

Solid Earth Discuss., referee comment RC2
<https://doi.org/10.5194/se-2021-42-RC2>, 2021
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Comment on se-2021-42

Anonymous Referee #2

Referee comment on "Establishing an integrated workflow identifying and linking surface and subsurface lineaments for mineral exploration under cover: example from the Gawler Craton, South Australia" by Ulrich Kelka et al., Solid Earth Discuss.,
<https://doi.org/10.5194/se-2021-42-RC2>, 2021

This paper presents a workflow to firstly identify lineaments (faults and shear zones) by different techniques and later on plot their intersections in an effort to create density maps that can be used as exploration tool in areas with a 'thick' sedimentary cover.

In my opinion, the paper is very poorly written, especially the geological part. The text is very often redundant. Some parts are repeated constantly throughout the text (e.g., relationship between mineralization and faults). There are millions of commas missing. The expression 'the study area' is constantly repeated (I have counted up to 36 times). Figures 13 and 14 are not discussed in the text and only referred to in table 1 or in figure 15. They should be at least minimally discussed.

From a geological perspective, the Geological Overview is not well organized and it is almost impossible to get an image of the geology of the area. Structures and zones cited in the text are often missing in figures so it is impossible to follow the description. The differentiation between shear zones and faults the authors make is meaningless. And the paper lacks a description about the age of faults/shear zones and that of mineralization. If the latter is older than most of the structures, what is the point of doing this work. Contrarily, if mineralization is younger, it could use any pathway. That needs to be described in the introduction. And if this is not known, you need to say it and use it as support for your work.

In relation with the technical part, the work has a sound mathematical basis used with little geological/rational support. The datasets have different resolution, implying that identified features have different length and are going to be plotted in different positions (something that is key to make intersection maps). Upward continuation uses values that are not explained (why 2000 m or 900 m and what does it imply). Why not using vertical derivatives to picture gradients and boundaries/lineaments? These are good at spotting gradients, which in potential field data are evidence of lithological boundaries (by fault, shear zones or purely compositional). And last but not least, the places that authors point

as potentially interesting areas for mineral prospecting (Fig. 15), very seldom coincide with mineral occurrences, so we have a problem.

In summary, although mathematically the paper is correct, it lacks a good geological background. Processes are applied over datasets that might not be useful for the purpose of the paper. And in case it was going to be published, it needs to be rewritten, mostly the geological part. Also, datasets need to be further discussed and errors and limitations considered. So in my opinion, the paper has to be rejected in its present form although resubmission of a new MS could be an option given the goal and background of the paper

Ahead there are some comments that I made before I realized it was better to make annotations in the MS. So use both, this text and the annotated MS for review.

Some comments. More in the tex.

Line 81: The key geological features should be enough....

Line 87: What does Lake Harries Greenstone Belt (figure 1 and 2b) have to do with the lithologies? You haven't cited this belt before. Cite figure 1 so we know what you refer to.

Line 91: Rocks of the Hiltaba Suite (figure 2).

Lines 91 to 95: No need to mention four times 'study area'

Line 96: Granitic gneisses are orthogneisses?

Line 97: What is a low magnetic signature? Low amplitude?

Line 98: Comma missing after Suite.

Lines 117-120: How can you distinguish the magnetic signature of shear zones and faults? That paragraph responds to your own work or there references missing. Fluid flow also demagnetizes or remagnetizes shear zones. Also, shear zones also juxtaposes blocks of rocks with different magnetic character.

Line 123: I don't see, as such, a NW trending Mulgathing Trough in figure 2a. In general, there is little relationship between geology as described in the text and shown in the maps. This needs to me highly improved.

Fig. 1: Add a rectangle in the Australia map in figure 1b delimiting the area shown in the bigger figure 1a. Maybe figure 1a should be figure 1b and viceversa.

Please also note the supplement to this comment:

<https://se.copernicus.org/preprints/se-2021-42/se-2021-42-RC2-supplement.pdf>