Auxilary material for Paper 2011TC003087

# Variations in amount and direction of sea-floor spreading along the North East Atlantic Ocean and resulting deformation of the continental margin of North West Europe

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Tectonics

## Introduction

This appendix contains:
- figures of restoration of the opening of the NE Atlantic for 13 stages, from Chron 5 (10.3Ma) to 55.9 Ma for each restoration, for Model 1 and Model 2; we have indicated the criterion of fit (G) for the restorations of both models on each figure;
- table and a graph of the G values for the restorations of both models;
- tables of the best-fit rotation poles and their uncertainties (total misfit, degrees of freedom, quality factor, number of data points and great circle segments, covariance matrices), for each spreading system, for both models.

Map projection is Universal Transverse Mercator (UTM, WGS 1984, zone 27N).

Figure 1: Restoration at Chron 5 - 10.3 Ma - MODEL 1 *(G = 0.0017)*

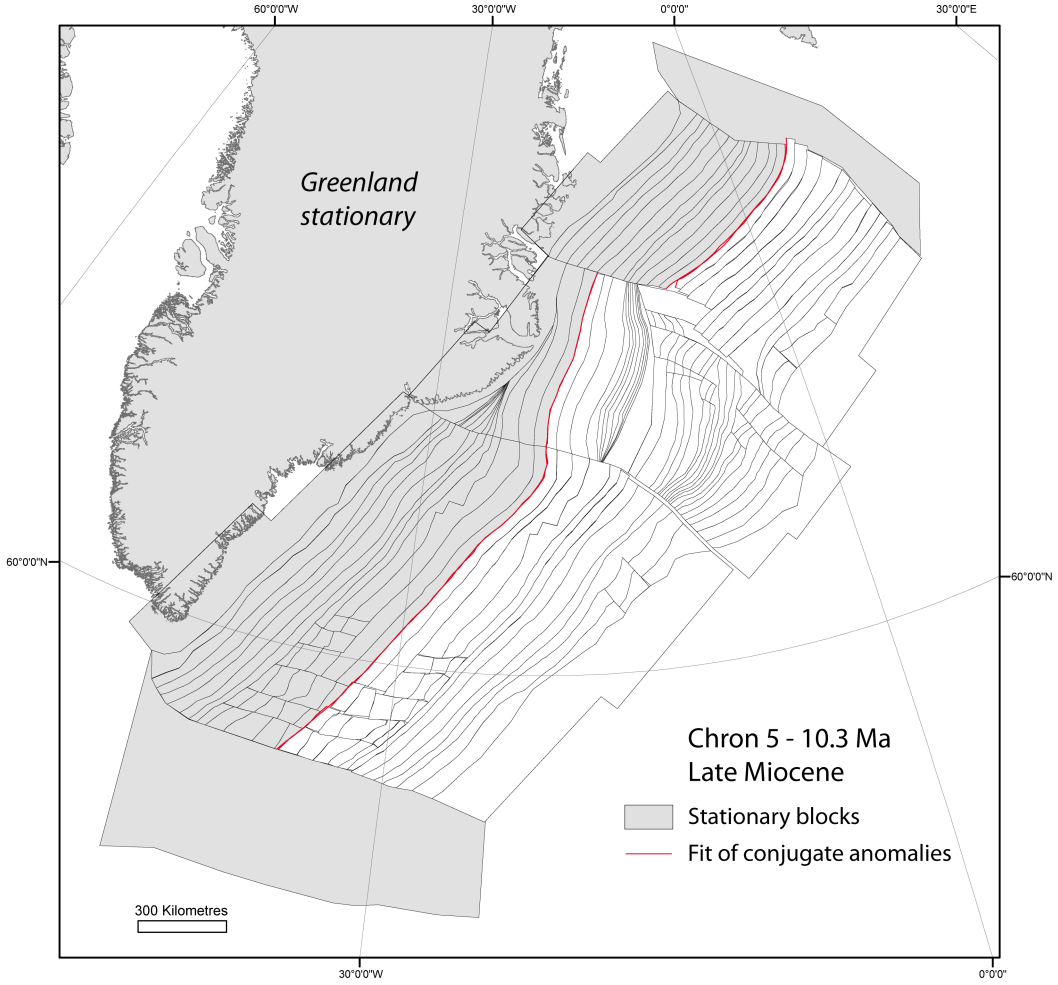



Figure 2: Restoration at Chron 5 - 10.3 Ma - MODEL 2 *(G = 0.0009)*

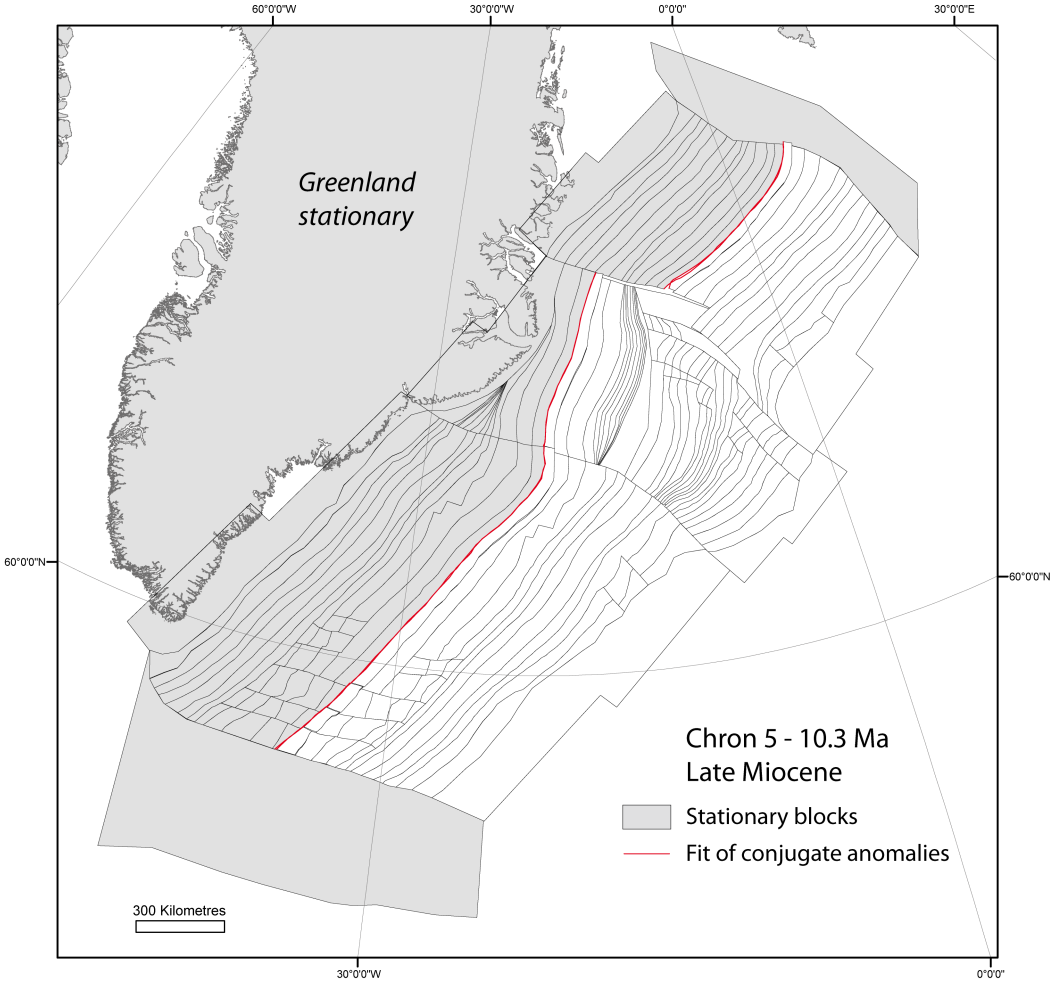


