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Revised Eocene-Oligocene kinematics for the West Antarctic rift system

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[1] Past plate motion between East and West Antarctica along the West Antarctic rift system had important regional and global implications. Although extensively studied, the kinematics of the rift during Eocene-Oligocene time still remains elusive. Based on a recent detailed aeromagnetic survey from the Adare and Northern Basins, located in the northwestern Ross Sea, we present the first well-constrained kinematic model with four rotations for Anomalies 12o, 13o, 16y, and 18o (26.5–40.13 Ma). These rotation poles form a cluster suggesting a stable sense of motion during that period of time. The poles are located close to the central part of the rift implying that the local motion varied from extension in the western Ross Sea sector (Adare Basin, Northern Basin, and Victoria Land Basin) to dextral transcurrent motion in the Ross Ice Shelf and to oblique convergence in the eastern end of the rift zone. The results confirm previous estimates of 95 km of extension in the Victoria Land Basin. **Citation:** Granot, R., S. C. Cande, J. M. Stock, and D. Damaske (2013), Revised Eocene-Oligocene kinematics for the West Antarctic rift system, *Geophys. Res. Lett.*, *40*, 279–284, doi:10.1029/2012GL054181.

1. Introduction

[2] The West Antarctic rift system (WARS) has divided West and East Antarctica since the Late Cretaceous. Past relative motion between the plates had important implications for its lithospheric structure and consequently on the development of the Antarctic ice sheets [*Bingham et al*., 2012; *Wilson and Luyendyk*, 2009; *Wilson et al*., 2012]. Furthermore, the WARS links the Pacific with the Indo-Atlantic plates and therefore plays an important role in the global plate circuit [*Molnar et al*., 1975]. Motion has probably been accommodated by a series of discrete rifting pulses with a westward shift and concentration of the motion throughout the Cenozoic [*Huerta and Harry*, 2007; *Wilson*, 1995]. The latest episode of motion has taken place along the westernmost edge of the Ross Sea, forming the Victoria Land Basin (VLB) and Northern Basin (Figure 1). North of the western Ross Sea, with structural continuity with the Northern Basin [*Cande and Stock*, 2006], marine magnetic anomalies indicate the formation of the Adare Basin between middle Eocene and late Oligocene time [*Cande et al*., 2000]. Although these anomalies provide the best direct constraints on the relative motions between the Antarctic plates, due to the limited available data and lack of fracture zones, they have thus far provided only limited information on the kinematics of the rift.

[3] Three previous kinematic studies used different approaches to quantify the motion between East and West Antarctica and resulted in contrasting implications for rift tectonics. *Cande et al*. [2000] used a three-plate configuration (East Antarctica-Australia-West Antarctica) to compute the first finite rotation (pole and angle) for Anomaly 13o (Figure 2b). Due to the limited data available at that time, this pole position has a very large uncertainty (~5000 km), but implies extensional motion throughout the WARS. A more recent attempt [*Davey et al*., 2006] used external geological constraints to overcome the lack of data and computed the rotation for Anomaly 18o (Figure 2d); this model implied significant convergence in the eastern parts of the rift. Plate circuit closure (East Antarctica-Australia-Pacific-West Antarctica) between Anomalies 21o and 8o [*Müller et al*., 2007] provided an alternative kinematic solution. According to this latter model, most of the rift system has undergone dextral transcurrent motion. On the basis of data collected during a recent detailed aeromagnetic survey from the Adare and Northern Basins we have calculated four new well-constrained finite rotations that allow us to describe the Eocene-Oligocene motion between East and West Antarctica without any a priori assumptions.

2. Adare Basin and Northern Basin

[4] The Adare Basin was accreted along one arm of a ridge-ridge-ridge triple junction between chrons C20 and C8 (43–26 Ma) [*Cande and Kent*, 1995; *Cande et al*., 2000]. Asymmetric seafloor spreading took place along the now fossil Adare spreading axis, with 7 and 5 mm/yr spreading rates in the east and west flanks, respectively. The remarkable continuity of magnetic anomalies across the shelf break and into the Northern Basin (Figure 1) [*Damaske et al*., 2007] suggests a strong kinematic link between seafloor spreading and the WARS. These anomalies are truncated in the south by the E-W Polar-3 anomaly (Figure 1) that has been inferred to be caused by igneous activity along a transfer fault [*Behrendt et al*., 1991; *Davey et al*., 2006]. A recent seismic refraction study [*Selvans et al*., 2012] revealed an overall flat trend of seismic velocity contours across the shelf break suggesting a continuity of crustal type. The abnormally shallow bathymetry of the Northern Basin could be attributed, at least in part, to the seaward propagation of

All Supporting Information may be found in the online version of this article.

