Geophysical Research Abstracts
Vol. 14, EGU2012-1164, 2012
EGU General Assembly 2012

Rhythmic layering in the lower part of the West-Pana intrusion (Fedorov-Pana layered complex, Kola Peninsula).

P. Pripachkin and T. Rundkvist

Geological Institute, Kola Science Centre , Russian Academy of Sciences, Apatity, Russian Federation
(paul@geoksc.apatity.ru)

The Fedorov-Pana Early Proterozoic layered mafic-ultramafic complex (FPC) locates in the centre of the Kola Peninsula and extends northwestwards for over 80 km. From the north, FPC comes into contact with granite-gneiss and alkaline granite of the Archaean basement, and from the south it is overlain by the Proterozoic volcano-sedimentary rocks of the Imandra-Varzuga palaeorift. FPC is composed of three main massifs, i.e. Fedorova Tundra, West-Pana Massif (WPM), and East-Pana Massif. In terms of geological and petrographic features, the WPM cross-section consists (bottom-up) of the marginal, norite, and gabbronorite zones. The gabbronorite zone has a thickness of 2,500 to 4,000 m, and includes two levels of contrastingly layered rocks. These are the Lower Layered Horizon (LLH), and rocks of the Upper Layered Horizon and Olivine Horizon. Based on the published data and results of the exploratory boreholes sampling, we have studied the structure of the WPM lower part, including LLH. As a result, the following has been established.

The lower part of WPM is characterized by a hierarchically rhythmic structure. Its 1.5 km thick cross-section may demonstrate mega-, macro-, and microrhythms. The thicknesses of the revealed megarhythms reach first hundred meters. Layered horizons with a thickness of a few tens of meters tend to the bottom. Of them LLH represented by alternating norite, pyroxenite, leucogabbro, anorthosite, and gabbronorite is best studied. The upper parts of the megarhythms are made up of gabbronorite.

The macro- and microrhythms are common within layered horizons (the former are studied in detailed by the example of LLH). The macrorhythms are 5-10 to 10-15 meter thick (rarely slightly thicker). The thickness of the microrhythms is found to be tens of centimeters. The structure of the macro- and microrhythms is similar. The bottom is composed of norite and pyroxenite while the top is represented by gabbronorite and leucogabbro.

It is known that the layered horizons of WPM associate with the zones of sulphide and PGE mineralization. According to our data, these are generally confined to the bottom of the macrorhythms. The most important levels of PGE mineralization occur within LLH. Nevertheless, over- and underlying layered zones also contain sulphide and PGE mineralization. Thus, the PGE mineralization of WPM tends to the bottoms of the megarhythms. PGE mineralization within these is recorded at the bottoms of the macrorhythms.

The revealed hierarchically rhythmic structure of the WPM lower part indicates that the LLH generation was probably not related to the additional injection of a magma melt batch. We believe that LLH is a regular element of layering in the lower part of WPM appeared as a result of intrachamber substance differentiation. The presence of various rhythms in WPM and LLH (also marked by the distribution of PGE mineralization zones) implies periodic (self-sustained) mechanism for the layering to appear.