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## Abstract List – Oral

# Geometry and Neogene evolution of Terror Rift, western Ross Sea, Antarctica

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Terror Rift developed in the broader Victoria Land Basin (VLB) adjacent to the Transantarctic Mountains, as a 400 km-long, 50-70 km-wide, up to 14 km-deep sedimentary basin. It belongs to the Mesozoic/Cenozoic West Antarctic Rift System (WARS) and continues farther south beneath the Ross Ice Shelf.

A post-29 Ma seismic stratigraphic and fault interpretation was developed, using all resolutions of seismic reflection data available, including the multichannel seismic reflection data (MCS) from the Seismic Data Library System, and by correlating seismic stratigraphy from the core holes in the McMurdo Sound area, and from the Deep Sea Drilling Program (DSDP) sites farther east.

Depth conversion using a new 3D velocity model was performed on gridded stratigraphic horizons and on MCS data crossing Terror Rift. Thirteen interpreted depth sections were used to measure two components of vertical motion from rift flanks to basin center. These components are vertical separation across faults, and stratal dip, usually the result of progressive tilting. Extension of Miocene horizons across faults was also calculated.

The Terror Rift model presents a different relief accommodation on the two flanks, showing tilting combined with faulting along the western side and an alternation in 4 segments between faulting and tilting on its eastern flank. Accommodation zones separate fault-controlled segment of the eastern margin from dip-controlled segments. An anticline (Lee Arch) on the eastern border of the TR is dissected by the N- striking up-to-the-basin and down-to-the-basin steep to sub-vertical faults which form a geometry similar to a negative flower structure. Some of the offshore faults have reverse separation of late Miocene and possibly younger strata, and parts of other faults are vertical, consistent with right-lateral slip and oblique rifting after ~26 Ma.

We consider tilting linked to differential subsidence since at least 29 Ma in southern Terror Rift, and vertical-separation of strata across faults in central and northern Terror Rift since at least 21 Ma until post-Miocene time, demonstrating tectonic activity after ~29 Ma and continuing after 21 Ma. Certain faults exhibit sea floor scarps or fault line scarps, with almost one km of vertical separation of a younger than 7.5 Ma horizon. We measure no significant change in rate of total subsidence of southern Terror Rift through late Oligocene and Miocene time. This differs from published papers that propose that significant tectonic extension did not occur between 23 and 13 Ma (e.g., Fielding et al., 2008).

Published plate tectonic studies indicate that extension slowed about 26 Ma, and 30 km of oblique extension-right-lateral displacement occurred across Terror Rift between 26 and 11 Ma (Granot and Dyment, 2018). We measure less than 4 km of extension of a 21 Ma unconformity across offshore mapped faults imaged on a MCS profile extension. This suggests that Terror Rift was a mostly transtensional dextral transform boundary between 26 and 11 Ma. Given evidence for post-7.5 Ma activity on faults, Terror Rift changed from an orthogonal rift before 26 Ma to a transtensional

transform boundary after 26 Ma, into or through post-Miocene time.

References

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Granot, R., and Dyment J., 2018, Late Cenozoic unification of East and West Antarctica. Nature Communications volume 9, Article number: 3189.