

# Integrated Geophysical and geochemistry investigations at the Ondurnaran lode gold deposit

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## Introduction

Undurnaran deposit (109° 34' 23.1 E, 44° 40' 51.7" N) locates in Saikhandulaan soum of Dornogovi province. Detailed geological prospecting work using scale of 1:10000 was carried out from 2009 up to 2011 (Figure 1).

Microquartzite, quartzite and carbonate veins contain gold micrograins (Figure 2). Sometimes gold is included in meta-andesite and diorite. Alteration zone with a little arched form directs from southeast to northward. Size of the alteration zone is ranging from 20 meters up to 30 meters in wide and its length continues approximately 500

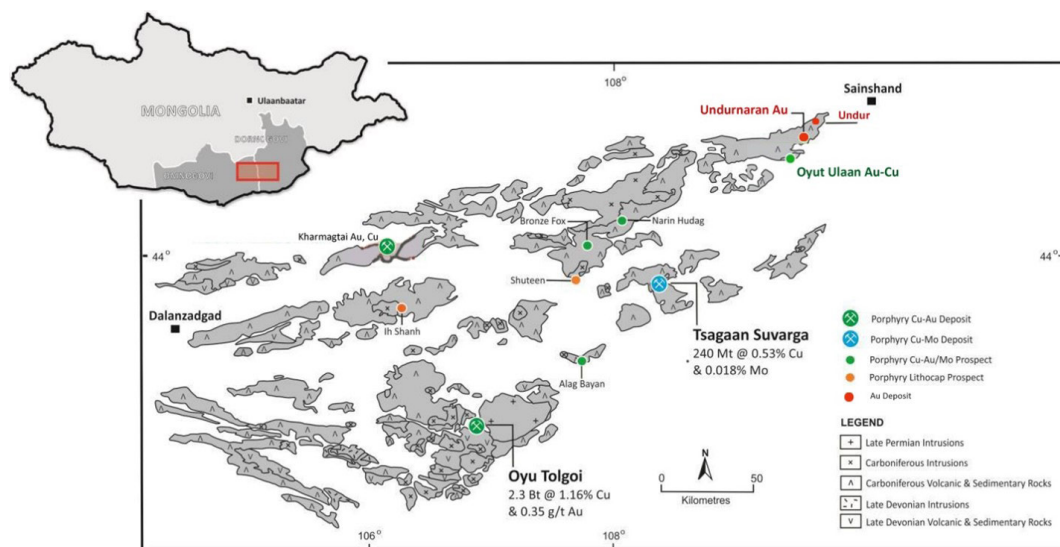
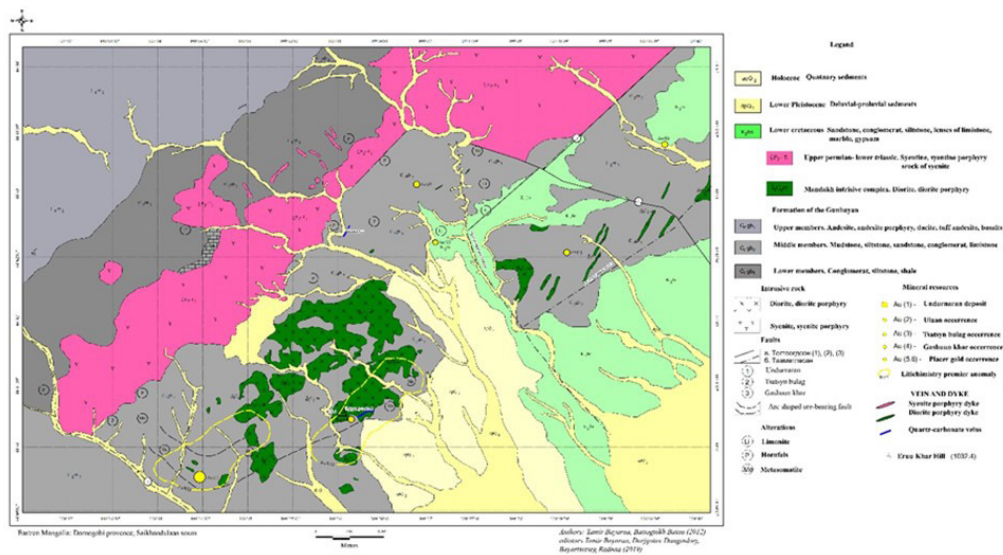


Figure 1. Map of Mongolia showing the location of the Undurnaran area

Mineralization of the Undurnaran deposit is related to Upper Carboniferous Gunbayan formation volcanogenic-sedimentary rocks and Late Carboniferous Mandakh complex diorite.

meters. Gold grade reaches approximately 3.5-4.5 g/t within mineralization zone. Gold mineralization is mainly controlled by Saikhandulaan abyssal fault which continues from northeast to southwest (Figure 3).