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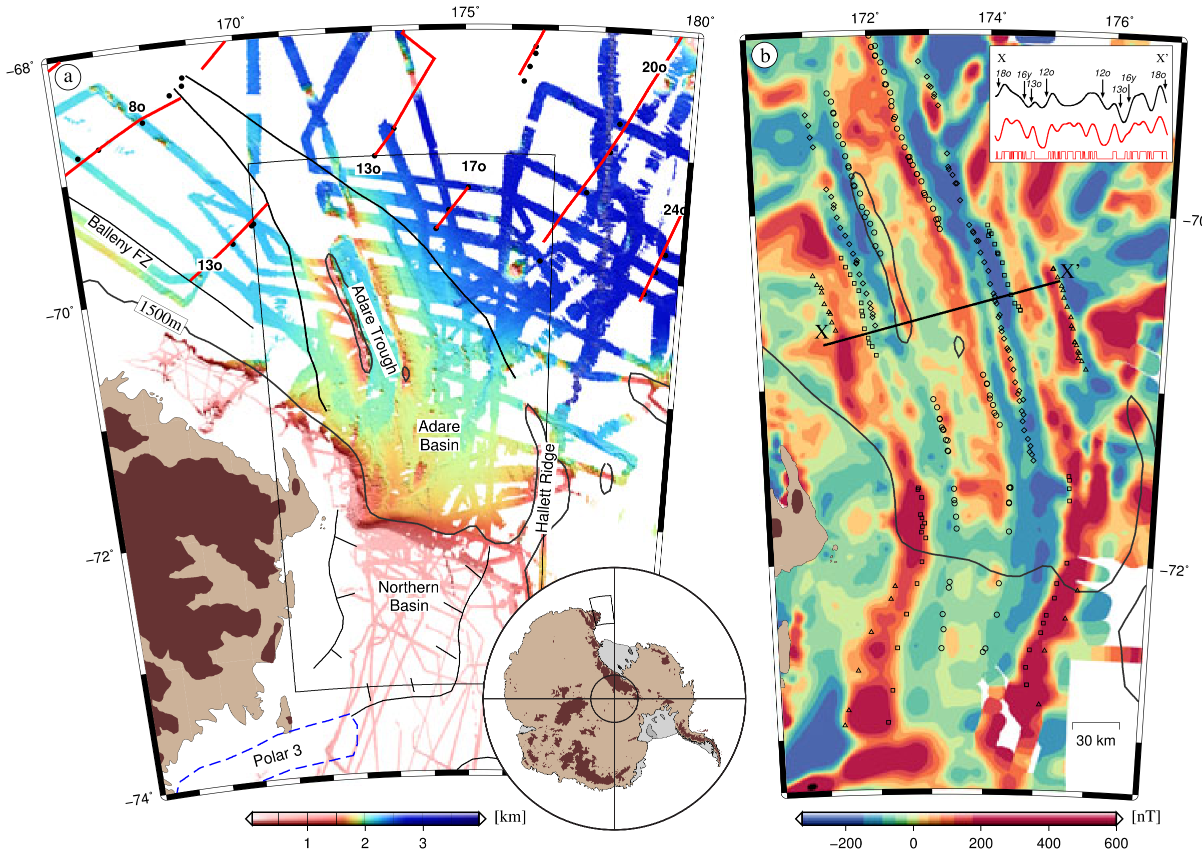

Figure 1. Tectonic setting of the northwestern tip of the West Antarctic rift system and marine magnetic anomalies in the Adare and Northern Basins. (a) Bathymetric map showing the northwestern Ross Sea where the Adare Basin abuts the Northern Basin from the north. Red lines delineate isochrons and dashed blue line denotes the Polar 3 anomaly. Black box shows the location of the grid shown in Figure 1b. (b) Magnetic anomaly grid based on data collected during GANOVEX IX 2005–2006 project [*Damaske et al.*, 2007] and shipboard surveys. Anomalies 12o are denoted by circles, 13o by diamonds, 16y by squares, and 18o by triangles. Inset shows a representative X-X′ magnetic profile across the Adare Basin. Red thin line outlines the magnetic block model, red thick line delineates the resultant synthetic magnetic anomaly profile, and black line delineates the observed magnetic anomaly data along the profile. Arrows mark the locations of the picked anomalies used for reconstructions.

