EGUsphere, referee comment RC2
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Comment on egusphere-2022-180

Chris Elders (Referee)

Referee comment on "Strato-structural evolution of the deep-water Orange Basin: constraints from 3D reflection seismic data" by Nombuso G. Maduna et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-180-RC2, 2022

The authors of this manuscript are to be congratulated for presenting some very elegant interpretation and visualisations of an interesting data set that images a the compressional and transitional (or translational?) domains of a large scale submarine slide complex.

I think that there are a few issues that the authors should consider in their interpretation and discussion of their observations. I feel that some of the inferences are somewhat circumstantial, and it would be useful if they could be better substantiated, or the alternatives considered. They are:

- Evidence that the small scale underlying thrusts in the Albain sequences are younger than overlying large scale thrust system.This seems counterintuitive, particularly given that thrusts normally cut up stratigraphy, particularly when a basal detachment becomes “locked”. Why could these older thrusts not simply be part of an older mass transport complex, which would be an equally valid (and more probable) interpretation of the data and the obsereved relationships?

- The use of the term transitional rather than translational to describe the domain between the extensional and compressional domains of a mass transport complex.Both are used in the literature, particularly for mass transport complexes in this region. "Transitional" may be valid where the zone is narrow, and extensional and compressional structures interact. "Translational" is more appropriate where the zone is wide and the sequences above the detachment are being displaced horizontally between the extensional and compressional domains. It think the situation described here is more akin to the latter, in which case the observations are particularly interesting. All the faults in this domain (even those interpreted as extensional) are highly oblique to the thrust faults in the compressional domain, and I suspect are also oblique to the extensional faults in the extensional domain, although this is not imaged in this data set. Are there any more extensive 2D surveys or existing maps that could be used to address this? If so, the inference that the translational domain consists mainly of oblique faults would be very interesting and innovative and would indicate the style of deformation that operates in this zone.

- The use of the term "spoon-shaped" to describe the plan view pattern of the oblique faults – I think this is confusing, and the inference of this geometry by extrapolation beyond the extend of the data set is geologically and mechanically unrealistic.I think it is better to confine the use of the term to the three dimensional geometry of individual fault planes that show curvature in three dimensions (up dip and along strike). This has previously been used to describe the geometry of linked extensional and oblique faults in the extensional domain.

- The inference of the sense of motion on oblique faults from the offset of thrusts.The implication in the manuscript is that the thrusts were originally contiguous structures that have subsequently been offset by the oblique faults. I think this is unlikely. I think it is more likely that they act like lateral ramps in thrust sheets and accommodate differences in displacement between originally offset thrusts. The actual displacement will depend on the nature of the offset, and will be variable. Transform faults between offset segments of a mid ocean ridge are also a good analogy in this respect.

- The use of the term "mass transport complex" to describe the turbidite and contourite deposits in the Oligocene and Miocene sequences – this is very confusing!The term mass transport complex should be restricted top large bodies of intact or semi-intact

sediment transported down slope by gravitational processes, and be distinguished from sediment being transported by currents, that still may be gravitationally controlled (mass flow would be a better term for these if you prefer to avoid using terms such as turbidite and contourite). The Deep Water Fold and Thrust Belt is part of a mass transport complex, and the term should be restricted to that feature.

- Evidence for the control of the underlying structure on the younger canyons and contourite channels.The evidence seems to suggest that the Oligocene canyon has a different orientation to the underlying structure, so it is difficult to see the control. This therefore also reduces the likely control of the underlying structure on the Miocene margin-parallel channels. It would be better to use maps that superimpose the sedimentary features on underlying structure to establish these relationships, rather than inferring them from vertical sections where apparent relationships my just be an artefact of the location of a single section. The suggestion that the margin-parallel channels are influenced by strong tides also seems somewhat circumstantial. Are there any observations from the data that can be used to support this?

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Please also note the supplement to this comment:
https://egusphere.copernicus.org/preprints/2022/egusphere-2022-180/egusphere-2022-180-RC2-supplement.pdf