Reconciling cover thickness estimates in Cloncurry region in Queensland using Bayesian estimate fusion

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The Cloncurry region lies in NW of Queensland and includes the Mount Isa Inlier, one of the most highly endowed meatllogenic provinces in Australia, which has a long history of mining and exploration. The area is covered by the Jurassic-Cretaceous Carpentaria and Eromanga Basins sediments with the Mount Isa Inlier outcrops to the West and South. The fully concealed Millungera Basin underlies younger basins to the East. In order to de-risk further mineral exploration in this region it is important to know the thickness of cover. There is a variety of geophysical data available that can be used to estimate cover thickness. The point depth estimates of cover are derived from geophysical data using different inference methods. In order to create a map, these individual depth estimates must be reconciled/interpolated. The conventional interpolation methods do not produce the most optimal solution since these methods don't easily account for discrepancies in the geophysical data distribution, resolution of the data and consequently variable accuracy of the cover thickness depth estimates. Also, most of these techniques do not produce an uncertainty estimate of the result. We have developed a Bayesian estimate fusion (Visser and Markov, 2019) that accounts for the variable data inaccuracies of the point cover thickness estimates which produces a map of cover thickness and its uncertainty. Additionally, the method uses non-intersecting drill holes, which were not usually utilised to create a map of the cover thickness. The method deals with outliers, by differentiating between the point depth estimates related to the cover-basement interface and the false positives that might be coming from the intrasedimentary units or the deeper basement. Lastly, the method incorporates existing fault information which allows to better capture sharp cover thickness changes. The cover thickness and its uncertainty in the Cloncurry region are presented in Figure 1.

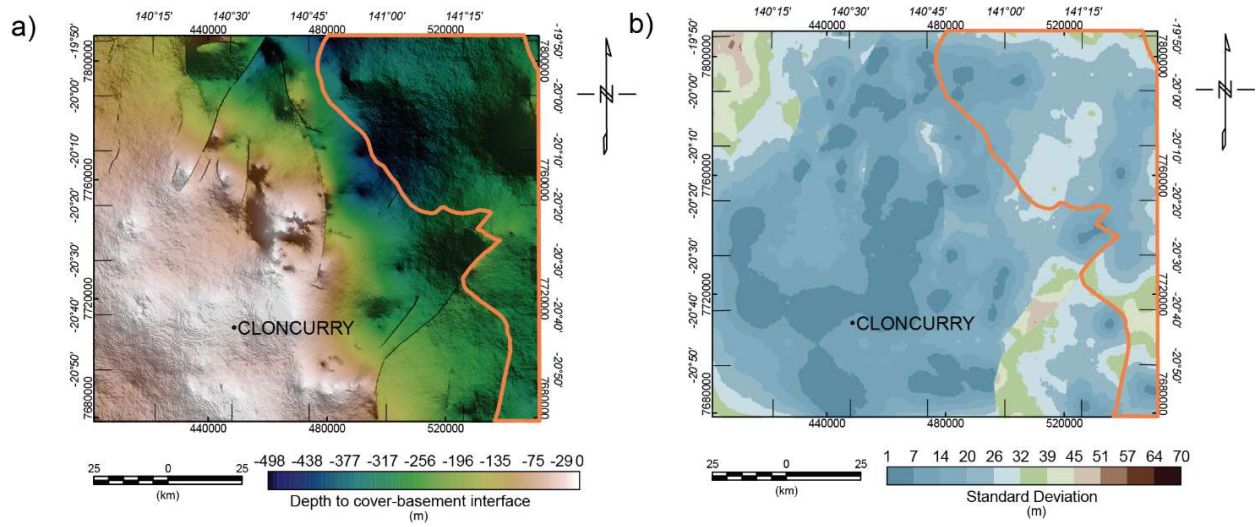

Figure 1. The cover thickness in Cloncurry. a) Map of the depth to cover-basement interface, b) Map of cover thickness uncertainty, expressed as the standard deviation of the ensemble solutions at each 200 m x 200 m pixel. Orange line is the boundary of the concealed Millungera Basin

References

Visser, G, and Markov, J., 2019, Cover thickness uncertainty mapping using Bayesian estimate fusion: leveraging domain knowledge, *Geophys J Int*, Vol.2019, Issue 3, p 1474 - 1490.