

Field trip 6

The Ural Platinum Belt: The Kachkanar titanomagnetite deposit in clinopyroxenite. Platinum placers and lode deposits related with the Svetly Bor clinopyroxenite-dunite Uralian-Alaskan-type intrusion

Duration: 2 days, August 15-16, 2014

Period: post-symposium field trip

Minimum/maximum number of participants: 8/24

Estimated Cost: 200 Euro. Cost includes: transport, accommodation, meals.

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The Kachkanar titanomagnetite deposit in clinopyroxenite.

This field trip gives you opportunities to visit the huge Kachkanar titanomagnetite deposit related with clinopyroxenite massif of the same name which is a part of the 900-km-long Ural Platinum Belt (Fig. 1): Close to this place there are two dunite-clinopyroxenite massifs – Svetly Bor and Veresovy Bor – the typical concentrically-zoned Uralian-Alaskan-type ultramafic intrusions comprising PGM-rich chromitite and disseminated PGE mineralization, the source of the famous platinum placers along the Is river (fig. 2). The Kachkanar ultramafic massif is situated 230 km north of Yekaterinburg at the outskirts of small town – Kachkanar. The massif has almost round shape of about 10 kilometers in diameter and forms a horseshoe-like ridge with the highest points Mt. Northern Kachkanar (878.3 m) and Mt. Southern Kachkanar (866.7 m). Bedding, deformation structures and foliation follow the round shape of the massif and deep steeply to the center of body. So, it has conical internal structure.

The massif mostly consists of different types of clinopyroxenites – olivine-, amphibole-, plagioclase- and titanomagnetite-bearing pyroxenites. The relationships between these different lithologies are usually transitional. Olivinite, olivine gabbro and hornblendite present in subordinate amount. Ultramafites are cut by numerous dykes of amphibole-rich gabbro-pegmatite, plagiogranite and plagioclasite which are nicely visible at the quarry slopes.

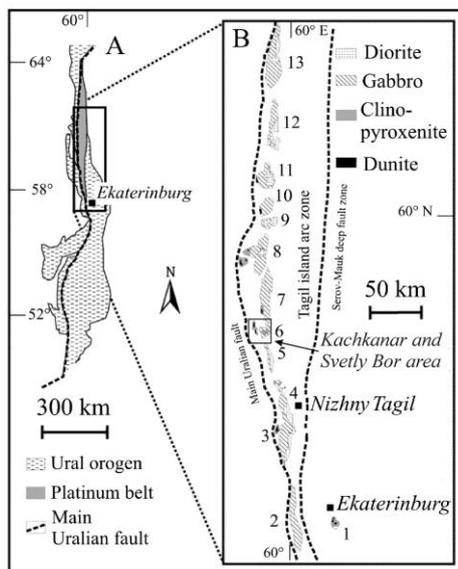


Fig. 1. A Location of the "Ural Platinum Belt" in the Ural orogen, and B geological setting of the Volkovskiy gabbro complex in relation to the major Ural-Alaskan-type complexes of the Ural Platinum Belt; 1 = Uktus, 2 = Revda, 3 = Tagil, 4 = Tagil-Barancha, 5 = Arbat, 6 = Kachkanar, 7 = Pavda, 8 = Kytlym, 9 = Knyaspin, 10 = Kumba, 11 = Denezhik, 12 = Pomursk, 13 = Chistop (modified after Yefimov et al., 1993)

Fig. 1. Geological sketch of the Ural Platinum Belt and position of the Kachkanar and Svetly Bor ultramafic complexes.

A gabbro body divides the massif on two parts – a Kachkanar block is in the west and a Gusevjgorsky block is in the east. The Gusevjgorsky block now is the main target for operating by the Kachkanar Mining Company "Vanadium". There are four big open pits there clearly visible from satellites (fig. 2, 3). The titanomagnetite-bearing pyroxenite and olivinite are the main type of ore. Usually they contain 25-30% of disseminated titanomagnetite. Sometimes the massive ore is also present. The average TiO_2 content in titanomagnetite is about 2% and the vanadium content is about 0.5% of V_2O_5 . Titanomagnetite ore goes to dressing mill in Kachkanar, where produce sinter and pellets for metallurgical plants. The total resources of the Kachkanar deposit are about 6 billions of metric tons. Titanomagnetite ore and high-magnesium ultramafic rocks incorporated in

clinopyroxenite, contain disseminated PGMs. They produce small platinum placers in the mountain valleys, creeks and streams, which were exploiting in the past.

