New Genetic Concepts of Magmatic Cu-Ni Deposits
岩浆铜镍矿床成因新认识

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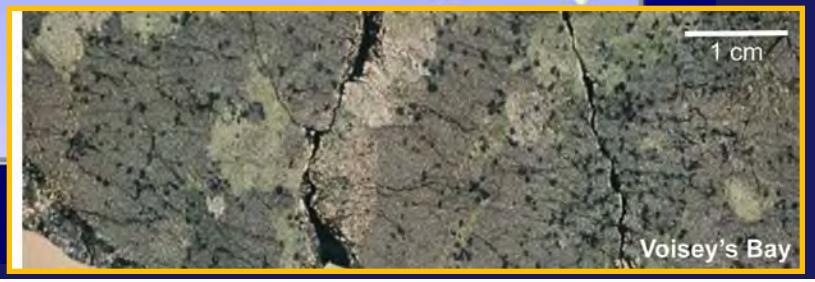
世界级岩浆硫化物矿床

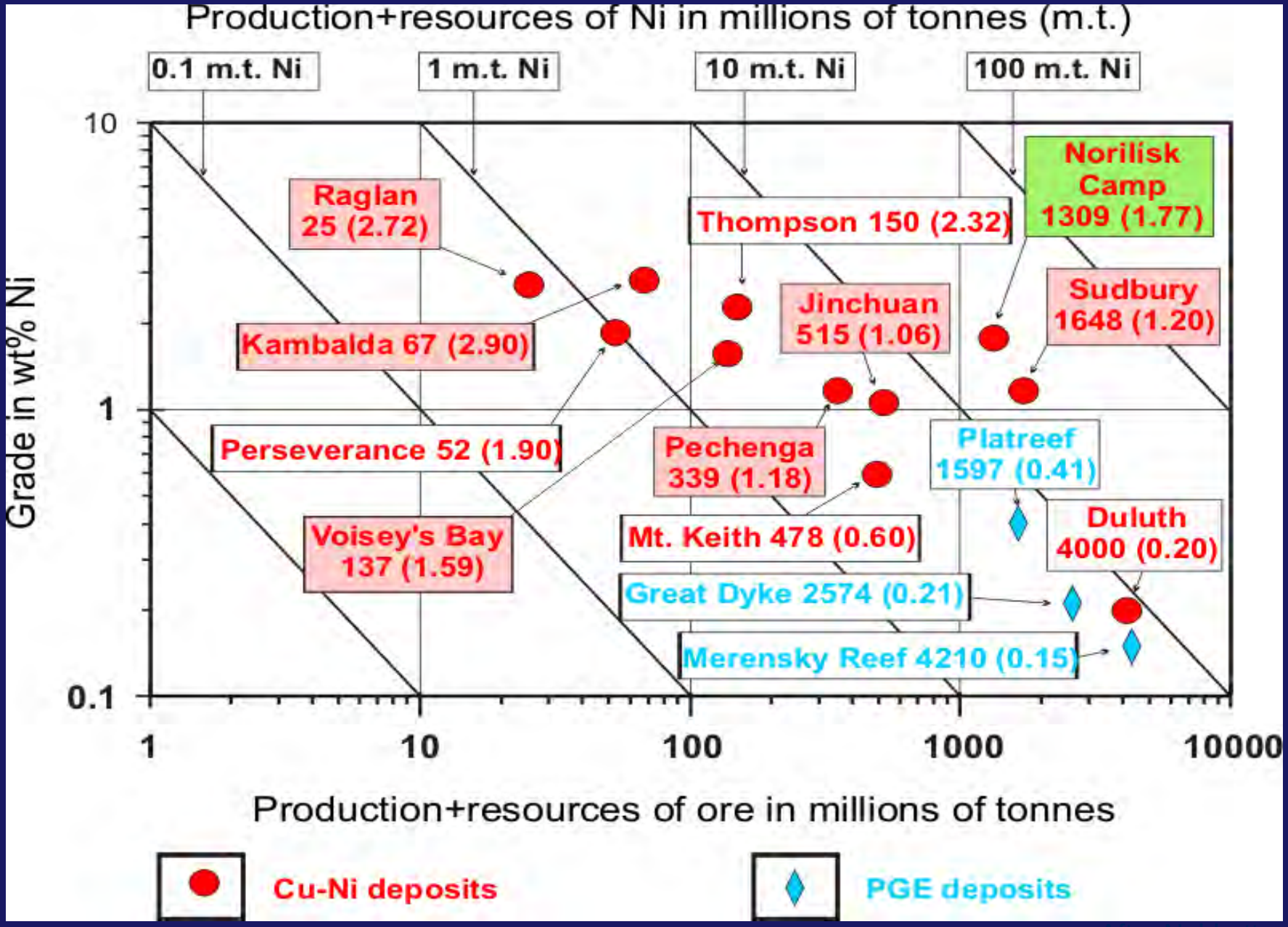
WORLD-CLASS MAGMATIC SULFIDE DEPOSITS

镍矿床 Ni Deposit/Camp　　铂矿床 Pt Deposit/Camp





镍矿产量 + 资源量 (百万吨)



镍的品位

铜镍矿床

铂族元素矿床

