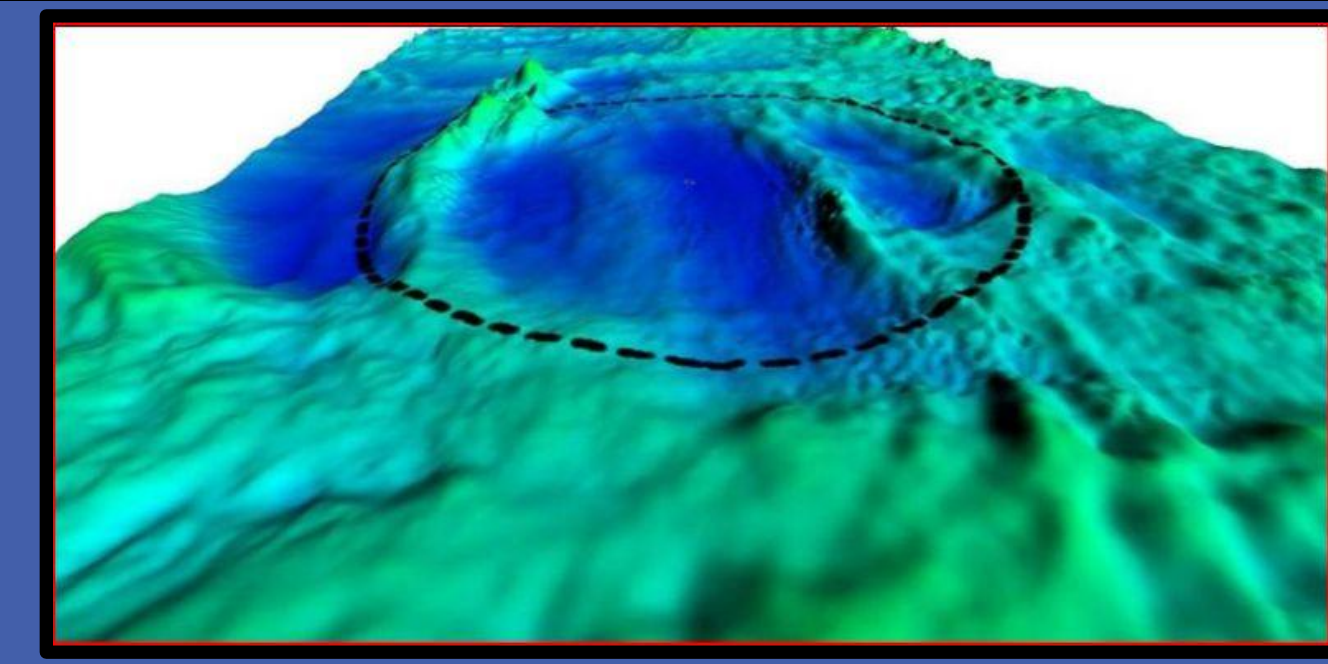


IRIDIUM ANOMALY ASSOCIATED WITH MAPCIS?

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Abstract

In 2011, pseudotachylite breccias from the Musgrave Province, Northern Territory, Australia were studied from locations 40km, 60km and 100km from a proposed impact site, known as MAPCIS, where 2kg to 5kg samples that contain pseudotachylite breccia were collected. The samples were initially sliced in Coober Pedy and Adelaide, Australia and were later verified as pseudotachylite breccia in 2012 by both Actlabs Ltd., Canada and Applied Petrographic Services Inc., USA. This pseudotachylite breccia was put into context of an impact and compared the geomorphology to pseudotachylite breccia of the Vredefort structure, South Africa at the: *34th IGC Brisbane 2012, GSA Annual Meeting in Charlotte 2012, 35th IGC Cape Town 2016 and the 2016 GSA Annual Meeting in Denver*. In 2017, a new line of investigation was opened as there is an Iridium anomaly associated with the Precambrian/Cambrian boundary. For the first time, this pseudotachylite breccia from the Musgrave province was assayed for Iridium as well as other PGEs. The samples from the Musgrave province along with samples of Pt. from the Sudbury Canada and Vredefort, SA impact sites were prepared at Virginia Commonwealth University to be assayed at Bureau Veritas Commodities Canada Ltd. The results showed an Iridium anomaly in the Musgrave pseudotachylite orders of magnitude higher than what would be expected from continental crust. The Iridium enrichment in the samples is consistent with an extraterrestrial source or possibly a mantle source. Further sampling and assaying may be needed to fully differentiate the source of the Iridium enrichment. Although pseudotachylite breccias in central Australia are the largest known deposits on Earth, they are relatively unknown and unstudied. Samples were donated to the Australian Museum, Sydney, the South Australian Museum, Adelaide, the Queensland Museum, Brisbane and Naturhistorisches Museum, Vienna. These samples were the first of their kind in each museum collection. We hope to stimulate further research in this area.