glacio-marine sediment deposits [*ten Brink and Schneider*, 1995] that have filled the basin, out over the oceanic crust, since its formation. Altogether, the magnetic anomalies found within the Northern Basin constrain the southern part of the spreading system and therefore present an opportunity to better define past plate motion.

[5] Postspreading motions (younger than 26 Ma) in the Adare Basin were relatively minor. A recent detailed multichannel seismic reflection study [*Granot et al.*, 2010] showed that two rifting events took place roughly 24 and 17 million years ago. Based on their seismic results, offsets of magnetic isochrons and gravity modeling [*Müller et al.*, 2005], *Granot et al.* [2010] concluded that the total possible amount of postspreading extension in the Adare Basin was 7 km. This motion has been accommodated in a narrow region inside the basin. Pliocene to recent volcanic activity followed this narrow region [*Granot et al.*, 2010]. There is no evidence for post-Oligocene deformation inside the Northern Basin although we cannot exclude such motion.

3. Data and Analysis

[6] We combined ~25,000 km of aeromagnetic profiles collected as part of the GANOVEX IX 2005–2006 project [*Damaske et al.*, 2007] with GPS-navigated archival shipboard magnetic data. The total-field aeromagnetic data were collected 600 m above sea level along lines spaced 5 km apart with a towed bird assembly. Contributions from diurnal variation and the geomagnetic field were removed to correct for external and internal fields, respectively. Crossover errors were accounted for by a leveling procedure (for a complete description of data acquisition and processing please see *Damaske et al.* [2007]). The compiled magnetic dataset contains 1.01 million data points and allows us to identify anomalies 12o, 13o, 16y, and 18o within the Adare and Northern Basins (Figures 1b and 2). We picked the anomalies on screen using an interactive program and omitted from further consideration the anomalies that cross the locus of younger deformation as defined by the study of *Granot et al.* [2010]. We note however, that even when we included all the available data, the kinematic results were nearly identical.

[7] To compute the finite rotations and their uncertainties, we employed the best-fitting criteria of *Hellinger* [1981] as implemented by *Royer and Chang* [1991] and *Kirkwood et al.* [1999]. For each anomaly we have calculated both a two-plate best-fit rotation using data solely from the Adare and Northern Basins (West-East Antarctica) and a three-plate best-fit solution using data from all three arms of the