**Figure 2.** Map of the geology the Undurnaran area

Host rocks such as diorite, andesite and their tuff are suffered to phyllic and argillic alterations. Ore minerals of gold-bearing rocks are represented by martitized magnetite (hematite), goethite, and hydrogoethite, arsenopyrite, pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, covellite, chalcosite, malachite, azurite and plumbojarosite. Mineral assemblages are pyrite + chalcopyrite + sphalerite + galena. Oxidation mineral assemblages are represented by goethite + secondary pyrite + plumbojarosite.

## Methodology

### Mineralisation and geochemistry study:

*Geophysical study:*

The aim of geophysical study is to investigate the subsurface mineralization's and structural trend, alteration in the area using a combination of magnetic survey, self-potential (SP) methods, gradient array IP/Resistivity and dipole-dipole array of IP/Resistivity (Figure 3).

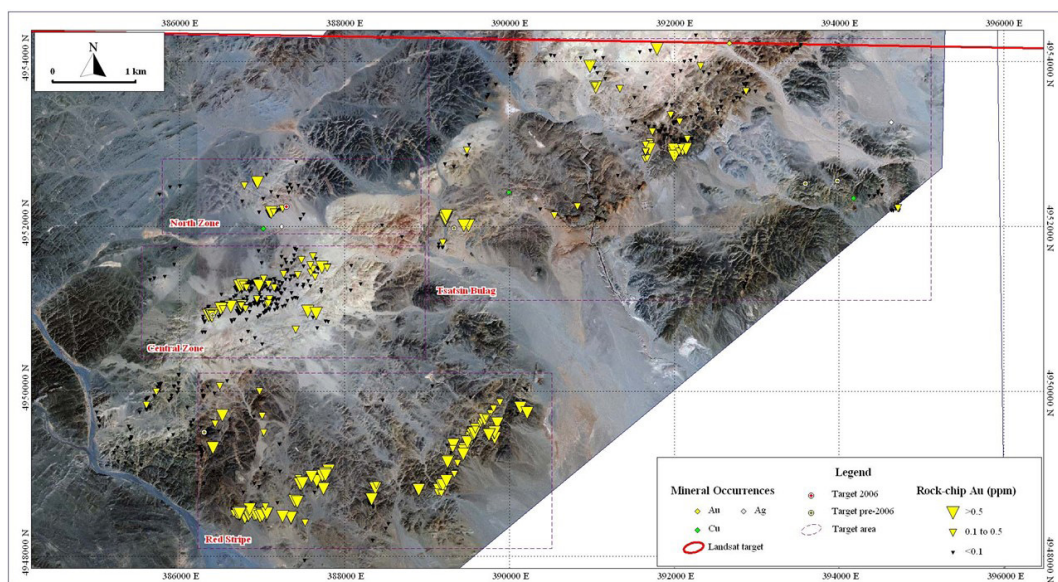
The extraction of the magnetic signal generated at different depth levels can be done using the

matched filtering technique (F.J.R.Syberg,1972). The power spectrum of potential data is step by step matched to a model power spectrum which corresponds to several equivalent layers at different depths (Spector, A. and Grant, F.S.,1970). Horizontal and vertical derivatives are routinely used to enhance details in magnetic data. The total horizontal derivative and analytical signal are two effective tools that are used to detect the edges of magnetized structures (Figure 4).

## Result

## Mineralisation and geochemistry study:

High-grade gold-arsenic mineralization at the Undurnaran prospect is hosted within several auriferous quartz veins that are typically 1-metre-wide and strike north to northeast for up to 4.5 kilometres. These veins are hosted in strongly magnetite-chlorite-epidote altered andesites. The 178 rock-chip samples collected from the Undurnaran prospect returned average assays (from 178 samples) of 4.9 g/t Au (maximum 124 g/t Au), 4 ppm Ag (maximum 38 ppm Ag),



**Figure 3.** Map of geochemistry rock chips sampling the location of the Undurnaran area. Undurnaran deposits to in to the Red stripe site

650 ppm As (maximum 4800 ppm As) and 10 ppm Mo (maximum 105 Mo) (Figure 3).

*Geophysical study:* The magnetic data were analysed using gradient interpretation techniques, such as analytic signal (AS), tilt derivative (TDR), horizontal gradient (HG), vertical gradient (VG), and Euler Deconvolution (ED) methods, and results were correlated with known geological structures (Figure 4).

The area is structurally extended to the northeast and consists of vertical dipping rock units. The fault structure is subdivided into two systems because of general strike and subsequence of the structure development: a. Northeast-directed fault; b. Northwest-directed fault. This classification two fault system and to sorting study results magnetic geophysics (Figure 5).

## Conclusions

Undurnaran gold deposits: According to the results of fluid inclusion study, quartz veins origin of gold-bearing deposit is mesothermal (308°C up

335°C). Gold mineralization is originated from H<sub>2</sub>O-NaCl-CO<sub>2</sub> composition solution under low pressure. Second stage fluid inclusions found in re-crystallized quartz grains temperature is 183° up 197°C. Ice melting temperature is ranging from -4.2°C up to -1°C and salting 1.7-6.7. Gold mineralization of the Undurnaran deposit is from epithermal to mesothermal.

