parfenov and others (1993).

Black pattern represents serpentinite melange containing allochthonous Alpine-type mafic-ultramafic complexes composed of a lower mantle suite of serpentinized lherzolite, harzburgite, and dunite and upper plutonic suite of layered ultramafic rocks and layered and nonlayered gabbro, gabbro-diabase, diabase, and plagiogranite.

Gray pattern represents an imbricate oceanic and island arc assemblages of pillow basalt, andesite, radiolarian chert, limestone, argillite, and graywacke. Prehnite-pumpellyite metamorphic facies. Fossil ages range from Late Cretaceous to Devonian.

SOUTHWESTERN KORYAK HIGHLAND AND KARAGIN ISLAND

OPHIOLITIC COMPLEXES OF KARAGIN ISLAND

Late Cretaceous to Early Cretaceous (late Albian) oceanic rocks

Black pattern represents allochthonous Alpine-type mafic-ultramafic complexes composed of a lower mantle suite of serpentinized harzburgite and dunite and upper plutonic suite of layered and nonlayered gabbro, and sheeted dikes.

Gray pattern represents pillow basalt, radiolarian chert, argillite, and graywacke.

VOLCANIC ARC TERRANE OF SOUTHWESTERN KORYAK HIGHLAND

Paleogene to Late Cretaceous andesitic volcanic and volcaniclastic rocks of Olyutorka-Kamchatka terrane of Parfenov and others (1993). Subordinate zonal dunite-clinopyroxenite-gabbro plutonic rocks. Interpreted to represent an intraoceanic volcanic arc that was active during emplacement of Karaginsky ophiolitic complex.

Contact
Approximate, concealed, or inferred contact.

Fault
Dashed where approximately located or inferred.

Thrust fault
Dashed where approximately located or inferred. Barbs on upper plate

Glaucophane occurrence

Lawsonite (or pseudomorph after lawsonite) occurrence

This map is part of a series of open-file reports that present the results of a comprehensive study of the ophiolitic terranes and complexes of Alaska and northeastern Russia. Other reports in this series describe the metallogeny of these ophiolitic terranes and complexes and provide details on their lithology, thickness, age, geochemistry, and geologic setting. The following reports have been placed in open-file previous to this map:

OF 92-20A	Geologic map of the ophiolitic and associated volcanic arc and metamorphic terranes of Alaska (west of the 141st meridian)
OF 92-20B	Ophiolitic and other mafic-ultramafic metallogenic provinces in Alaska (west of the 141st meridian)
OF 92-20C	Ophiolitic complexes of the Gulf of Alaska
OF 92-20D	Ophiolitic terrane of the western Brooks Range, Alaska
OF 92-20E	Ophiolitic complexes and associated rocks near the Border Ranges fault zone southcentral Alaska
OF 92-20F	Ophiolitic terrane bordering the Yukon-Koyukuk basin, Alaska
OF 92-20G	Ophiolitic terranes of east-central and southwestern Alaska

The study of the ophiolitic terranes and complexes of Alaska and northeastern Russia was carried out between 1989 and 1991 by the U. S. Geological Survey, the Alaska Division of Geological and Geophysical Surveys, and the Far East Branch of the Russian Academy of Sciences. An investigation of the mineral deposits associated with the ophiolitic and other mafic-ultramafic terranes of Alaska was conducted by the U.S. Bureau of Mines between 1981 and 1991.

The term *ophiolite*, as used in this report and in the other reports in this series, follows the definitions of Steinmann (1927) and the Geological Society of America Penrose Conference on ophiolites (Penrose Field Conference, 1972). It refers to an association of mafic and ultramafic rocks that in a complete sequence is characterized, from bottom to top, by tectonized ultramafic rock, a transitional zone of interlayered ultramafic and mafic cumulates, layered gabbro, massive gabbro, a mafic sheeted dike complex, and pillow basalt. Most workers now regard ophiolite assemblages as allochthonous fragments of oceanic crust and upper mantle that formed along mid-ocean ridges, in small marginal basins, or as basement to island arcs.

Ophiolites are found in orogenic belts throughout the world and often have been referred to as alpine-type mafic-ultramafic complexes. Since the recognition of plate tectonics 25 years ago, these assemblages have been of special interest because they commonly mark the boundaries of fossil lithospheric plates and provide insight into the mechanisms and timing of plate accretion and subduction. The ophiolitic terranes of Alaska and northeastern Russia are especially critical to the study of global plate tectonics because they lie at the juncture of North America and Eurasia thereby offering an unique opportunity to learn about the relative motions between these two great continental plates. They are also important to our understanding of the tectonics of Alaska and northeastern Russia and its accretionary history because this region is thought to be made up of a collage of differing lithotectonic terranes that were accreted to the North American and Eurasian continents in Mesozoic and Cenozoic time (Coney and others, 1980; Zonenshain and others, 1990).

In addition to their significance in global plate tectonics, ophiolites provide an important worldwide source of chromite, nickel, copper, manganese, asbestos, talc, and other commodities.

On this map the ophiolitic terranes are highlighted in black and gray patterns. Also shown are spatially associated metamorphic and volcanic arc terranes that may provide insight into the formation or tectonic emplacement of the ophiolites. Occurrences of blueschist mineral assemblages, which many workers believe are formed at convergent plate margins, are shown by symbols (circles, and triangles).

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