Early genetic model was based on the Sudbury Ni-Cu deposits discovered almost 2 centuries ago

早期成因模式是建立在两个世纪以前发现的萨德伯里铜镍硫化物矿床的基础上



Canadian Pacific Railway near Murray Mine (Discovery Cut), photo taken Sept 2, 1916

在Murray矿山附近的加拿大和平铁路 (发现处的露头)，照片摄于1916年9月2日



萨德伯里 Sudbury

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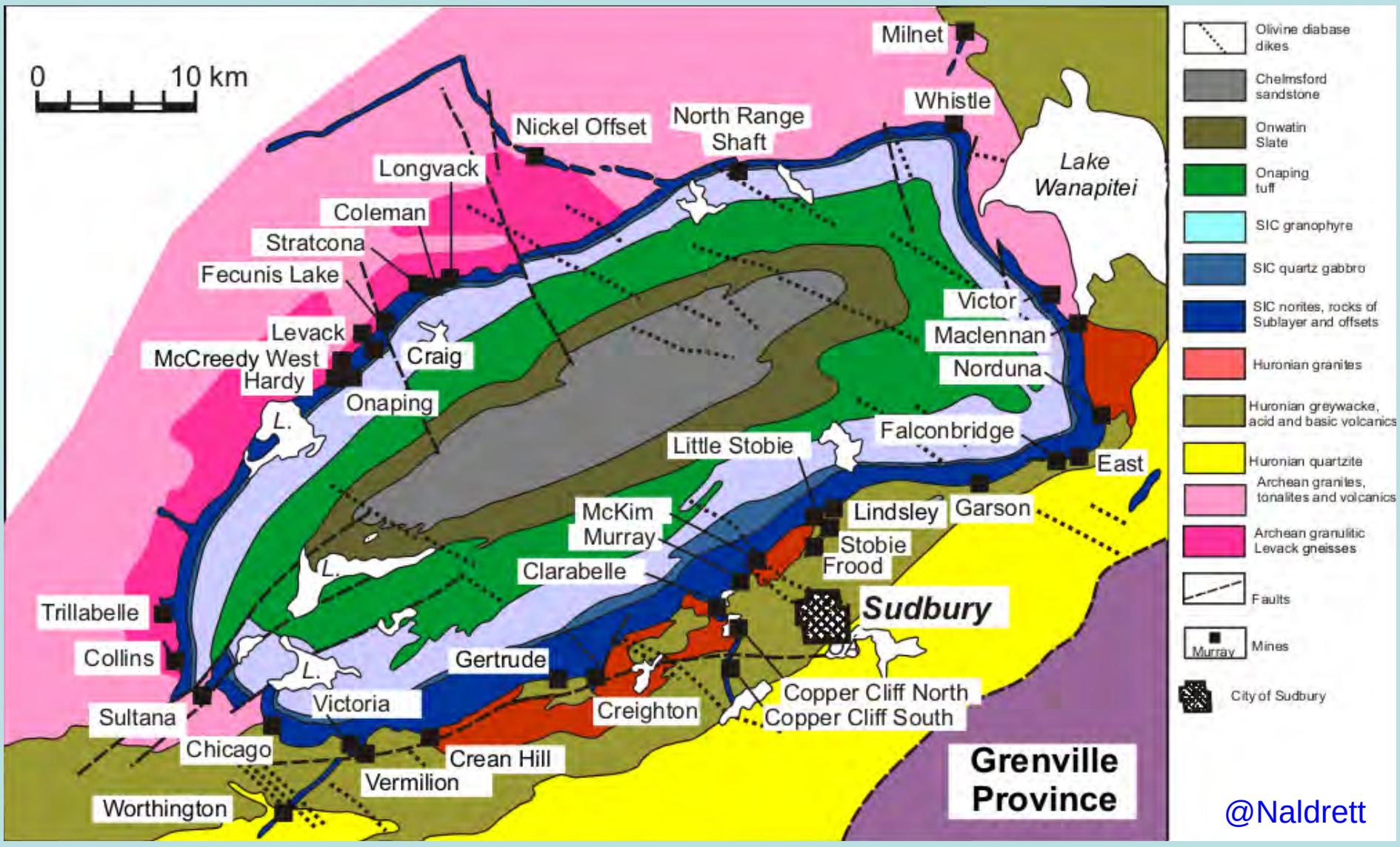
萨德伯里铜镍矿床分布平面图



