

EXOTIC TERRANES OF TAIGONOS PENINSULA, NORTHEASTERN RUSSIA

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ABSTRACT

Outcrops of exotic terranes in the Koryak region are exposed along the south-west Coastal belt of Taigonos Peninsula (northwestern coast of the Okhotsk Sea). New data obtained by the authors make it possible to compare these formations with the Penzhina Range assemblages. Ophiolites of Povorotny Cape are similar to ophiolites and melanges of Kuyul terrane. In jaspers of siliceous-volcanogenic strata, radiolarian assemblages of Triassic-Jurassic age are found. Podiform chromitite bodies in restite peridotite is established. The tectonic assemblage of the Kengeveem River mouth region is comparable to the Early Paleozoic oceanic assemblage of Ganychalan terrane. In phylitized rocks of the meta-sedimentary strata which earlier was combined with Carboniferous sediments, Middle-Late Ordovician conodonts were found. The similarity of the coastal belt with the Penzhina Range is emphasized by imbricated thrust tectonics, development of serpentinite melange bands, ophiolitic olistostromes, and metamorphics of different facies including glaucophane schists.

INTRODUCTION

The vast accretionary complex of Anadyr-Koryak region is structurally associated with the Late Mesozoic and Cenozoic continental margin volcanic belts of northwestern Circum Pacific. This accretionary complex is composed of ophiolitic and exotic terranes grouped into two major belts - the western Talovka-Pekulney and the eastern Khatirka-Mainits. Investigations over many years have shown that ophiolites and other melanocratic rocks which differ in age, composition, and geodynamic environment, are tectonically combined in these belts. The oldest formations, including Early-Middle Paleozoic metamorphosed oceanic assemblages, are studied in detail within the western belt, in Penzhina Range, where they are combined with the Triassic-Middle Jurassic ophiolites.

Within the coastal belt of Taigonos Peninsula (northwestern coast of the Okhotsk Sea) ultramafics, metamorphics, and basalts which comprise the extreme southwestern outcrops of exotic assemblages in the Anadyr-Koryak region, are exposed. The geologic composition and petrology of these formations are insufficiently studied. They are considered to be fragments of Late Jurassic-Early Cretaceous ophiolitic assemblages (Nekrasov, 1976). The field work carried out by the authors in 1993 makes it possible to compare terranes of Coastal belt of Taigonos Peninsula with the Paleozoic and Mesozoic terranes of Penzhina Range. The study was carried out on two representative sections: the Povorotny Cape, and an area near the Kengeveem River mouth (Fig. 1).

POVOROTNY CAPE

Investigations were carried out along the coastline from the Vitaetglya River mouth, along the sea cliffs of the Shchel Bay, and further to the Povorotny Bay. These investigations as well as the geologic mapping of a 5 km wide zone along the coastline show that the zone of serpentinite melange here is the core structure. The melange can be divided into three zones based upon the distribution of lumps, blocks, and tectonic slices of varying composition in the serpentinitic cement of the melange zone. These are the axial (central), northern, and southern (marginal) zones.

In the central part of the study area, relatively poorly serpentinitized alpine - type peridotites (lherzolites and harzburgites), sometimes distinctly banded, more often massive, with pyroxenitic veins are exposed.

Along the north margin of the melange belt, near the steep southward dipping (almost vertical) contact exposed in the sea cliffs near the mouth of Largerny Creek and its first fork, blocks and slices of metagabbro of various sizes occur in serpentinite cement. These occur as leuko- and melanocratic banded and massive blocks. Besides gabbro, there are harzburgite - dunite blocks with disseminated and banded chromite mineralization, and also blocks of diabase intruded by plagiogranites, and spilites with poorly preserved ball and pillow structures. Thus, the disintegrated upper part of the ophiolitic section is exposed here.

Fig. 1. Schematic geologic map of the Povorotny Cape area, and structural cross-section along the sea cliffs of its south-west coast.

1 - alpine-type peridotites: poorly serpentinized (a) and intensively serpentinized (b); 2 - leuko- and melanocratic banded and massive metagabbro; 3 - garnet amphibolites, eclogites and schists; 4 - basaltic strata with bodies of bituminous limestones of Paleozoic(?) age; 5 - jasper-spilitic strata (kingiveem suit)(a) and andesitic-basaltic to boninitic tuffolava strata Jurassic(?) age (b); 6 - serpentinite melange; 7 - terrigenous strata; Late Jurassic - Early Cretaceous age on the geologic map (a), and cross-section (b); 8 - high angle fault, thrust fault (b).

The melange contact in the lower part of Lagerny Creek is sharp and rectilinear. A felsic dike is intruded in serpentinites parallel to the contact. However, to the east, the contact becomes more sinuous and diffuse because narrow serpentinite fingers branch from the melange and intrude into the surrounding volcanics. More abundant and larger (300 - 500 m wide and 2 - 3 km long) plates and blocks consisting of the volcanics derived from adjacent strata to the north, are drawn into the melange. Small fields of terrigenous rocks which structurally underlying the melange are exposed near the contact.