Figure 3: Restoration at Chron 5A - 14.2 Ma - MODEL 1 *(G = 0.0016)*

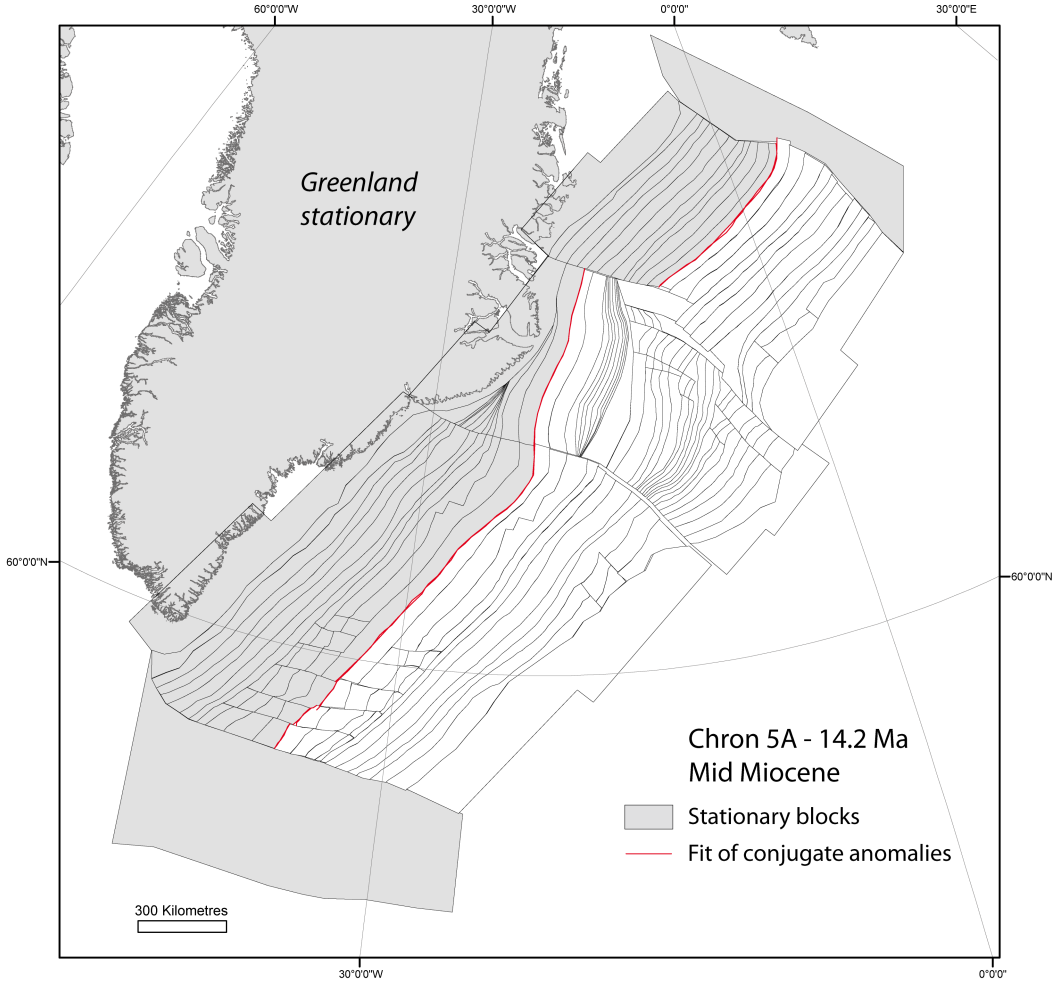



Figure 4: Restoration at Chron 5A - 14.2 Ma - MODEL 2 *(G = 0.0007)*

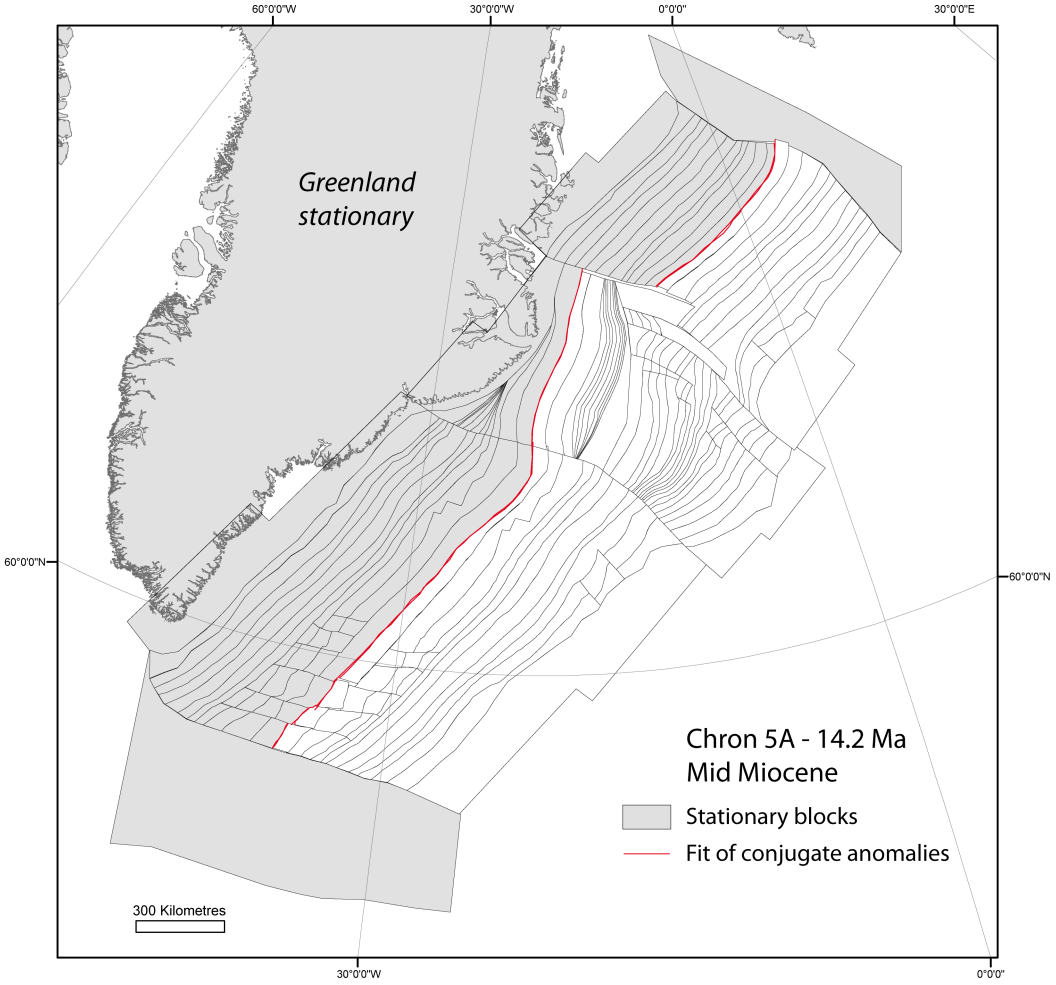


Figure 5: Restoration at Chron 6 - 19.6 Ma - MODEL 1 *(G = 0.0021)*

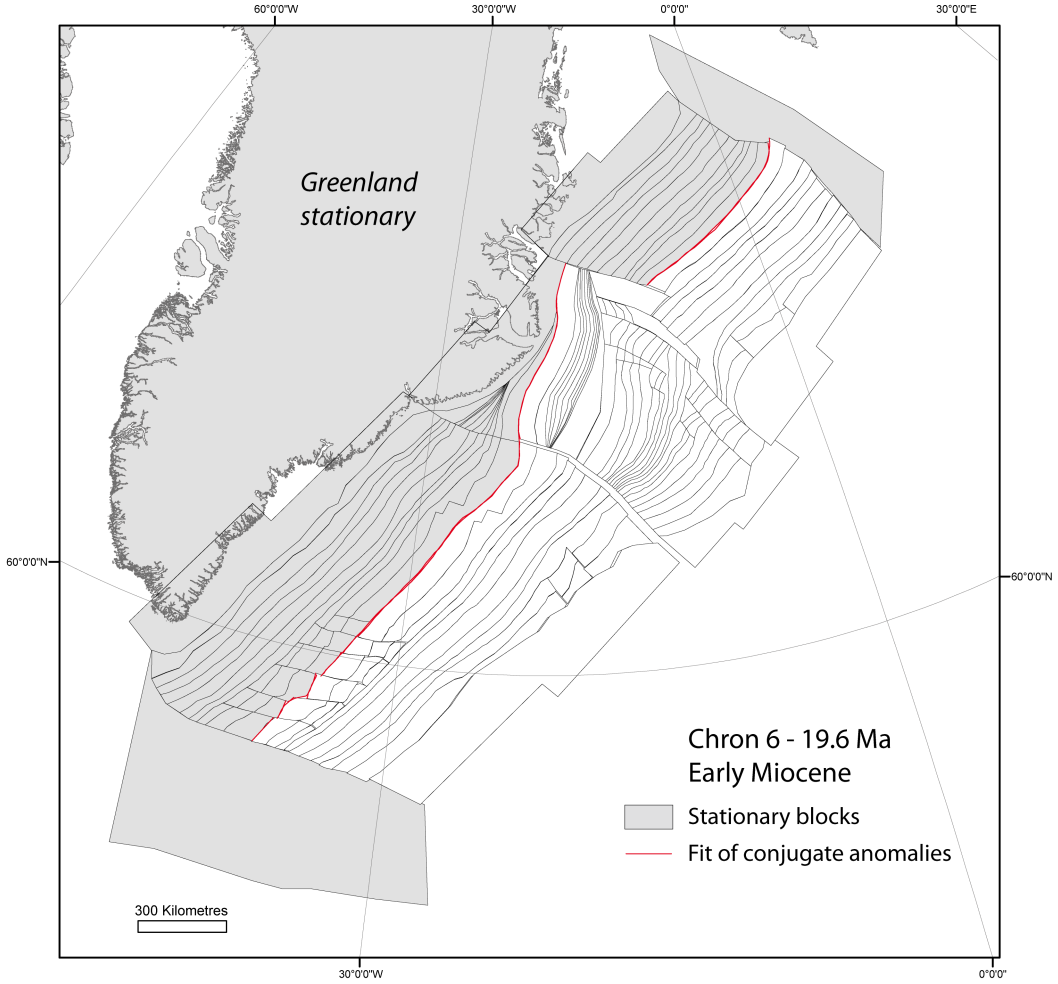