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The traditional view before 1980s
80年代以前的传统观点



This model suggests that magmatic Ni-Cu sulfide deposits occur in the base of large layered intrusions. It was regarded as an universal model in many textbooks and was widely used in mineral exploration worldwide not long ago.

这种模式提出了岩浆硫化物矿床产于大岩体底部。在早期教科书中被认为是个普遍的模式, 并且在过去矿产勘探中得到广泛的应用。

Meteorite impact at Sudbury, ~1.85Ga

萨德伯里的陨石冲击: 大约正18.5亿年以前



Sudbury Breccia
萨德伯里角砾岩

Large vein of partial melt
with blocks of granite gneiss





Shocked Quartz from Onaping Formation
石英的冲击构造

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Shatter Cones, south of Kelley Lake

冲击锥

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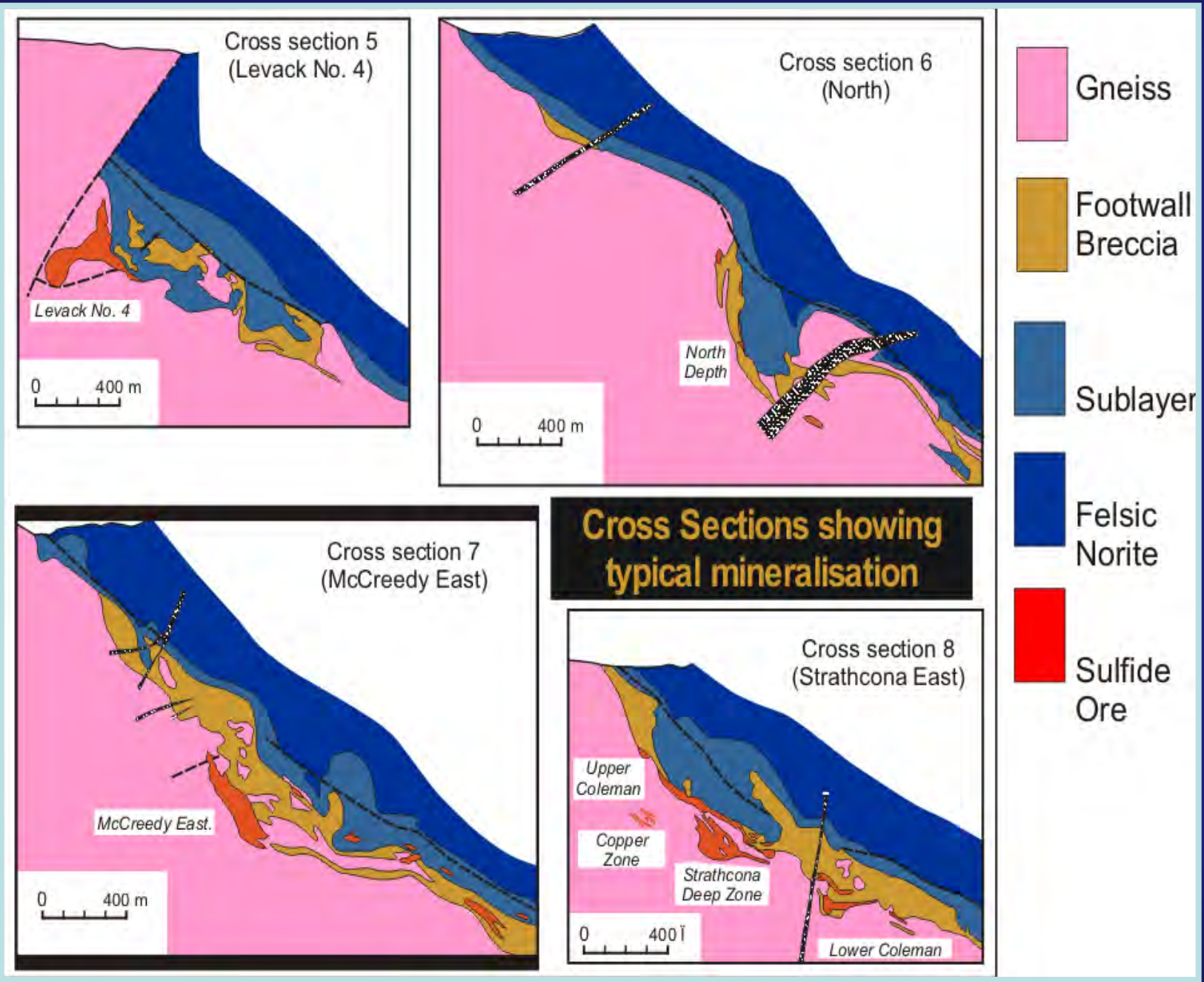
Sudbury North Range 萨德伯里岩体北缘矿床剖面图