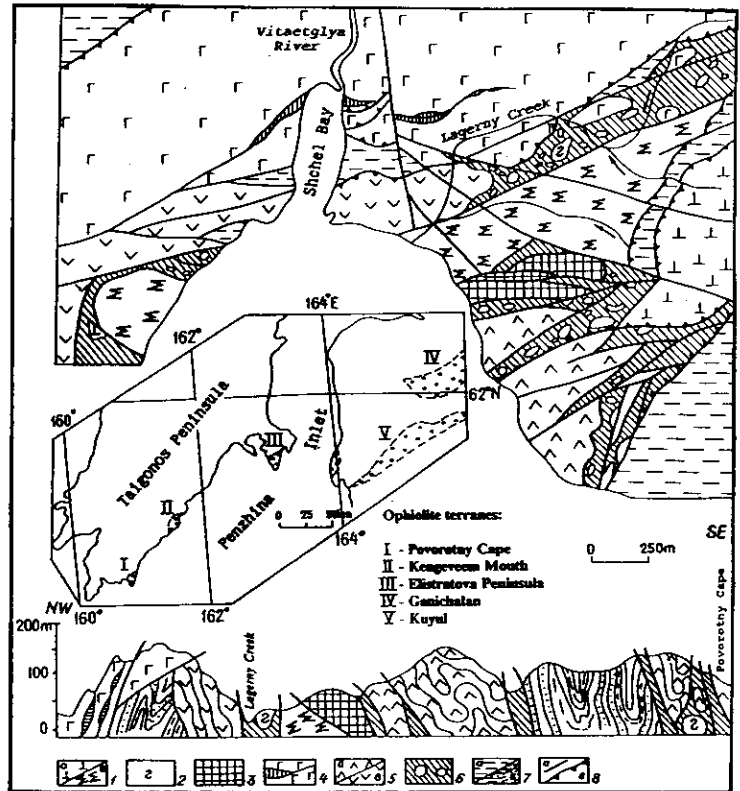
The composition of the melange's southern edge is also intricate. This contact, as is evident from the sea cliffs, is steeply inclined to the south. Near this boundary, blocks up to 100 m (and more) in diameter, composed mainly of metamorphic rocks (garnet amphibolites, eclogites, and intensively folded schists) occur among the serpentinites (Gelman, Nekrasov, 1968; Zhulanova, 1990). A jasper-basaltic unit fringes the ultramafics in the south and is tectonically imbricated. This unit is cut by thin serpentinite bands. At two places along the coast of the Povorotny Cape, we found the radiolaria remains which are defined by V.T.Krymsalova (written communication, 1993) as Calovian - Tithonian and Late Triassic in age.

Thus, the two kilometer long section exposed in the cliffs of Povorotny Cape and formed by repeating jasper - spilitic horizons interbedded with terrigenous strata, cannot be considered a single stratigraphic sequence. The data instead indicates the imbricate - thrust tectonics of this region with the allochthonous bedding of imbricated Triassic - Jurassic ophiolites thrust on the terrigenous (with olistostrome) sediments of Valanginian - Hauterivian age.

An assemblage of volcanics and sedimentary rocks which differs from the typical oceanic cherty - jasper - spilitic assemblage of Povorotny Cape is developed to the north of the melange. Previous investigators combined these assemblages into a single suite. However, volcanics of andesitic - basaltic and boninitic composition, tuffs, tuffolavas, and tuff breccias are developed here. This volcanogenic strata probably has island arc affinities. It may be the age equivalent to, but not the genetic analogue of oceanic cherty - volcanogenic strata.

Northward, near the Vitaetglya River mouth, mainly basaltic strata with the thick lens-like bodies of bituminous limestone is exposed. Based on geologic correlations, we suggest that they are of Paleozoic age. The basaltic strata is intensely metamorphosed. Petrographic study of microsections from our collection by I.L. Zhulanova (personal communication, 1993) has established the development of glaucophane in metabasites. To the north, Paleozoic(?) metabasite strata is thrust onto the terrigenous assemblage of ophiolitic-clastic and olistostrome rocks of Late Jurassic-Early Cretaceous age.

New age data, lithology, and tectonic composition of ophiolites and associated rocks of Povorotny Cape suggest that they are analogues of the rocks of the Kuyul Terrane in the Penzhina Range. In the latter, accretion took place in Pre-Albian time.