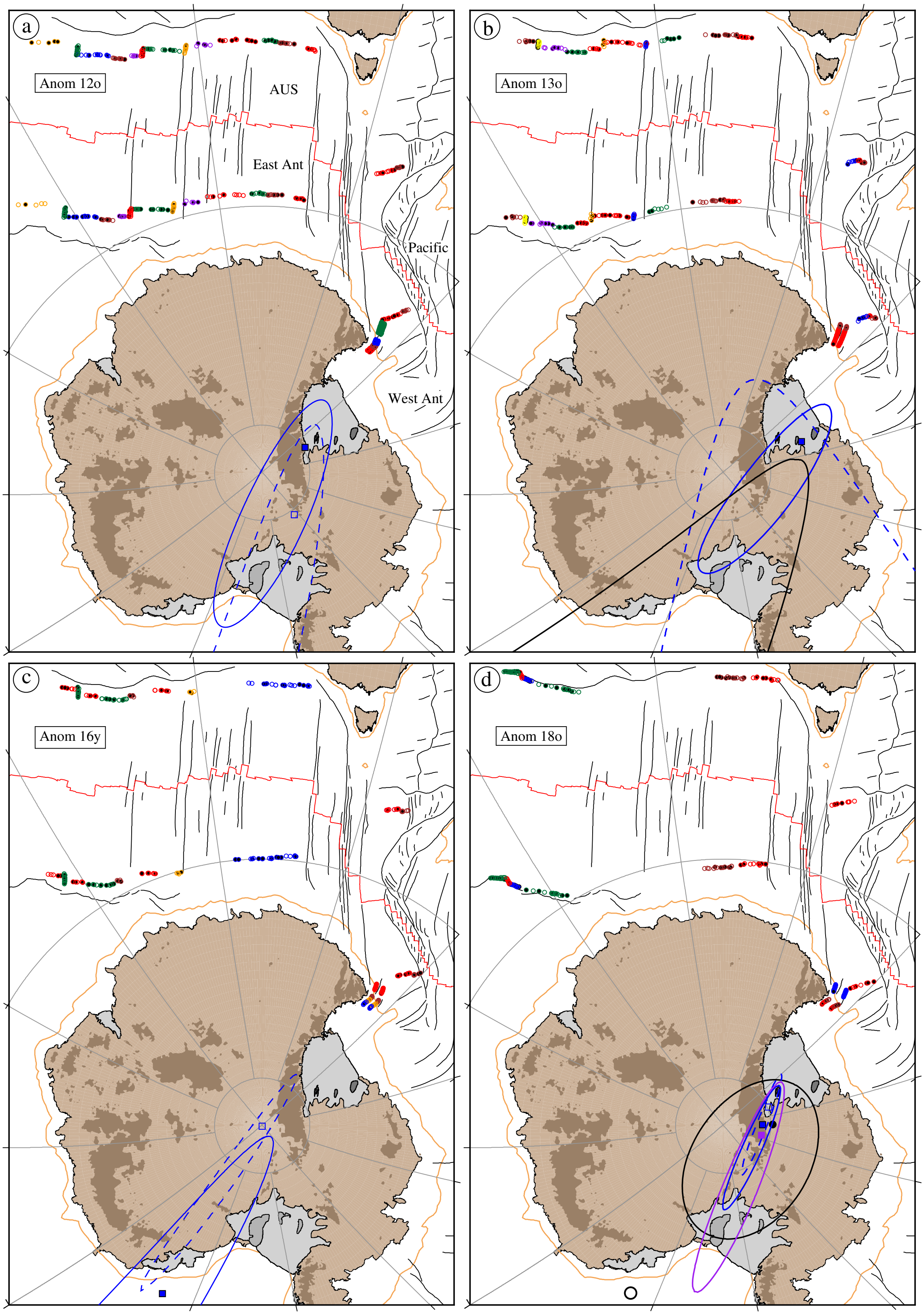

Figure 2. Magnetic anomaly picks and fracture zone locations used in this study, and the resulting best-fit rotation poles and their 95% confidence limits: two-plate solutions (dashed blue lines and empty squares) and three-plate solutions (solid blue lines and filled squares). The four panels show the four different magnetic anomaly data sets used: (a) 12o, (b) 13o, (c) 16y, and (d) 18o. Empty and filled circles are the unrotated and rotated picks, respectively. Different colors represent different spreading segments and fracture zones. Black line in Figure 2b delineates the uncertainty error ellipse calculated by *Cande et al*. [2000]. Stage pole 18o-12o is shown in Figure 2d in purple, 18o pole of *Davey et al*. [2006] is shown in black and stage pole 21o-8o of *Müller et al*. [2007] is shown with an empty circle.

Table 1. Finite Rotations and Covariance Matrices for the Relative Motion Between East (Fixed) and West Antarctica[a]

Age (Ma)	Mag. Anom	Lat (°N)	Long (°E)	Angle (°)	$\hat{\kappa}$	a	b	c	d	e	f	Points	Segs
30.94	12o	–84.78	190.99	–1.33	0.81	19.63	–5.33	58.44	2.74	–17.23	175.88	238	19
33.55	13o	–81.09	200.37	–3.17	0.69	116.83	1.27	301.77	3.65	–1.43	786.32	201	17
35.69	16y	–70.72	338.78	–1.38	0.47	31.15	–7.53	95.68	3.20	–23.97	292.13	146	14
40.13	18o	–85.87	220.49	–4.48	1.02	103.64	–28.37	317.60	10.08	–88.72	976.84	130	10

[a]The covariance matrix is given by the formula $\frac{1}{\hat{\kappa}} * \begin{pmatrix} a & b & c \\ b & d & e \\ c & e & f \end{pmatrix} * 10^{-7}$ radians^2.

