Solid Earth Discussions

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Comment on se-2021-119

Fernando Tornos (Referee)

Referee comment on "Application of lithogeochemical and pyrite trace element data for the determination of vectors to ore in the Raja Au–Co prospect, northern Finland" by Sara Raič et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-119-RC1, 2021

The manuscript by Raic et al. on the vectors to ore in the Raja project, Finland, is an excellent study on the use of mineralogical and geochemical vectors in exploration – especially since it deals with orogenic gold systems, which have not been so extensively studied as other mineral systems. However, the paper is rather long and sometimes reiterative so I would suggest the authors to try to synthesize it.

Some other comments that can help to improve the study.

Line 11: potential instead new?

Line 12. Which tools?

Line 16. Which alteration?

Line 17. Albitization has affected all these rocks?

Line 40. “More than five” looks a bit strange.

Line 41. I would move this sentence to three above.

Line 46. “atypical metal…” is not needed here.

Line 47. Delete “mineral precipitation”

Line 49. Some instead “certain amounts of” – try to be more synthetic.

Line 56. Delete this phrase.

Line 59. Not all these elements are of economic interest.

Line 60. Delete “of a hydrothermal system”

Line 66. References

Line 86. Basaltic mafic is redundant

Line 88: material is not a really good geological term. Carbonaceous-bearing rocks?

Line 133. Perhaps I would say “averaging 383 ppm of Co”

Line 142. Could you explain these oxidized sediments?

Line 145. I think this deserves a more detailed explanation.

Line 158 to 163. I think that there is some contradiction here.

Line 170. Pyrrhotite nor pyrite are, to my knowledge, ore. Perhaps use metallic minerals.

Line 310: mica-rich seams and bands… don’t understand

Line 328. This is a repetition.

- The term sericitic alteration is too vague. Sericite is a fine grained white mica that you don’t know what is. Why not, phyllic?

Line 338. Repetition

Line 418. By whom is recommended?

Line 506. You do not discuss at all, the mechanisms of ore precipitation despite you quote it several times along the paper.

Line 623. Perhaps highest instead heaviest…

Line 643. I am a bit surprised that you state that albitization is caused by sedimentary brines during diagenesis. I guess that many people would disagree with this. Could you expand this discussion a bit, perhaps in other place of the paper? Or at least add some references.

Line 661. Rheology and metallurgical processes… can you explain this a bit more?

Line 740-onwards: this repeats what was said above. Try to clear it.

Line 767. Again, iI don’t understand why geometallurgy is quoted here.

Line 780. I think that here there is a misunderstanding of the paper by Dmitrijeva et al. (2020) paper. I don’t understand what is the link here with hematite – not present in Raja to my knowledge.

Line 785. There are no pyrites but pyrite. Pyrite grains?

Line 789. This is not true – with LA ICPMS you can usually detect nanoinclusions unless evenly disseminated.

Line 802. This is highly unlikely – for having such variations in the SO4-H2S ratios you need to be in the stability field of sulfates… check some relevant references. Perhaps reflects mixing between magmatic and sedimentary sources. The positive values perhaps due to the inheritance of sulfur from a system with biogenic reduction of sulphate in a partially closed system.

Line 809. The d34S depletion is very low and within the range of magmatic rocks, either leached from or degassing.

Line 816-onwards. This is dominantly a repetition of what has said before and a lot of vague statements. I would delete most of it and merge the key info with the conclusions

Line 851. What is a robust petrographic description?