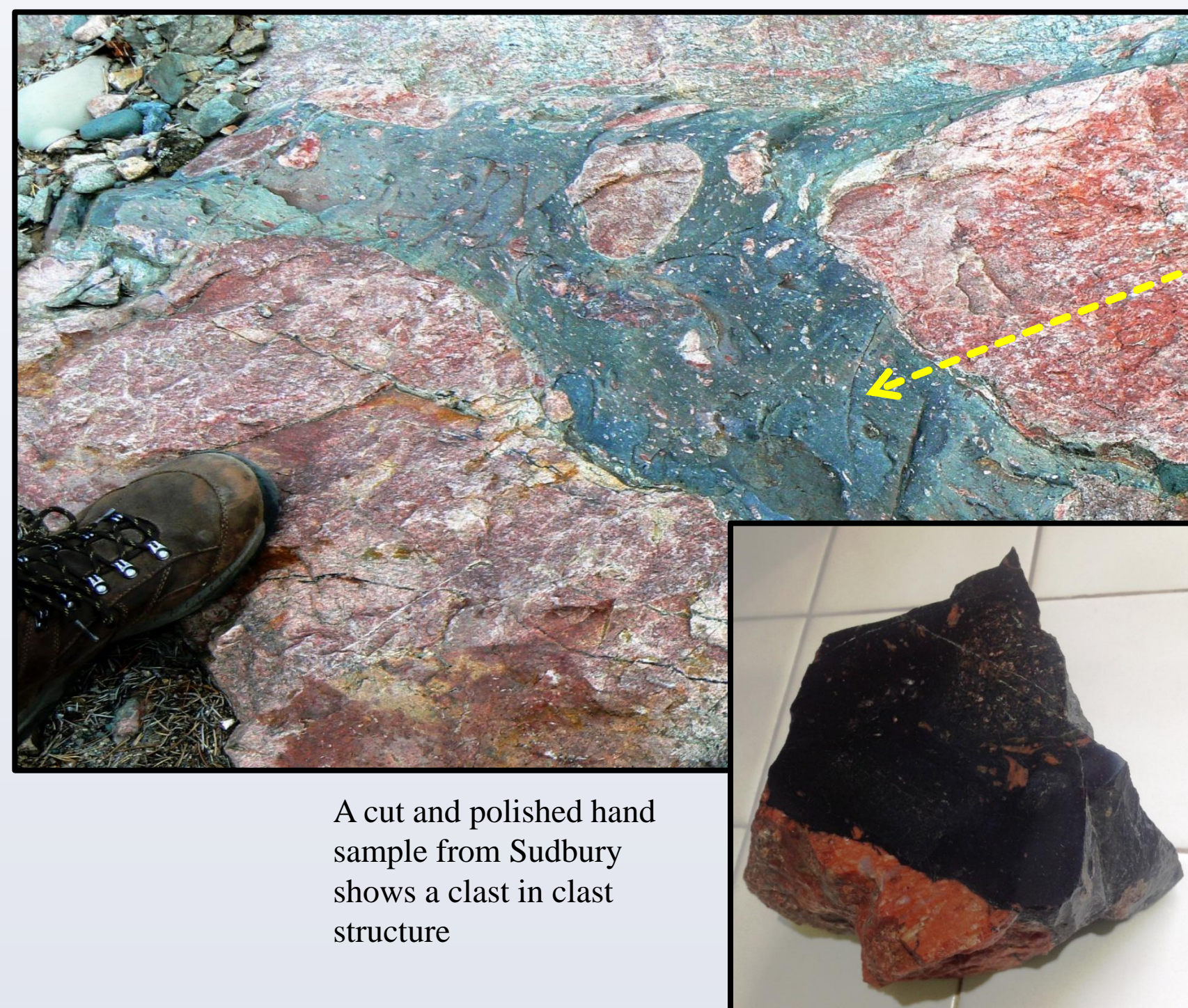
Objectives

1. To find if the pseudotachylite melt has Iridium concentrations consistent with an extraterrestrial impact source.
2. To find if there is a difference in the Iridium concentration between the country/wall rock adjacent to the melt and the pseudotachylite melt.
3. Use samples from the known impacts, Vredefort and Sudbury as controls

Materials and Methods

A slow cutter separates Pseudotachylite veins from the host rock very carefully. The separated host rocks and Pseudotachylite are crushed manually in agate mortar and pestle. Particles less than 100 um are collected by sieving and used for PGE analysis. The Samples up to 25 g in size are fire assayed using a nickel sulphide (NiS) fire assay procedure. The nickel sulphide button is dissolved in concentrated HCl and the resulting residue, which