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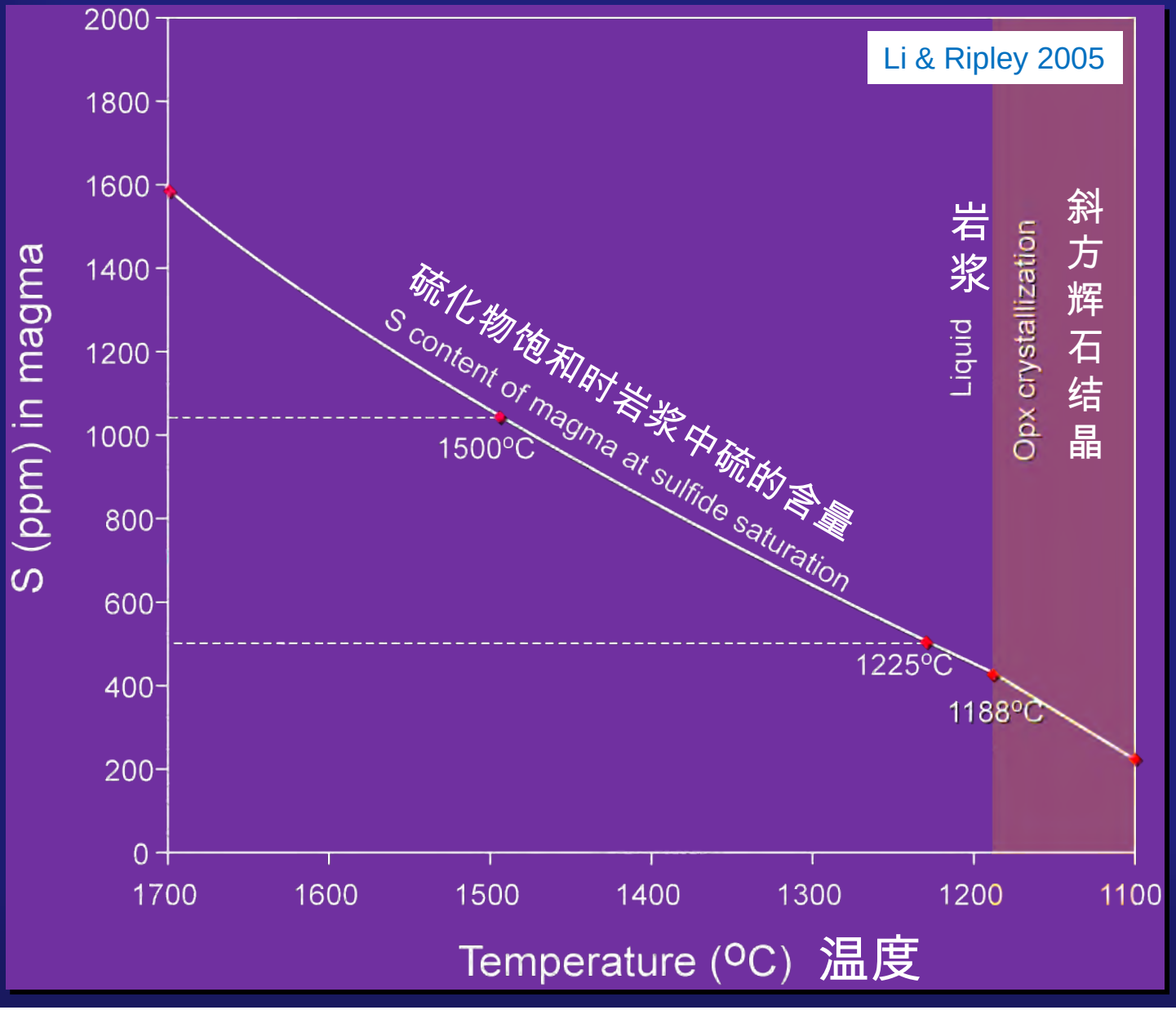