KENGEVEEM RIVER MOUTH REGION

Geological structure of this region is characterized by packets of imbricated slices which differ in composition and age from the rocks of Povorotny Cape, but is similar to the rock assemblage which formed the older Early-Middle Paleozoic Ganychalan terrane of the Penzhina Range. From the north to the south and from the upper plates to the lower plates, the following major tectonic units occur in the packet (fig. 2):

1. Intensely metamorphosed carbonate-terrigenous strata with the rich Visean-Namurian brachiopod fauna. Metamorphism is unevenly developed reaching amphibolite facies (biotite-cordierite schists and gneisses).
2. Phyllitized schists and sandstones lithologically similar to Ordovician-Silurian graptolitic sediments of the Pontoney mountains (Ganychalan terrane of Penzhina Range); poorly phyllitized silts and sandstones, and thin layers of limestone with conodont remnants. According to M. Ch. Gagiyeu (written communication, 1993) the latter characterizes the Middle-Late Ordovician age sediments. These sediments with a thickness of 300 m., were previously mistakenly combined with Lower Carboniferous rocks (Nekrasov, 1976).

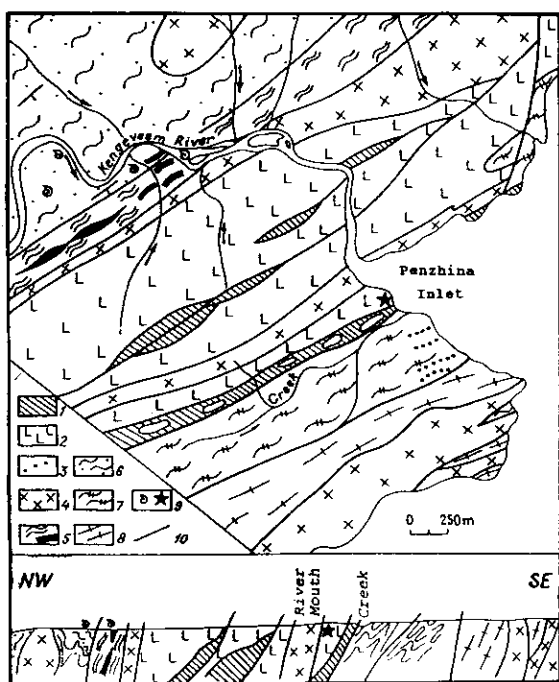


Fig. 2. Schematic geologic map of the mouth Kengeveem River area and structural cross-section along sea cliffs and river cliffs

- 1 - amphibole peridotite and serpentinite melange; 2 - amphibole gabbroids; 3 - gabbro-diabase dikes; 4 - granitoid plutons; 5 - phyllitized schists and sandstones with layers of limestones, Middle-Late Ordovician age; 6 - carbonate-terrigenous strata of Visean-Namurian; 7 - greenschists and blueschists(?) metamorphic complex; 8 - biotite and biotite-cordierite schists and amphibolites; 9 - fossil localities and sulphide zone; 10 - high angle faults.

3. A thick (more than 3 km) plate of amphibole gabbroids which in the lower part are differentiated into amphibole peridotites. The plate is broken into the small slices, gabbro are intruded by Late Mesozoic granitoids, and in the contact zones between them, signs of reomorphism are developed. Locally near the southern tectonic contact, metamorphosed amphibole gabbroids contain neogenic alkaline amphiboles. The mafic's age and environment of formation need further investigation.

4. Greenschists, increasingly deformed to the south. Near the granitoid pluton, the greenschist unit is changed to biotite and biotite-cordierite schists and amphibolites.

Petrographic peculiarities and the mineral composition of metamorphic rocks need special investigation. The results of these investigations will clarify the picture of metamorphic

facies alteration. The field observations proves that the degree of metamorphism and dislocation of rocks increases near the aureole of the Early Cretaceous granitoid plutons.

The metamorphic influence of this plutonism is revealed both in the greenschist strata and in the differentiated gabbroids. These observations indicate that high temperature (low pressure) metamorphism of the Early Cretaceous magmatic arc is superimposed onto the greenschist strata. The age of the primary substratum of these sequences is analogous to the Pontoney Mountain sequence; probably Early Paleozoic.

Thus, the Coastal belt of Taigonos Peninsula was previously considered to be a late Mesozoic eugeosinclinal complex (Nekrasov, 1976). In this belt, now two terranes are distinguished: the first of Early-Middle Paleozoic age, and the second, of Mesozoic age, both comparable with the Penzhina Range terranes. In contrast to Penzhina Range, the Early-Middle Paleozoic terrane of Taigonos Peninsula underwent metamorphism and plutonism related to the Late Jurassic-Early Cretaceous Uda-Murgal island arc.

REFERENCES

- Gelman, M.L., Nekrasov, G.E., 1968. Mesozoic Eclogites of Taigonos peninsula. - Geol. and Geophys. 12: 32-39. (in Russian)
- Nekrasov G.E., 1976. The tectonics and magmatism of the Taigonos Peninsula and the northwestern Kamchatka. - M.: Nauka. 160 p. (in Russian).
- Zhulanova, I.L., 1990. The Earth's Crust of the northeastern Asia in the Precambrian and Phanerozoic. - M.: Nauka. 304 p. (in Russian).