contains all the PGE are collected on a filter paper. This residue undergoes 2 irradiations and 3 separate counts to measure all the PGE. A 1 g aliquot is encapsulated in a polyethylene vial and irradiated with flux wires and an internal standard (1 for 11 samples) at a thermal neutron flux of $7 \times 10^{12} \text{ n cm}^{-2} \text{ s}^{-1}$. After a 7-day period, to allow Na-24 to decay, the samples are counted on a high purity Ge detector with resolution of better than 1.7 KeV for the 1332 KeV Co-60 photopeak. Using the flux wires, the decay-corrected activities are compared to a calibration developed from multiple certified international reference materials.

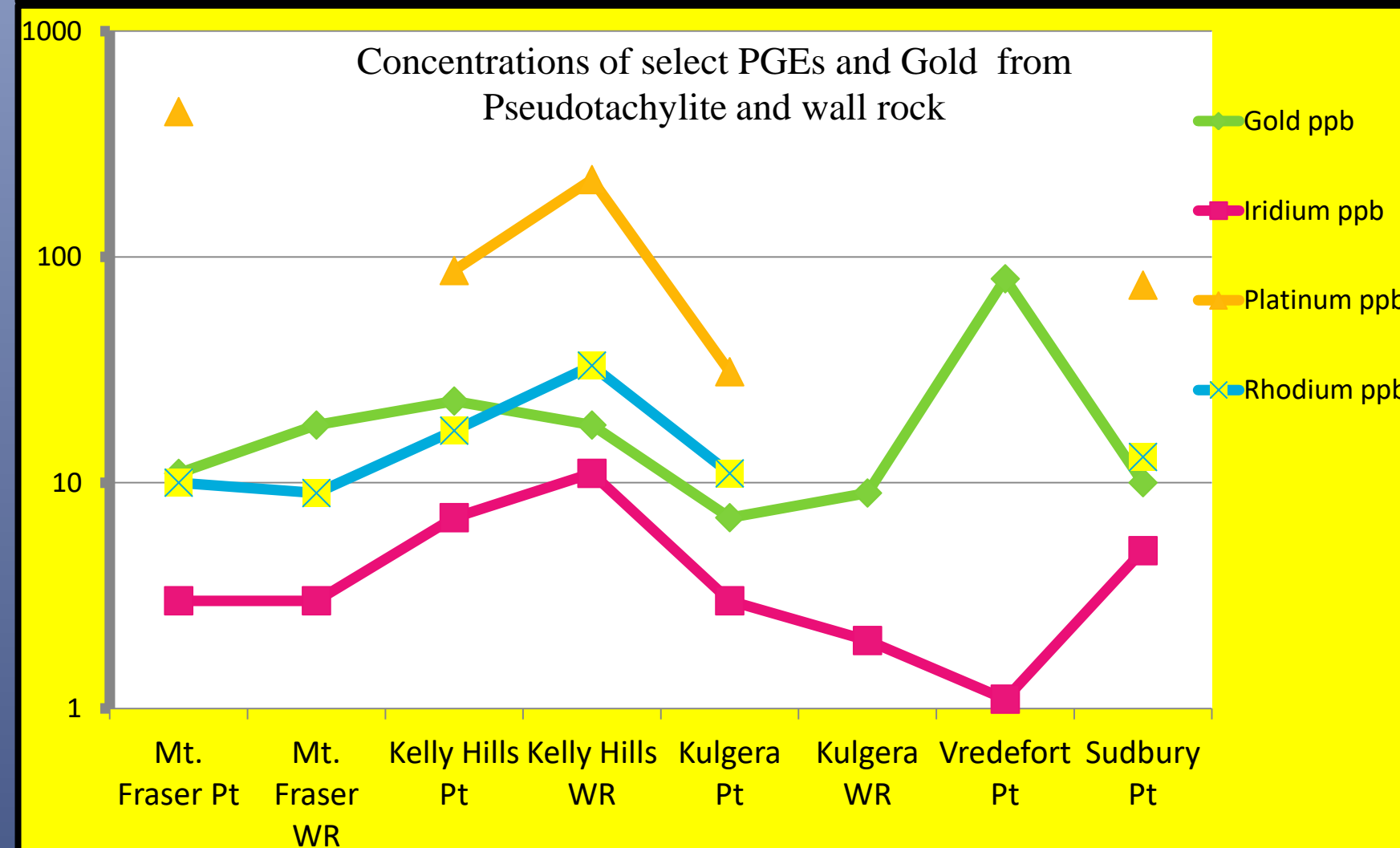
This Sudbury Impact pseudotachylite breccia can be found at a road cut on Highway 144 at the entrance to Halfway Lake Provincial Park, Ontario.