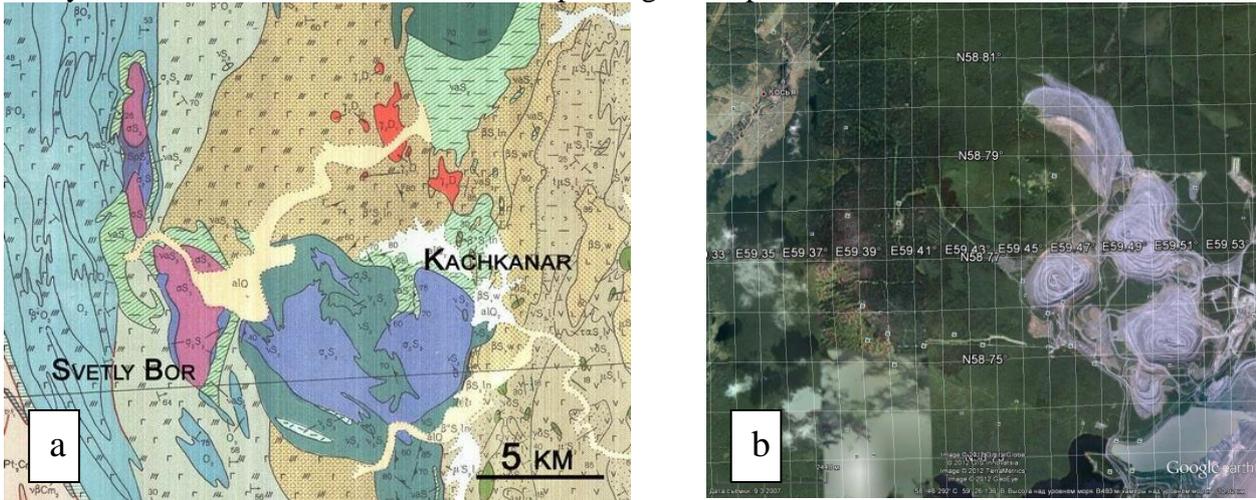


Fig. 2. a) A fragment of the regional geological map with position of the Kachkanar and Svetly Bor ultramafic massifs; b) Satellite image of the Kachkanar titanomagnetite deposit.



Fig. 3. A view on the Central quarry of the Kachkanar deposit from the Mt. Kachkanar



Fig. 4. Disseminated and massive titanomagnetite ore in the coarse-grained and fine-grained clinopyroxenite.

We are planning to visit one of the operating quarries, an old explorative open pit and some natural outcrops on the Mt. Kachkanar where the participants will become familiar with different ultramafic lithologies and types of titanomagnetite ore.

Platinum placers and lode deposits related with the Svetly Bor clinopyroxenite-dunite Uralian-Alaskan-type intrusion

The Svetly Bor dunite-clinopyroxenite massif is situated close to the western slope of Mt. Kachkanar (fig.2). It belongs to the typical Uralian-Alaskan-type ultramafic intrusion with simple internal structure. The massif has a lens shape and occupies an area of about 20 sq. km. It consists of mainly forsteritic dunite is situated in the core and surrounded by the narrow rim of olivine clinopyroxenite. Ultramafites is outlined by thin zone of high-temperature hornfels, amphibolite and gneiss which form a thermal contact aureole of the massif



Fig. 5. Different types of clinopyroxenite veins (right) are cutting of dunite. Hornblendite (dark dyke) is the latest vein is cutting of all ultramafites. Left photo. Late vein of clinopyroxenite cuts of dunite and chromite schlieren.



Fig. 6. Exploration of the new ore platinum-rich zone in the western marginal part of the Svetly Bor massif.

There are a lot of late veins of wehrlite and clinopyroxenites, including metasomatic type of green clinopyroxenites, cutting the dunite and chromitite (fig. 5). Hornblendite is the latest intrusive rock forming numerous dykes cutting all ultramafites and metasomatically transform them in the contact zones. Dunite and PGM-rich chromitite are the source of the famous platinum placers are situated along the Is river. Few hundreds of platinum nuggets (in between 100 g – several kilograms) were mined out from this placer in the past. This is one of the biggest placer in the Urals having length about 100 km. It was a grate producer of platinum in the past and still now it is operating.

Recently a new ore zone enriched in disseminated PGMs was discovered along the western contact of dunite and clinopyroxenite (fig. 6). The most interesting feature of this mineralization is the absence of geological relations with chromitites. Small grains of PGMs distribute in dunite regularly and may be distinguished only after careful studding. The amount of PGE in the ore zones approaches few ppm. Probably, a re-distribution of PGE (PGMs) within dunite took place during metasomatic event related with the numerous intrusions of hornblendite dykes are situated here.

Preliminary schedule of the field trip 6.

First day - Friday 15th August 2014: Early departure from the meeting point (Yekaterinburg) to Kachkanar – small town close to Mt. Kachkanar. Visit to one of the open quarries of the Kachkanar

titanomagnetite deposit. Examine of natural outcrops and old explorative open pit. Diner and night are at the hotel in Kachkanar.

Second day. Saturday 16 August 2014. Early departure from Kachkanar to Kos'ya village (60 km) located close to the Svetly Bor dunite-clinopyroxenite massif. Overview of the general geology of the massif. Visit to the natural outcrops of dunite, clinopyroxenite with different types of veins. Visit to ore zone in the western part of the massif. Inspection of the working placers.

Departure to Yekaterinbug