triple junction. We divided the anomaly picks and fracture zones into separate segments and assigned 2 km uncertainties to all the well-navigated magnetic anomaly picks within the Adare and Northern Basins. For the three-plate solutions picks from the Southeast Indian Ridge (between 80° and 150°; 12o and 13o picks were taken from *Cande and Stock* [2004]) were used to constrain the motion between East Antarctica and Australia while data from east of the Balleny fracture zone were used to constrain the motion between West Antarctica and Australia (Figure 2). Picks from these two arms were given 4 km uncertainties due to the poorer quality and relatively sparse distribution of data. Fracture zone locations were taken from the satellite gravity maps [*Sandwell and Smith*, 1997] and were given 10 km uncertainties. We note that changes in the size of uncertainties do not change the solutions and only slightly change the size and orientation of their error ellipses. A statistical parameter $\hat{\kappa}$ [*Royer and Chang*, 1991] serves as an evaluation parameter of the assigned errors for the location of the data points. For most of our data sets, the values of $\hat{\kappa}$ were near one (Table 1), indicating that the error estimates were reasonable. As discussed further later in the text, for Anomaly 16y $\hat{\kappa}$ is slightly smaller (0.47) indicating that the errors in this data set were somewhat underestimated.

4. Finite Rotations

[8] The data points used to constrain the locations of the four finite rotations (both two-plate and three-plate models), together with the solutions and their uncertainty ellipses, are shown in Figures 1b and 2. For the three-plate models, the East-West Antarctica rotations and their covariance matrices are presented in Table 1. The results for the other two arms are presented in the Supporting Information (Table S1). Generally, the two- and three-plate solutions agree well with each other (Figure 2), yet the three-plate solutions are better constrained and therefore have smaller error ellipses. The Anomaly 16y rotation is an exception to the match between the two solutions where its three-plate solution suffers from larger uncertainty compared with its two-plate solution (Figure 2c). Interestingly, all poles of rotation, except the Anomaly 16y pole, are clustered near latitude ~83°S whereas the 16y pole is located ~12° further north (Figure 2). This anomalous behavior of the 16y solution probably reflects the broad form of the anomaly; the ultraslow spreading rate of the Adare spreading axis resulted in merged surface magnetic anomalies that prevent accurate identification of some picks. Due to the better quality of the three-plate solutions, we consider them for the rest of this study. To conclude, our new rotations are internally consistent and indicate that the sense of motion between East and West Antarctica was rather stable during the middle Eocene and early Oligocene.

5. Discussion

[9] Our new rotations have important implications for the motions that took place within the WARS from middle Eocene to late Oligocene time. The northern part of the WARS has not undergone significant motion since Anomaly 8o (26.5 Ma) [*Cande et al*., 2000; *Granot et al*., 2010]; therefore, the calculated rotations can be viewed as stage rotations with respect to Anomaly 8o. The anomaly 18o data set, the oldest identifiable anomaly inside the Adare and Northern Basins, constrains the longest period of rifting (between 40.13 and 26.5 Ma) and is used here to evaluate the variation in relative displacement between the plates along the rift system (Figures 2d and 3), assuming rigidity of both Antarctic plates. This rotation and its uncertainty indicate that the motion varied from ENE-WSW extension in the Adare Basin (~140 km), to dextral transcurrent motion in the central parts of the rift zone (35–50 km, Ross Ice Shelf sector). Motions in the eastern parts of the rift zone were predominantly oblique convergence and reached roughly 160 km in the Antarctic Peninsula subduction zone area. Our new inferences for the WARS are comparable to a transition from extension to compression, which takes place at the northern end of the North American Basin and Range Province, where the Yakima Fold Belt of Washington shows compression simultaneous with post-16-Ma extension throughout most of Nevada and some of Oregon [*Reidel and Hooper*, 1989]. Interestingly, the zone of oblique convergence in the WARS is broadly located where the high Eocene-Oligocene bedrock topography is predicted to exist (between 210°E and 270°E) by recent reconstruction models [*Wilson and Luyendyk*, 2009; *Wilson et al*., 2012].