A cut and polished hand sample from Sudbury shows a clast in clast structure

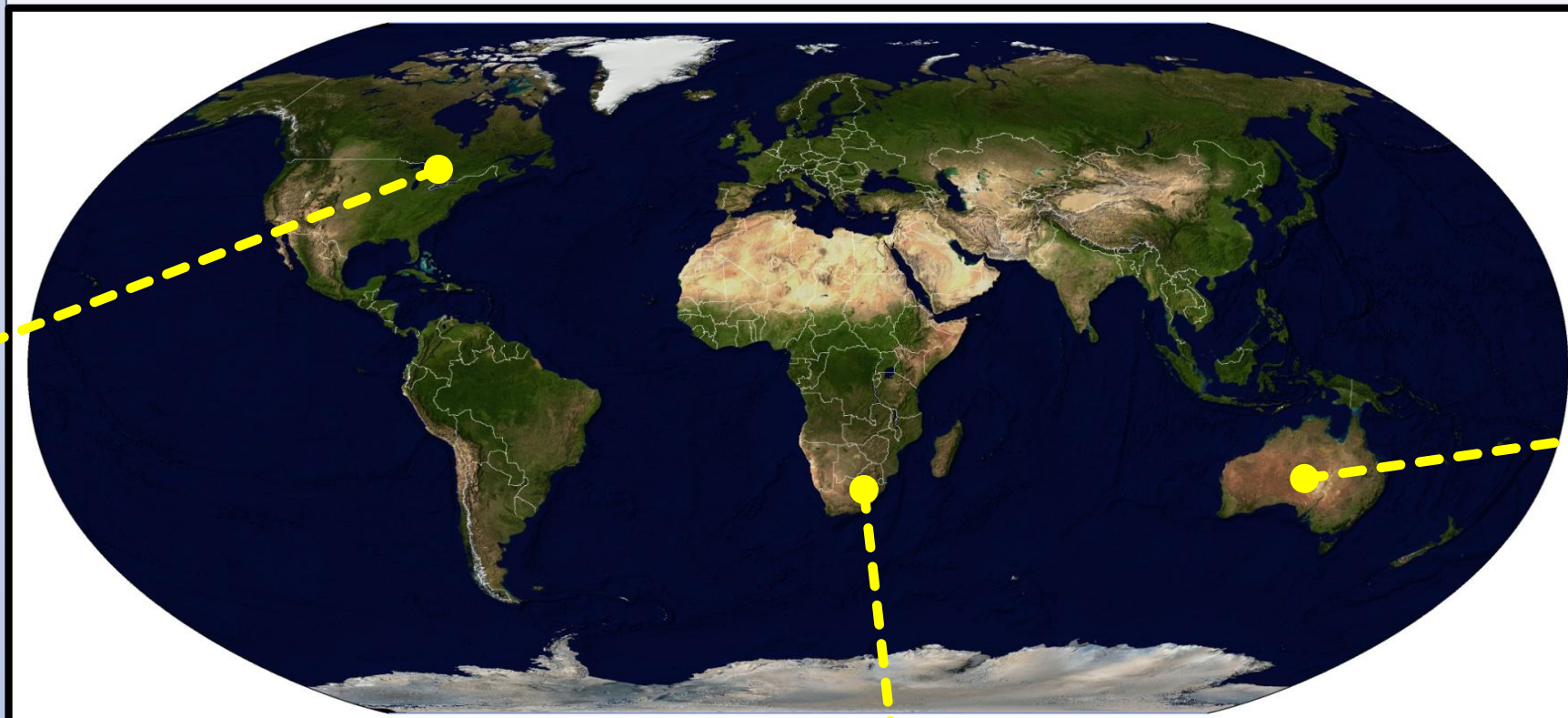
Results

1. The concentration of Iridium in both the melt and the wall rock is much greater than expect for continental crust and is consistent with either an extraterrestrial impact source or enrichment from a mantle source.
2. There appears to be no significant difference in Iridium concentrations between the Wall rock and the Pt veins.
3. MAPCIS appears to more closely match the PGE concentrations of Sudbury than Vredefort.



Due to the low sample weight, some of the PGEs could not be measured and were left off the chart.

The three largest deposits of pseudotachylite breccia can be found at Sudbury Canada, Vredefort South Africa and MAPCIS Australia.



A visit to the quarries at Vredefort, South Africa brings more than enough samples.



After visiting all three location, I find no significant differences on gross inspection.