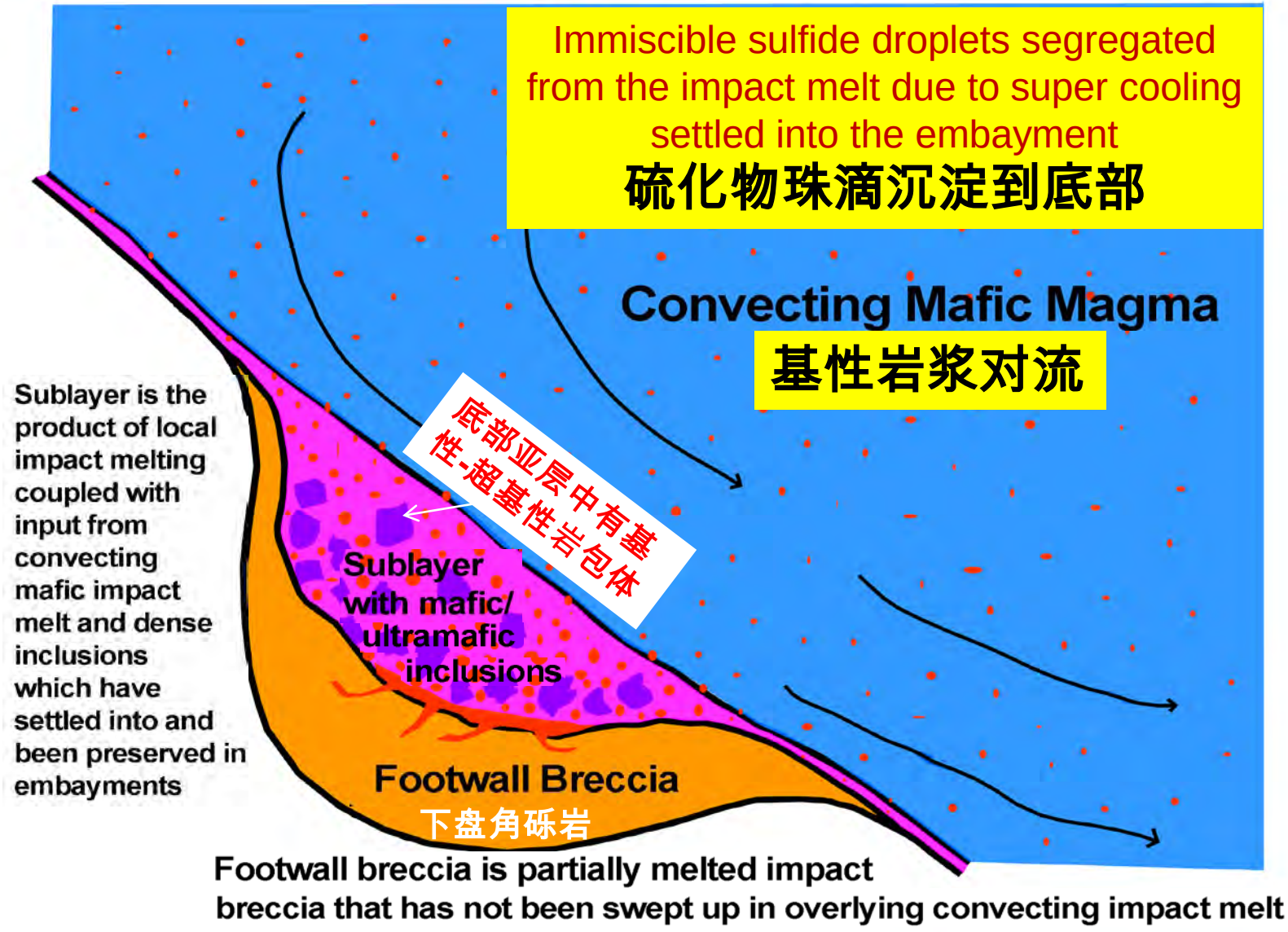
Sulfide segregation due to super-cooling of impact melt at Sudbury