[10] Our 18o pole of rotation stands in agreement with the pole of *Davey et al*. [2006] (Figure 2d) confirming that roughly 95 km of extensional motion took place within the VLB. This in turn provides an independent confirmation of the estimated extension of *Davey and De Santis* [2006] that was based on gravity modeling of multiple phases of extension. Because the trend of the predicted motion parallels the axis of the Polar 3 Anomaly, including the Polar 3 anomaly as an additional constraint on our model does not have a significant effect on our results. This observation confirms that the area of Polar 3 has most likely been used to transfer the motion between the Northern Basin and VLB, as speculated previously by *Behrendt et al*. [1991].

[11] Our model predicts that the region within the interior of the rift, where large subglacial basins and troughs exist

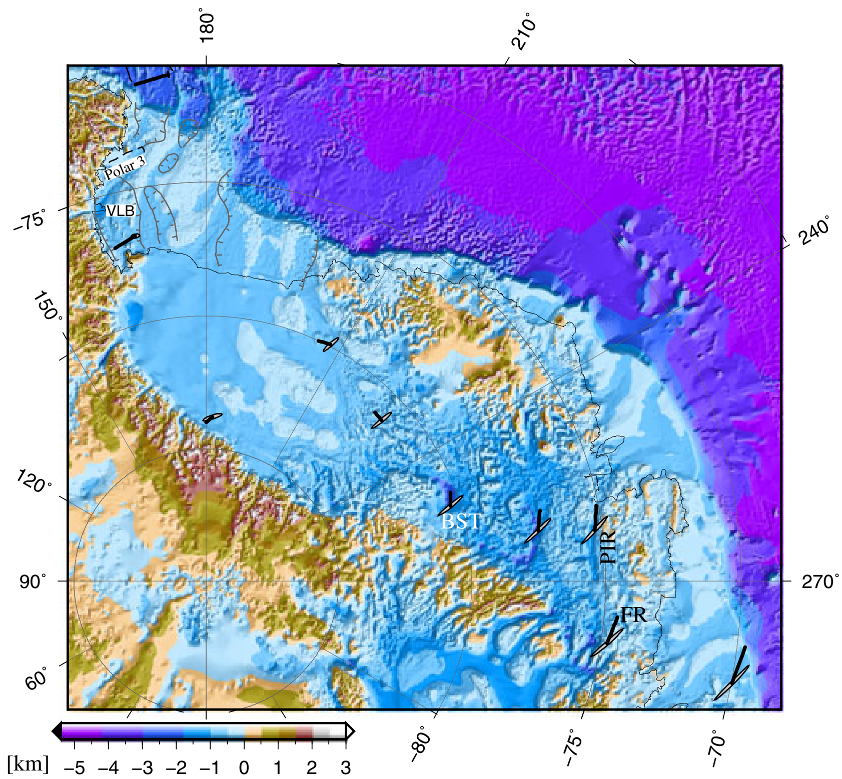

Figure 3. Predicted displacements and their 95% confidence ellipses in the West Antarctic rift system between Anomalies 18o and 8o (40.13–26.5 Ma). Motion is shown relative to a fixed West Antarctica. Bedrock elevation and bathymetry are based on the Bedmap2 compilation of *Fretwell et al*. [2012]. Abbreviations: BST, Bentley Subglacial Trough; PIR, Pine Island Rift; FR, Ferrigno Rift.

(e.g., the Pine Island Rift, Bentley Subglacial Trench and Ferrigno Rift, Figure 3), underwent significant convergent motion during Eocene-Oligocene time. Interestingly, the predicted sense of motion for the sector confined between longitudes 240°E and 270°E (Figure 3) aligns nicely with the trend of the major subglacial topographic features as is seen by the latest bedrock compilation (Bedmap2 in *Fretwell et al*. [2012]). This alignment suggests that during Eocene-Oligocene time these basins and troughs might have accommodated lateral motion. Although poorly resolved, these basins and troughs are also believed to have accommodated post-Oligocene extensional motion as inferred from thin sediment fill and gravity and magnetic modeling [*Bingham et al*., 2012; *Jordan et al*., 2010; *LeMasurier*, 2008]. A recently suggested middle-Miocene change in plate motion that may have been followed by a southward increase of extensional motion into the Ross Ice Shelf sector [*Granot et al*., 2010] seems to match with Neogene reactivation of the subglacial topography. We note however, that our results cannot exclude that some Oligocene-Eocene extensional motion has been accommodated along these subglacial basins and troughs.

