Field trip 5

The Ural Platinum Belt. The Nizhny Tagil clinopyroxenite-dunite massif and related platinum placers and ore deposits. The Volkovskiy gabbro massif and associated copper sulfide ore deposit.

Duration: 2 days, August 15-16, 2014
Period: post-symposium field trip
Minimum/maximum number of participants: 8/24

Logistics and Provisional Program:
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Fig. 1. View on the Ural Platinum Belt (Nizhny Tagil area) from the Chernoistochinsk village.

The proposed field trip aims to illustrate two distinct types of ore-bearing massifs within the 900-km-long Ural Platinum Belt (Fig. 2): The Nizhny Tagil clinopyroxenite-dunite massif (Fig. 3) and related platinum placers and platinum-bearing chromitites within dunite and the Volkovskiy gabbro massif comprising copper sulfide deposits with PGE mineralization.

Fig. 2. Geological sketch of the Ural Platinum Belt and position of the Nizhny Tagil clinopyroxenite-dunite and Volkovskiy gabbro massifs.

The Nizhny Tagil massif is situated 60 km west of Nizhny Tagil, the big metallurgical center of the Urals. The Nizhny Tagil ultramafic massif represents an undisputable example of the zoned Uralian-Alaskan-type clinopyroxenite-dunite complex and it is well-known in international literature due to its historically famous platinum lode and placer deposits. Its area is about 50 sq. km.

The Nizhny Tagil massif has a pear-like shape. In the west it contacts with Ordovician-Silurian metavolcanics and cherts bounded by the Main Uralian Fault zone (MUF). In the east, ultramafites contact tectonically with strongly deformed amphibolite and hornfels which divide the clinopyroxenite-dunite body from the Tagil gabbro massif which is situated to the east.
The massif consists of mostly forsterite dunite (close to 30 sq. kilometers), surrounded by a narrow zone of wehrlite and clinopyroxenite (fig. 3). Dunite is used like a refractory material and mined in open pit in the central part of body (fig. 4). There are several bow-like zones within dunite enriched in chromite schlieren and veins. Usually ore bodies have small size and thickness (up to tens centimeters long and few centimeters of width and thickness) and look like as isolated veinlets or pods surrounded by serpentine rims (fig. 5). Chromitite hosts predominantly Pt-Fe alloys with subordinate Os-Ir alloys, Ru-Os sulphide and other platinum-group minerals (PGM) (fig. 5). Some of the ore zones were operating in the past at the end of XIX and at the beginning of XX century on platinum (fig. 6). The platinum-rich chromitite was the source for the famous Uralian platinum placers. About 400 metric tons of platinum have been mined in the Ural Platinum Belt from placers and load deposits in the past during the first 100 years of exploiting.
The Volkovsky complex is located in the southern part of the Ural Platinum Belt (UPB), between the Main Uralian and Serov-Mauk faults, about 45 km N of the Nizny Tagil Uralian-Alaskan type dunite–clinopyroxenite intrusion (Fig. 2). The complex pertains to the Tagil-Barancha gabbro–diorite–syenite complex, and is in contact with volcanic and sedimentary rocks of the Tagil Island-Arc Zone, to the east, and with metabasaltic hornfels to the west. The Volkovsky complex consists of gabbro and minor ultramafic rocks intruded by diorites and syenites.

Fig. 6. The Krutoy Log platinum deposit is completely mined out in the past.

Fig. 7. The old (up) and new (bellow) open pits of the Volkovsky copper-sulfide deposit
relationships among Pd-bearing bornite-chalcopyrite- and titanomagnetite-apatite ores and gabbro can be clearly observed.

Preliminary schedule of the field trip.

First day - Friday 15th August 2014: Early departure from the meeting point (Yekaterinburg) to the Nizhny Tagil (150 km) and subsequently to the village Uralets (60 km), located in a close proximity to the zoned-type Nizhny Tagil Complex. Visiting field stops within the Nizhny Tagil clinopyroxenite-dunite massif with inspection of main ultramafic lithologies and small-scale mining operations from the past and the modern open-pit mine. Lunch during the trip. Dinner and overnight accommodation in “White Mountain” hotel located in Uralets.

Second day - Saturday 16th August 2013: Visit to the contact of the Nizhny Tagil Complex with hosted rocks. Departure to the Volkovsky gabbro massif (70 km), visiting the field stops at the Volkovsky massif. Lunch during the trip. Departure to Yekaterinburg with short stop at Nev’iansk (120 km) with a brief introduction to the history of the first iron works in the Urals and visiting historic sites of the city (fig. 6). Return to Yekaterinburg.