

Model 5b Mafic extrusive (flood basalt) –related Ni-Cu-PGE	
Alternative Model Name	Noril'sk Ni-Cu-PGE – Mafic intrusions related to flood basalts
Commodities	Ni, Cu, Pt, Pd (Co)
% Global Production	12% PGEs, 20% Ni (1998)
% Australian Prod.	Nil
World Class Deposit Size	900 Mt @ 2.7% Ni –largest economic concentration of chalcophile metals in the world
World Class Deposit Examples	Noril'sk-Talnakh (Russia) Duluth (USA: 1.12 Ga, 4000 Mt @ 0.2% Ni)-not world class
Geological Setting	Extensive basaltic flood volcanism (Siberian Traps) associated with intracontinental rift zones; sulphide deposits hosted by sub-volcanic differentiated tholeiitic sills (30 to 350 m-thick) which acted as feeders to vast volumes of overlying basaltic magmas
Age	Palaeozoic; in particular Permian-Triassic
Components:	
<i>Source</i>	Tholeiitic basaltic magmas derived from mantle plume
<i>Transport/Pathway</i>	Feeder conduits along deep-crustal faults
<i>Trap</i>	Assimilation with crustal components (evaporites, coal) and gravitational settling of sulphides to base of feeder sills
<i>Other</i>	
Critical Elements	<ul style="list-style-type: none"> • Extensive basaltic flood volcanism (?young Phanerozoic) associated with intracontinental rift zones (1) • Volcanism associated with mantle plume activity and major faults extending to base of crust (1) • S saturation of magmas caused by interaction of magmas with country rocks (2) • Development of magma chambers at different crustal levels and sub-volcanic differentiated sills that acted as feeders to overlying basaltic magmas (3) • Sulphides concentrated in conduits or channels through which much magma has flowed (4)
Other Comments	Possible (unmineralised?) Australian analogues-Antrim Plateau Volcanics and Hart Dolerite (Kimberley), Cooya Pooya Dolerite (Pilbara), Zamu and Oenpelli Dolerite (Pine Creek); Jurassic Dolerite (Tasmania), Quaternary flood basalts (Victoria)
Key References	<p>Duzhikov, O.A. & Distler, V.V., 1992. Geology and Metallogeny of Sulfide Deposits Noril'sk region, USSR, Society of Economic Geologists Special Publication 1, 242 pp.</p> <p>Naldrett, A.J., 1989. Magmatic Sulfide Deposits. Oxford University Press, New York, 177 pp.</p> <p>Naldrett, A.J., 1997. Key factors in the genesis of Noril'sk, Sudbury, Jinchuan, Voisey's Bay and other world-class Ni-Cu-PGE deposits: implications for exploration. Australian Journal of Earth Sciences, 44, 283-315.</p> <p>Naldrett, A.J. et al. 1996. Controls on the composition of Ni-Cu sulfide deposits as illustrated by those at Noril'sk, Siberia. Economic Geology, 91, 751-773.</p>