[12] Finally, our rotations differ from the *Müller et al*. [2007] kinematic model that was calculated using the East Antarctica-Australia-Pacific-West Antarctica plate circuit Figure 2d). This difference may suggest that the West Antarctic Plate did not behave rigidly. However, the *Müller et al*. [2007] rotation has no error bound and therefore the difference between the rotations may in fact be insignificant.

6. Conclusions

[13] New aeromagnetic data from the Adare and Northern Basins together with magnetic data from the Southeast Indian Ridge and southwest Pacific Ocean have been used to constrain the motion between East and West Antarctica. The four new calculated rotations have poles located close to and south of the central part of the rift zone implying that the extensional motion in the Adare Basin decreased southward until it was dominated by transcurrent motion at the central part of the WARS. Motion would have been progressively more convergent east of 230°E. Finally, our results confirm a total extensional motion of roughly 95 km in the VLB during middle Eocene to late Oligocene time.

[14] **Acknowledgments.** We would like to thank Graeme Eagles and an anonymous reviewer for their constructive reviews. This study was funded by NSF grants OPP04-40959 (SIO) and OPP04-40923 (Caltech).

References

Behrendt, J. C., W. E. LeMasurier, A. K. Cooper, F. Tessensohn, A. Trehu, and D. Damaske (1991), Geophysical studies of the West Antarctic Rift System, *Tectonics*, *10*(6), 1257–1273.

Bingham, R. G., F. Ferraccioli, E. C. King, R. D. Larter, H. D. Pritchard, A. M. Smith, and D. G. Vaughan (2012), Inland thinning of West Antarctic Ice Sheet steered along subglacial rifts, *Nature*, *487*, 468–471, doi:10.1038/nature11292.

Cande, S. C., and D. V. Kent (1995), Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic, *J. Geophys. Res.*, *100*(B4), 6093–6095.

Cande, S. C., J. M. Stock, R. D. Müller, and T. Ishihara (2000), Cenozoic motion between East and West Antarctica, *Nature*, *404*, 145–150.