The igneous rock units refer to calc-alkaline category as for geochemical composition where the ration of Na<sub>2</sub>/K<sub>2</sub>O is found to be 1.7 to 2; the Al oxide increases from 15.8 to 17% and alkaline reaches up to 6.38-7% with characteristically dominant constituent of sodium. Volcanogenic and intrusive rock units are found to be volcanic-plutonic association of the same age referring to Rb-Sr isochron age of 303±18Ma and absolute age of 303±18Ma. Sr isotope ration of the igneous rock units of the target area ranges from 0.7113 to 0.7154 and from 0.7050 to 0.7082 in andesite and diorite, respectively. Also, it refers to I-type igneous origin slightly exposed to crust pollution.



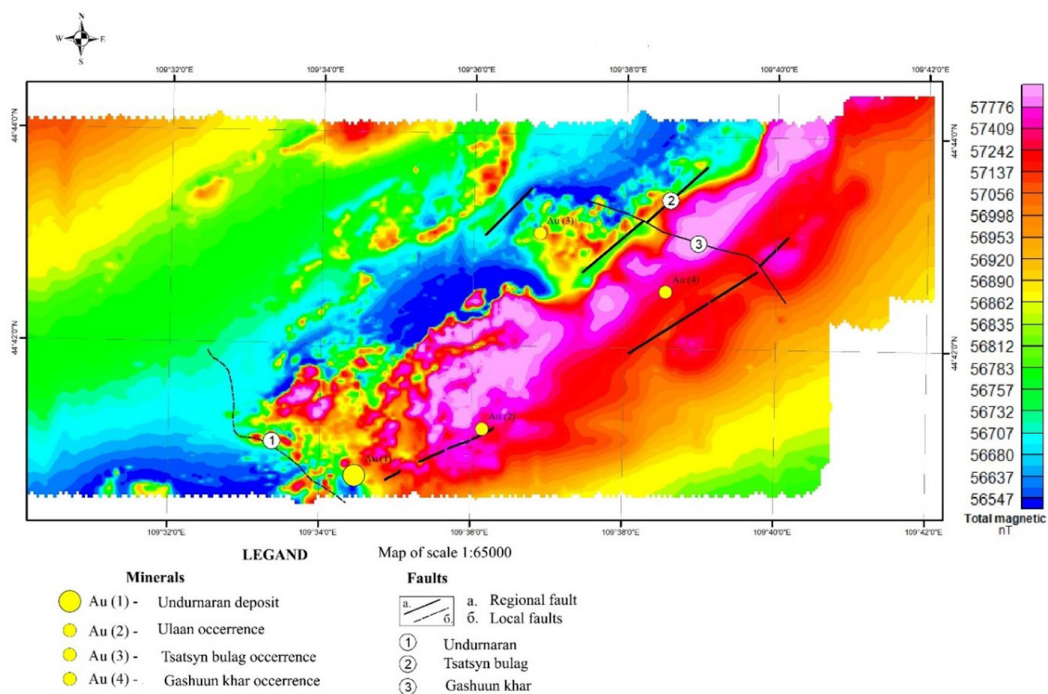


Figure 4. Magnetic map of the Undurnaran area.

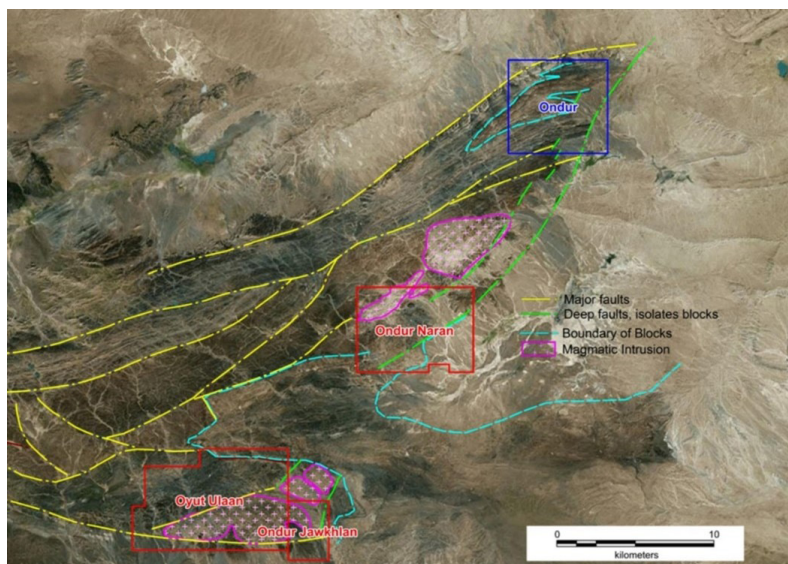


Figure 5. Interpretation map of the Undurnaran area.

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