萨德伯里过热岩浆冷却过程造成硫化物熔离



Conceptual Cross Section 示意剖面图

底部亚层是局部冲击熔融产物



下盘角砾岩是冲击角砾岩

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Magma Association of Cu-Ni Deposits
铜镍矿床岩浆组合

(1) Related to Komatiites (ultramafic lavas, principal example: Kambalda, Raglan)
与科马提岩相关 (超基性熔岩)

(2) Related to Continental Flood Basalts (principal example: Noril'sk, but also Duluth, Insizwa)
与大陆溢流玄武岩相关

(3) Related to Ferropicrites (principal example Pechenga)
与铁苦橄岩相关

(4) Anorthosite plutonic suites (principal example: Voisey's Bay)
斜长岩侵入体组合

(5) Tholeiite (principal example: Jinchuan)
拉斑玄武岩岩浆

(6) Impact melt (ONLY example: Sudbury)
冲击熔融

A Wake-Up Call 晨钟终于敲响

After several decades of unsuccessful hunt for the Sudbury type Ni-Cu deposits in large layered intrusions, we finally come to realize that we have been fooled for too long by the Sudbury model. Meanwhile, all important Ni-Cu deposits have been accidently found in magma conduits, not in large layered intrusions. The Sudbury deposits are unique and cannot be used to guide the exploration of Cu-Ni deposits related to continental magmatism.

经过了几十年的努力，世界上没人在大型层状侵入体中找到另一个萨德伯里型铜镍硫化物矿床。与此同时，偶然发现的铜镍硫化物矿床大部分产在岩浆通道里。我们现在意识到萨德伯里矿床是个特例，其成矿模式不能用于寻找与大陆岩浆作用有关的铜镍硫化物矿床。