Bureau Veritas Commodities

BQ-NAA-2 Platinum Group Elements by Nickel Sulfide

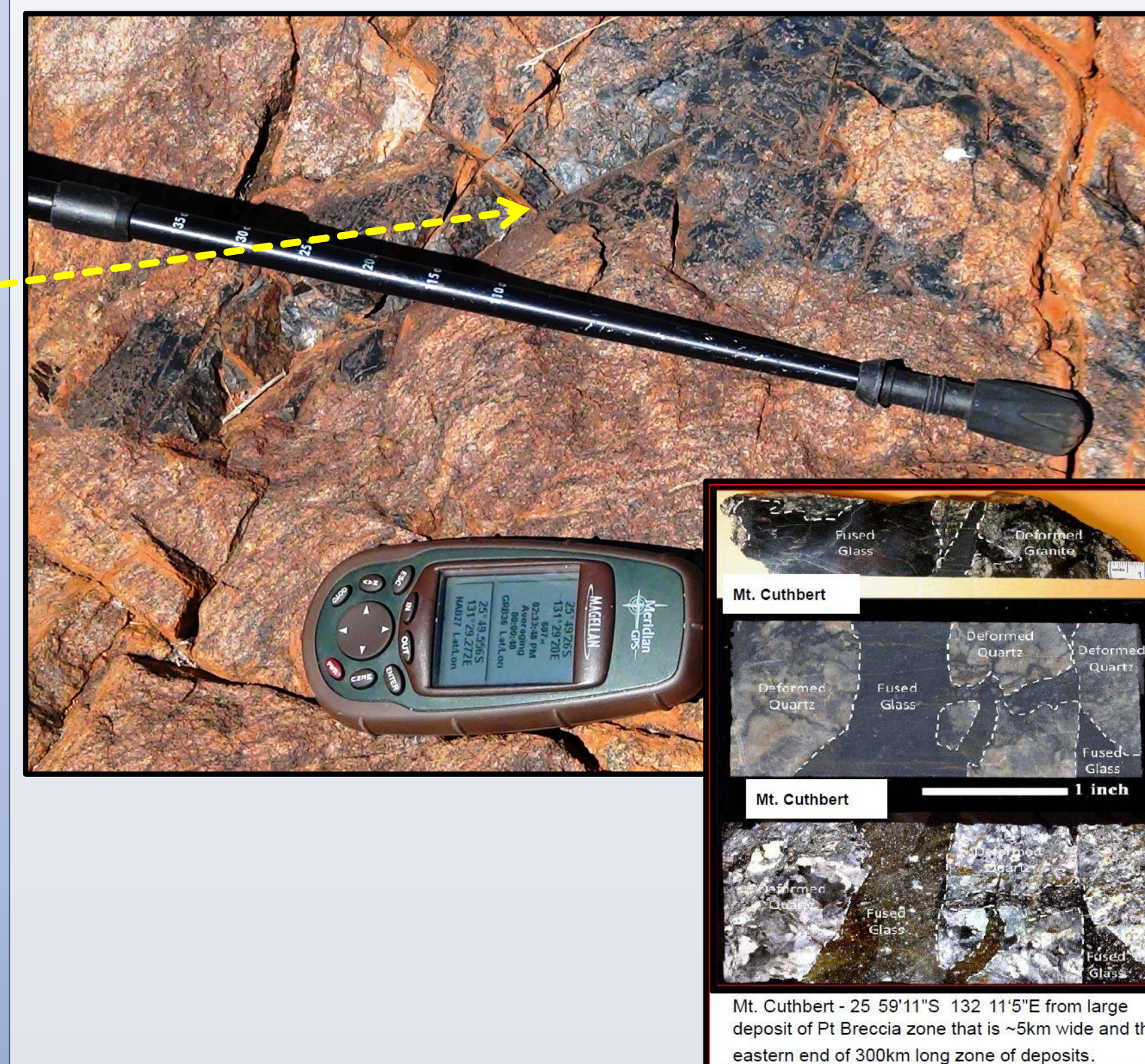
RESULTS OF ANALYSES OF SOLID												
Maxxam ID	EMI323	EMI324	EMI325	EMI326	EMI321	EMI322	EMI327	EMI328				
Sample ID	Dan3pt	Dan3wr	K1pt	K1wr	Dan1pt	Dan2wr	PtA	PtC				
UNIT												
Gold (Au)	ppb	23	1	18	1	9	1	11	1	18	1	80
Iridium (Ir)	ppb	7	1	11	1	3	1	2	1	3	1	1
Osmium (Os)	ppb	<10	10	<10	10	<10	10	<10	10	<10	10	<10
Palladium (Pd)	ppb	<290	290	<220	<130	<160	160	200	210	<190	190	<160
Platinum (Pt)	ppb	87	20	220	20	31	20	<26	26	440	20	<41
Rhodium (Rh)	ppb	17	5	33	5	11	5	<5	5	10	5	<5
Ruthenium (Ru)	ppb	<50	50	<50	50	<50	50	<50	50	<50	50	<50

KEY:

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Dan3pt = pseudotachylite vein Kelly Hills
Dan3wr = wall rock of vein Kelly Hills
Dan1pt = pseudotachylite Mt. Fraser
Dan2wr = wall rock of vein Mt. Fraser
K1pt = pseudotachylite Kulgera, Mt. Cuthbert
K1wr = wall rock of vein Kulgera Mt. Cuthbert
PtA = Vredefort South Africa pseudotachylite
PtC = Sudbury Canada pseudotachylite

