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Billion-year stability of cratonic edges controls location of global sediment-hosted metals

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Consumption of base metals (copper, lead, zinc and nickel) over the next ∼25 years is set to exceed the total produced in human history to date. Major factors driving this demand are global development and the transition to clean energy sources. Moreover, trace metals that are essential to high-tech applications (e.g. cobalt, indium and germanium) are often produced as by-products of base metal mining. A growing concern is that the rate of exploitation of existing reserves is outstripping discovery of new deposits, despite exploration expenditure tripling during the 2005–2012 minerals boom. Improvements in the effectiveness of exploration for mineral deposits, particularly those buried under shallow cover, are required to reverse this worrying trend and maintain growth in global living standards. Here, for the first time, we show that giant sediment-hosted base metal deposits occur exclusively along the edges of thick lithosphere. ∼90% of the world's sediment-hosted copper, lead and zinc resources lie within 200 km of these boundaries. This result provides an unprecedented global means to identify fertile regions for targeted mineral exploration, reducing the search-space for new deposits by approximately two thirds on this criterion alone. In addition to these exploration implications, the 2-billion year age range of these deposits indicates that edges of thick lithosphere are mostly stable over this time period without appreciable thermo-mechanical erosion, despite experiencing several tectonic cycles since their formation.