

This paper presents a summary of the seismic and other geophysical studies of the Superior Craton. It reflects a compilation of Lithoprobe data and new data from the Metal Earth project.

It has received contrasting reviews, and I would say that my review sits between the two.

It is good to see the extent of work that has been done. However, this can only ever be an interpretation as the exact geometry of the geology in cratonic areas at depth is poorly constrained, so one would expect a degree of variation in the interpretations. The temptation is to overinterpret such results – for example the strong assertion that the vertical faults are leaky transforms – why not simply vertical accretion boundaries of more mafic material with more granitic material?

This result is an interpretation as there is no plate tectonic context, there is no strong geological context as in these Archean cratons can only be interpreted based on what one thinks might have been happening. The implication here is that there has been tectonic accretion and that the crustal structures represent that tectonic accretion process with imbrication of the relatively low angle thrusts.

Only where there is exposure of deep crust can some sort of constraints be placed and these can be inferred from the Kapuskasing section. It would have been useful to see some more direct comparisons with mid-crustal reflections from this section. I believe that a lot of the low angle reflectors are mafic sections like the amphibolites in the Kapuskasing structure. The same goes for some of the layered lower crustal sections that one sees outcropping from the Superior province in for example the Ungava region underthrusting the Proterozoic sections (see work from Lucas, St Onge etc..) These are very instructive on what one might interpret in the Superior geophysical section and how layering might develop during the accretion process.

The section on fluid flow in the crust is poor and comes through as an afterthought. The Metal Earth project was conceived to look at fluids and mineralisation in the cratons and their margins – an entire paper could be written about how the fluid pathways are preserved – especially in the southern Superior where there are significant greenstone belts, superimposed by Huronian rifting and fluids and even younger kimberlites associated with Phanerozoic rifting.

In general, given that the authors have replied to the critical comments the I would think the paper is acceptable for publication with some modifications. It would be worth seeing some less definitive assertions and a more nuanced interpretation that recognizes that we do not really have much idea of the exact processes of Archean tectonic accretion.