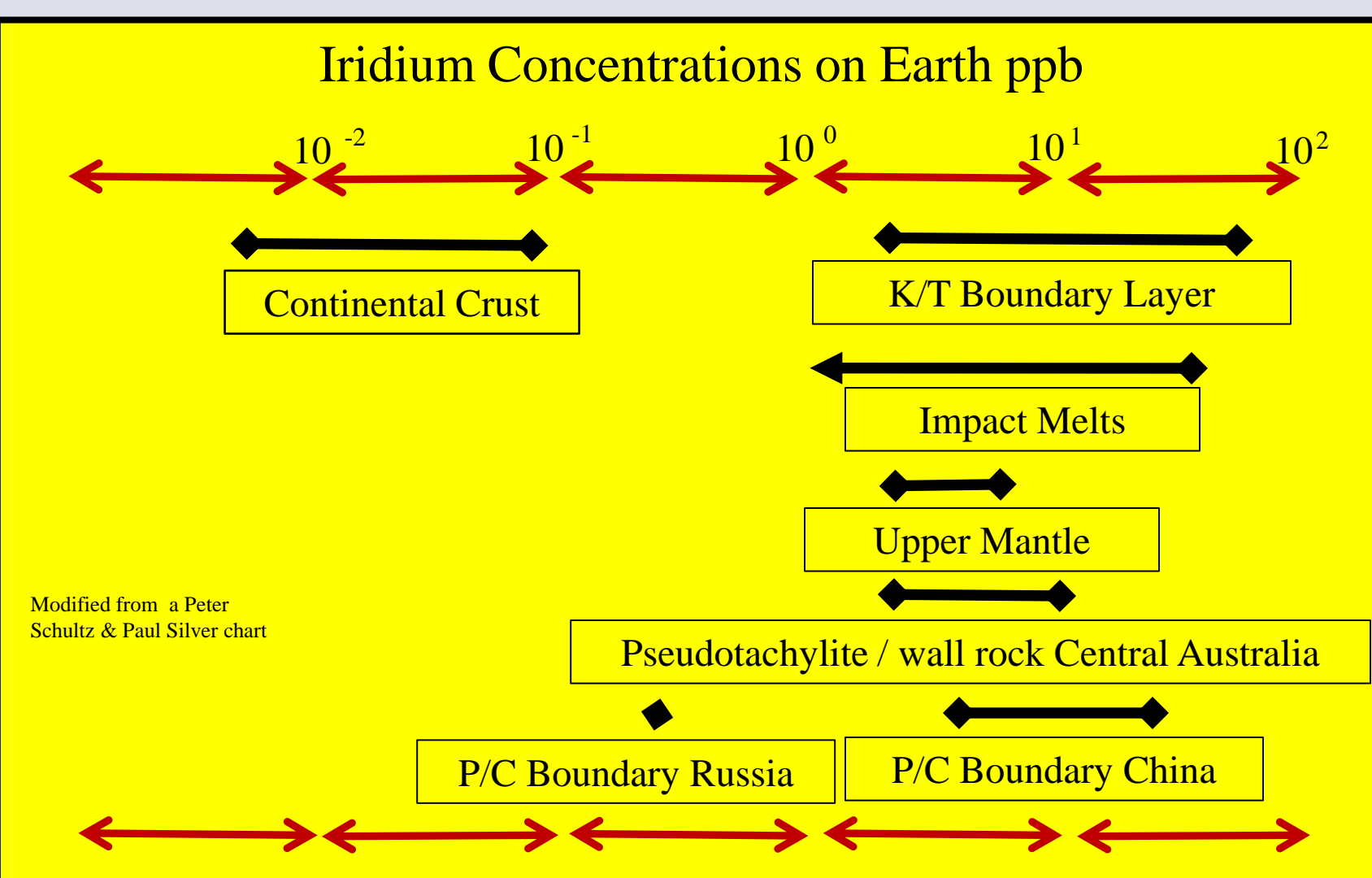
Eastern Musgrave Range
Northern Territory, Australia

The MAPCIS pseudotachylite breccia is in deposits of 4% to 10% melt that run for 300km and can be up to 5km wide.



Results

The concentrations of Iridium in the pseudotachylite veins and wall rock is an order of magnitude greater than what would be expected in granitoid continental crust. It is more consistent with other known impact melts or upper mantle



Discussion

This is the ten year anniversary of MAPCIS Research. So much has been accomplished and there is an almost infinite amount of research yet to come. Finding high Iridium concentrations is but one step. The discovery of high Iridium concentrations in all the samples from the three pseudotachylite sites has important implications. A portion of the Iridium could be extraterrestrial from an impacting bolide and/or from a mantle source. M. W. Wallace, et al., 1990, showed that the PGEs including Iridium have significant diagenetic mobility after emplacement. We have to ask the question, did the melt enrich the wall rock with Iridium or vice versa. This raises the questions that need to be answered before the Iridium is positively attributed to an impact.

An Iridium anomaly has been noted at the Precambrian/Cambrian boundary in China, Russia and Tasmania which some researchers have attributed to an impact source and others believe it was deposited by other means. I believe that finding the Iridium at the center of the MAPCIS impact will help to tie these other discoveries together.

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