Platinum potential of the Pacific Rim in connection with ultramafic zoned intrusions.

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INTRODUCTION

Ultramafic zoned intrusions, also known as Ural-Alaskan (UA) type intrusions, seem to be particularly associated with the Pacific Rim (Fig. 1), near the oceanic/continental plate boundary, where they occur in Alaska, British Colombia, the Russian Far East, Colombia, Philippines, Papua New Guinea, New Caledonia, Eastern Australia and New Zealand. UA intrusions also occur in the Urals (Russia), Ethiopia and Egypt.

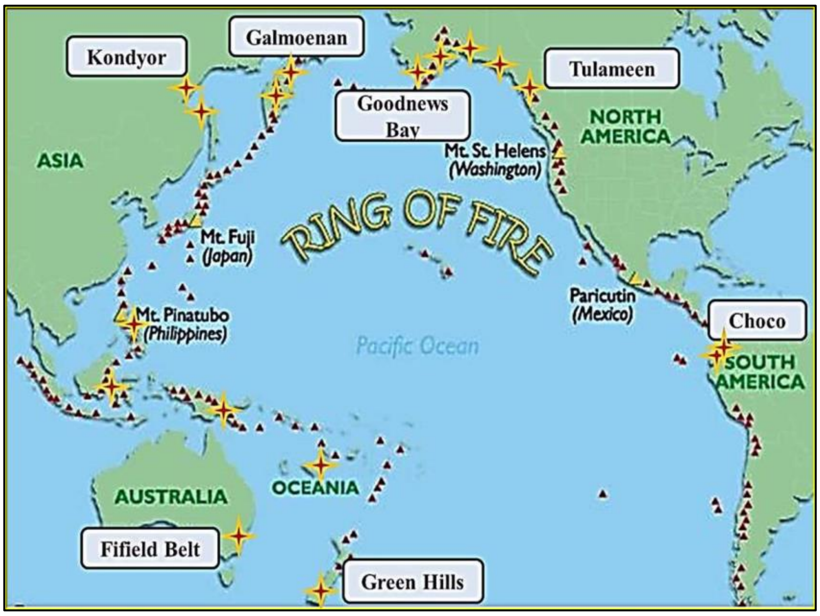

FIG 1 - Location of UA-type platinum deposits around Pacific Rim

The key economic importance of UA intrusions is the existence of metallic platinum (mainly isoferroplatinum). Being very dense and resistant to erosion, metallic platinum can form rich placers as the intrusion erodes. The most productive alluvial platinum deposits in the world are associated with UA complexes.

Worldwide examples of successfully mined UA-sourced platinum placers include:

- Urals Platinum Belt (Central Russia) – 380 tonnes;
- Choco (Colombia Platinum Belt) – 150 tonnes;
- Kondyor (Russian Far East) – 100+ tonnes;
- Galmoenan (Kamchatka, Russia) – 55 tonnes;
- Good News Bay (Alaska) – 25 tonnes;
- Tulameen (BC, Canada) – 680 kg;
- Fifield (NSW, Australia) – 630 kg.

While a number of deposits have been mined very profitably in these countries, active exploration and mining of platinum placers currently occurs only in Russia (Kondyor and Galmoenan), and this is the main country where knowledge of this type of deposit still exists. The knowledge deficit in most other countries, together with widespread resistance to placer mining, makes fund-raising for placer platinum exploration virtually impossible.

GEOLOGY OF ZONED COMPLEXES

UA complexes are pipe-like, concentrically zoned ultramafic-mafic intrusions, typically ranging in size from 12 to 80 sq km. The intrusions exhibit a zonal structure with a dunite core, surrounded successively by wehrlite, clinopyroxenite and gabbro rims. Contacts are generally gradational. The dunite core contains chromite (as an accessory mineral phase, or forming local segregations, “schlieren” and veinlets), as well as metallic platinum.

UA intrusions occur mainly in two distinct geological settings. The majority occur within mobile belts close to continental margins (eg Kamchatka, British Colombia, Alaska and New Zealand). In these cases, the intrusions are more or less deformed, and may also be partly tectonically dismembered. Within the mobile belt setting, UA intrusions are frequently associated, at a regional scale, with ophiolites. Because of their physical similarities (both contain dunite, pyroxenite and gabbro and have chromite mineralisation), it can be difficult to differentiate them.

More rarely, UA complexes occur in intra-continental rift zones within stable continental platforms (eg Kondyor and Inagly in Siberia, Russia and Fifield Belt in Australia). In these cases, the zonal structure and pipe-like shape are normally perfectly preserved. A later, alkaline phase is also characteristic of UA intrusions of this setting.

EXAMPLES OF CURRENT PLATINUM DEPOSITS

The best examples of placer platinum deposits would be the several alluvial mines currently active in the Russian Far East, namely the Galmoenan placers in Kamchatka and the Kondyor placers in Eastern Siberia.

Seven placers have been mined all around the Galmoenan intrusion since 1993. The main placers range from 2-9 km long, 20-400 m wide and 0.4-5 m thick. Grades range between 0.4-7 g/t (Koryaksko.., 2003).

The Kondyor placers occur both inside the ring structure and beyond the gorge through the ring. Platinum placers are known to extend for more than 70 km downstream. Mining began in 1984 and annual production is still 3-4 tonnes. The average platinum grade varies from 0.5-5 g/m3 (up to 60-80 g/m3 in some parts) (Mochalov and Khoroshilova, 1998).

UA intrusions are also known to host bedrock platinum mineralisation. For example, historically about 1200kg was mined from the Nizhny Tagil massif (Urals, Russia) and about 2400 kg (mainly from laterite) from the Yubdo intrusion, Ethiopia. While this is still a small amount compared with production from placers, exploration provided on the Galmoenan and Kondyor intrusions (Russian Far East), demonstrated that this type of bedrock deposit has significant economic potential. For example, an inferred resource of 30 tonnes has been delineated at Galmoenan (Nazimova, Zaytsev, and Petrov, 2011).

An exploration plan for bedrock platinum deposits should have the following sequence: UA intrusion → well-developed dunite core → course grained/pegmatoid dunite → chromite mineralisation (veinlets, schlieren, nets) → platinum mineralisation. Using appropriate exploration techniques in such settings is critical to success.

PACIFIC RIM PLATINUM POTENTIAL

Exploration and development opportunities for platinum placers still exist in many parts of the world, where either UA intrusions with well-developed dunite cores have been delineated, or where isoferroplatinum grains have been found in significant amounts. After carrying out comprehensive reviews of the literature, accompanied by reconnaissance field exploration, NZ Exploration has demonstrated the priority platinum potential of East Australia, New Zealand and Canada, BC (NZ Exploration reports, Nazimova and Ryan, 2014).

Given the relative ease and low cost of exploring placer deposits, the low capital and operating costs of a mining operation, the high profit margin of most placer operations, the lack of chemical use and the fact that non-forested land can often be left in better condition post-mining, than its pre-mining stating state, this reluctance to become involved in platinum placer exploration and mining is mystifying.

Despite historic production of hundreds of tonnes of platinum from placers associated with UA intrusions, exploration for these deposits has completely dwindled. Thus UA intrusions and their associated platinum placers should be considered a new and potentially exciting target type for the Pacific Rim.

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