Cande, S. C., and J. M. Stock (2004), Pacific-Antarctic-Australia motion and the formation of the Macquarie Plate, *Geophys. J. Int.*, *157*(1), 399-414, doi: 10.1111/j.1365-246X.2004.022224.x.
Cande, S. C., and J. M. Stock (2006), Constraints on the Timing of Extension in the Northern Basin, Ross Sea, in *Antarctica: Contributions to Global Earth Science*, edited by D. Futterer et al., pp. 319–326, Springer, New York.
Damaske, D., A. L. Läufer, F. Goldmann, H. D. Möller, and F. Lisker (2007), Magnetic anomalies north-east of Cape Adare, northern Victoria Land (Antarctica), and their relation to onshore structure, in *Antarctica: A Keystone in a Changing World—Online Proceedings of the 10th ISAES X*, edited by A. K. Cooper et al., U.S. Geol. Surv. Open File Rep., 2007-1047, doi:10.3133/of2007-1047.srp016.
Davey, F. J., S. C. Cande, and J. M. Stock (2006), Extension in the western Ross Sea region-links between Adare Basin and Victoria Land Basin, *Geophys. Res. Lett.*, *33*, L20315, doi:10.1029/2006GL027383.
Davey, J. F., and L. De Santis (2006), A Multi-phase rifting model for the Victoria Land Basin, western Ross Sea, in *Antarctica: Contributions to Global Earth Science*, edited by D. Futterer et al., pp. 303–308, Springer, New York.
Fretwell, P., et al. (2012), Bedmap2: improved ice bed, surface and thickness datasets for Antarctica, *Cryosphere Discuss.*, *6*, 4305–4361, doi:10.5194/tcd-6-4305-2012.
Granot, R., S. C. Cande, J. M. Stock, F. J. Davey, and R. W. Clayton (2010), Postspreading rifting in the Adare Basin, Antarctica: regional tectonic consequences, *Geochem. Geophys. Geosys.*, *11*, Q08005, doi:10.1029/2010GC003105.
Hellinger, S. J. (1981), The uncertainties of finite rotations in plate tectonics, *J. Geophys. Res.*, *86*(B10), 9312–9318.
Huerta, A. D., and D. L. Harry (2007), The transition from diffuse to focused extension: Modeled evolution of the West Antarctic Rift system, *Earth Planet. Sci. Lett.*, *255*(1-2), 133–147, doi:10.1016/j.epsl.2006.12.011.
Jordan, T. A., F. Ferraccioli, D. G. Vaughan, J. W. Holt, H. Corr, D. D. Blankenship, and T. M. Diel (2010), Aerogravity evidence for major crustal thinning under the Pine Island Glacier region (West Antarctica), *Geol. Soc. Am. Bull.*, *122*, 714–726, doi: 10.1130/B26417.1.
Kirkwood, B. H., J.-Y. Royer, T. C. Chang, and R. G. Gordon (1999), Statistical tools for estimating and combining finite rotations and their uncertainties, *Geophys. J. Int.*, *137*, 408–428.
LeMasurier, W. E. (2008), Neogene extension and basin deepening in the West Antarctic rift inferred from comparisons with the East African rift and other analogs, *Geology*, *36*(3), 247–250, doi:10.1130/G24363A.1.
Molnar, P., T. Atwater, J. Mammerickx, and S. M. Smith (1975), Magnetic-Anomalies, Bathymetry and Tectonic Evolution of South Pacific since Late Cretaceous, *Geophys. J. Roy. Astron. Soc.*, *40*(3), 383–420.
Müller, R. D., S. C. Cande, J. M. Stock, and W. R. Keller (2005), Crustal structure and rift flank uplift of the Adare Trough, Antarctica, *Geochem. Geophys. Geosys.*, *6*, Q11010, doi:10.1029/2005GC001027.
Müller, R. D., K. Gohl, S. C. Cande, A. Goncharov, and A. V. Golynsky (2007), Eocene to Miocene geometry of the West Antarctic Rift System, *Austr. J. Earth Sci.*, *54*, 1033–1045, doi:10.1080/08120090701615691.
Reidel, S.P., and P. R. Hooper (Eds.) (1989), Volcanism and tectonism in the Columbia River flood-basalt province, *Gological Society of America Special Paper* 239.
Royer, J.-Y., and T. Chang (1991), Evidence for relative motions between the Indian and Australian Plates during the last 20 m.y. from plate tectonic reconstructions: implications for the deformation of the Indo-Australian Plate, *J. Geophys. Res.*, *96*(B7), 11779–11802.
Sandwell, D. T., and W. H. F. Smith (1997), Marine gravity anomaly from Geosat and ERS 1 satellite altimetry, *J. Geophys. Res.*, *102*(B5), 10039–10054.
Selvans, M. M., R. W. Clayton, J. M. Stock, and R. Granot (2012), Using overlapping sonobuoy data from the Ross Sea to construct a 2D deep crustal velocity model, *Mar. Geophys. Res.*, doi:10.1007/s11001-011-9143-z.
ten Brink, U. S., and C. Schneider (1995), Glacial morphology and depositional sequences of the Antarctic continental shelf, *Geology*, *23*(7), 580–584.
Wilson, D. S., and B. P. Luyendyk (2009), West Antarctic paleotopography estimated at the Eocene-Oligocene climate transition, *Geophys. Res. Lett.*, *36*, doi:10.1029/2009GL039297.
Wilson, D. S., S. S. R. Jamieson, P. J. Barrett, G. Leitchenkov, K. Gohl, and R. D. Larter (2012), Antarctic topography at the Eocene-Oligocene boundary, *Palaeogeogr. Palaeoclimatol. Palaeoecol.*, *335-336*, 23–34, doi:10.1016/j.palaeo.2011.05.028.
Wilson, T. J. (1995), Cenozoic transtension along the Transantarctic Mountains-West Antarctic rift boundary, southern Victoria-Land, Antarctica, *Tectonics*, *14*(2), 531–545.

Correction to "Revised Eocene-Oligocene kinematics for the West Antarctic rift system"

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[1] In the paper "Revised Eocene-Oligocene kinematics for the West Antarctic rift system" by R. Granot et al. (*Geophysical Research Letters*, 40, 279–284, doi:10.1029/2012GL054181, 2013), an incorrect header was printed for Table 1. The correct header for the table follows.

[2] "Table 1. Finite Rotations and Covariance Matrices for the Relative Motion Between East and West (Fixed) Antarctica[a]"

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