

Solid Earth Discuss., referee comment RC1  
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## Comment on se-2021-42

Anonymous Referee #1

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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.,  
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### General comments

This manuscript by Kelka et al reports an application of automatic lineament detection of a large-scale subsurface fault network in Australia. Authors use a compelling geophysical dataset and provide a precious comparison between various automatic lineament detection and manual lineament detection. The manuscript is well-written, rather efficient in delivering its message, and figures are important and well designed, even if some are too small, given the richness of the details they bear. This manuscript is an important contribution as large-scale mapping of lineaments (here faults) is an area of growing impact in geology, whether it is for resource exploration, but also for structural integrity of an area and seismogenic risk. I think it fits perfectly the thematic of the special issue it aims at but there is some points that would benefit some more explanations. Hereinafter are reported some relatively minor questions, remarks and suggestion I wish the authors can answer before publication

### Specific comments

- What is the depth reached by the subsurface dataset? Could not subsurface and surface data combined to produce a 3D mapping that also take into account the dip of the faults? I guess they here are vertical, but such approach will be usable in other tectonic context, hence it would be an added value to be able to get the dip of faults from this kind of datasets. Also would the use of a subsurface data help in areas with limited outcrops due to vegetation?
- My main problem is that this paper present a workflow, but there is no actual workflow

diagram that would make it easier for the reader to understand what are the inputs, treatments and outputs at the different steps. Each steps are individually well illustrated and explained, but I missed a nice overall figure for the workflow.

- It seems that the authors restrict this workflow to regolith, and its interest to Australia. I understand that this is a special issue, but Solid Earth is a large-scope publication, and so I suggest authors extend the interest of this study beyond Australian mining in regoliths in the introduction and discussion
- There are been numerous studies that use drone/lidar images to map fractures from automatic lineament detection, should it be discussed what exactly does the subsurface geophysical dataset add to the table? There is two lines about that around l. 297 but it is very shallow, could you develop?
- I miss a brief discussion about the uncertainty and resolution of the method (e.g. on the orientation of lineaments, length, or % of lineament actually existing)
- The area of study has a long and complex geological history. So how do you know that the lineaments are indeed from the same long-term tectonic history which would be relevant to the fluid flow and related ore deposit?
- Is there anyway to interpolate between the large gaps by giving the machine a specific regional trend?
- Finally, some paragraphs are really hard to get because of the overuse of jargon, unexplained terms that the non-specialized reader will left puzzled with, without any reference. I am referring to the treatment part mainly: "10 Gaussian to the Kernel"; "Akaike information criteria"; "Sobel filtering"; "Green function"; "Canny edge detection". What are those? Please explain in a few words and add references for more in-depth explanations.

#### Technical comments:

- The abstract should summarize the main results of the study please replace l. 10 onwards with the actual finding of your study.
- 1 why is it challenging only in Australia?
- 24 « « these and existing » suggest these don't actual exist, please reword
- 30-33: complicated long sentence, could you add a break?
- 42:what exactly is a targeting map?
- Can the Olympic Dam located on fig 2?
- Figure one is small and the located area reported in a too subtle way.
- Is there a cross-section available for the area
- Line 101: not sure transported cover is the good wording, what do you mean?
- 114: what analytical products? That is rather vague
- 139: parenthesis missing after figure 4
- 150 it is under explored yet exploited for 125 years??
- 155 157 : please remove the teaser