Figure 6: Restoration at Chron 6 - 19.6 Ma - MODEL 2 *(G = 0.0009)*

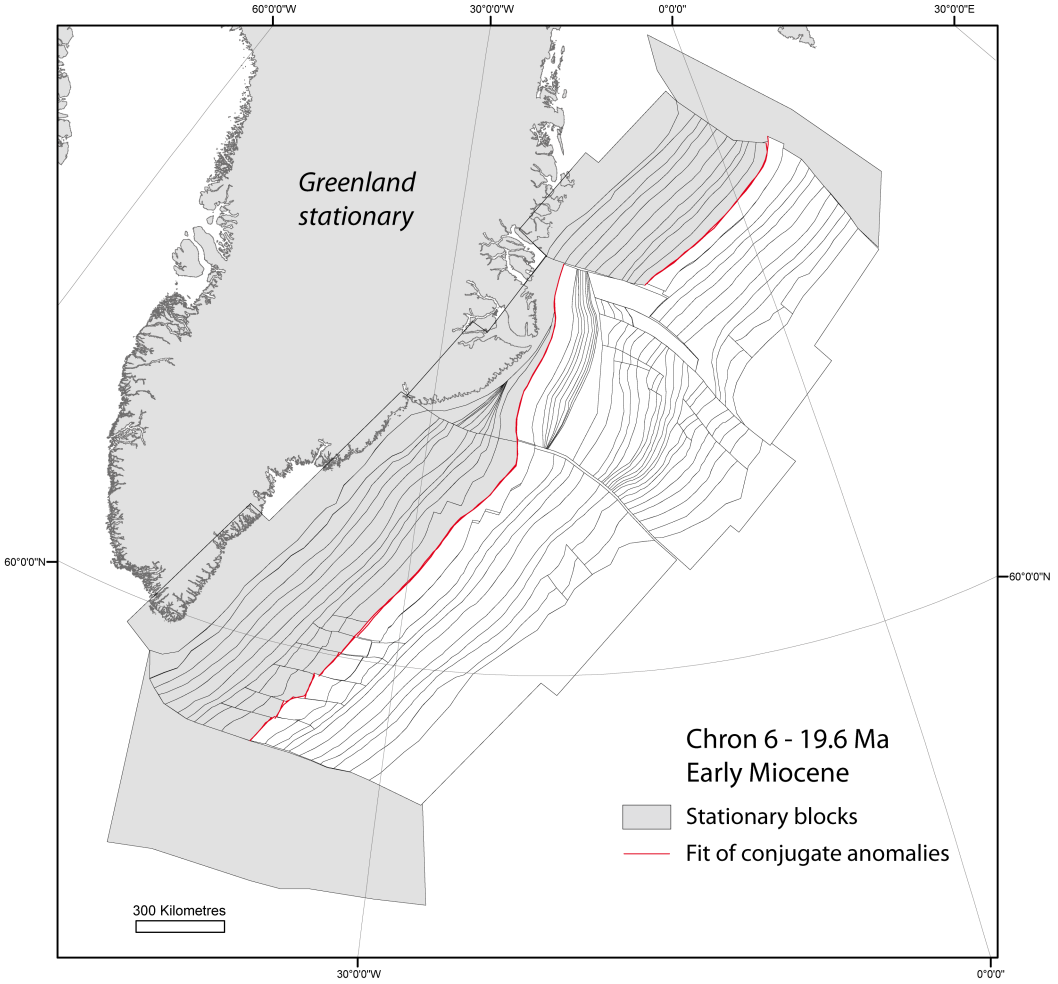


Figure 7: Restoration at Chron 8 - 26.4 Ma - MODEL 1 *(G = 0.0018)*

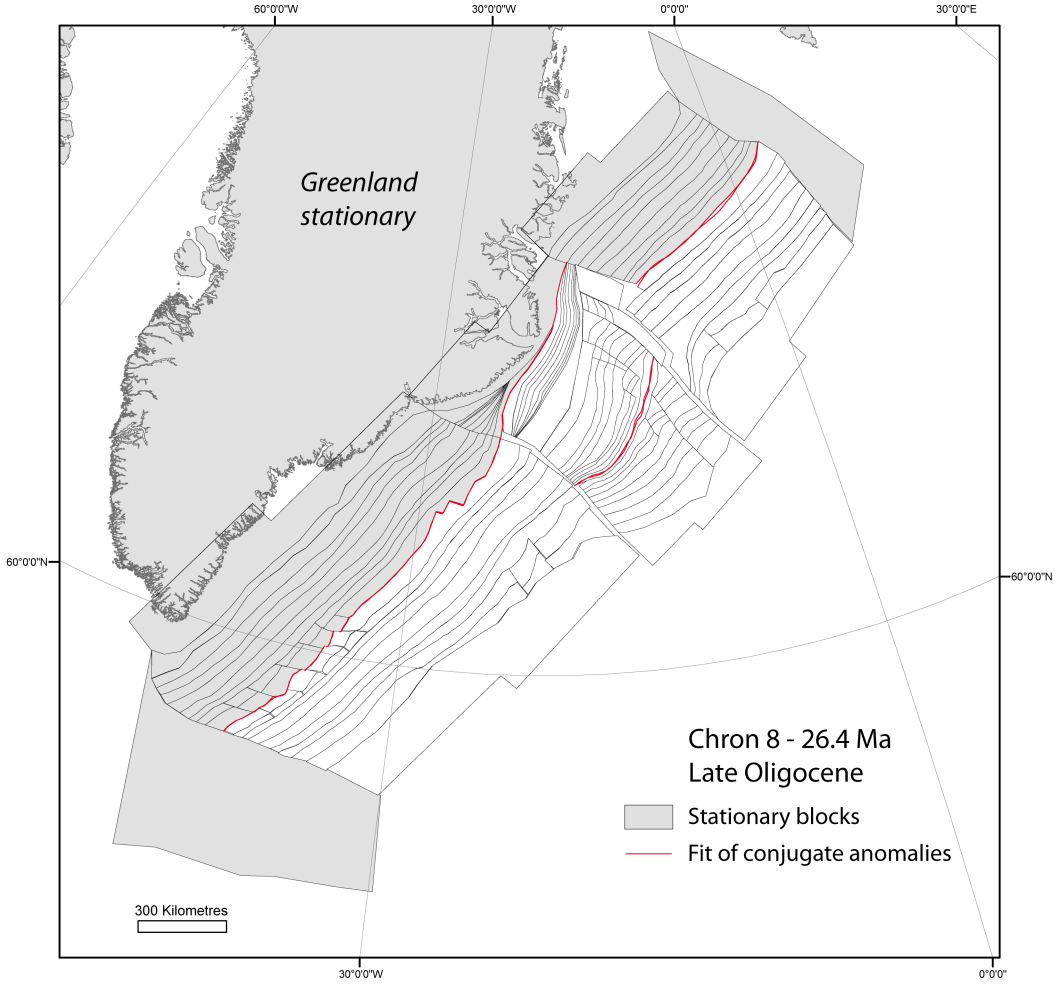



Figure 8: Restoration at Chron 8 - 26.4 Ma MODEL 2 *(G = 0.0024)*

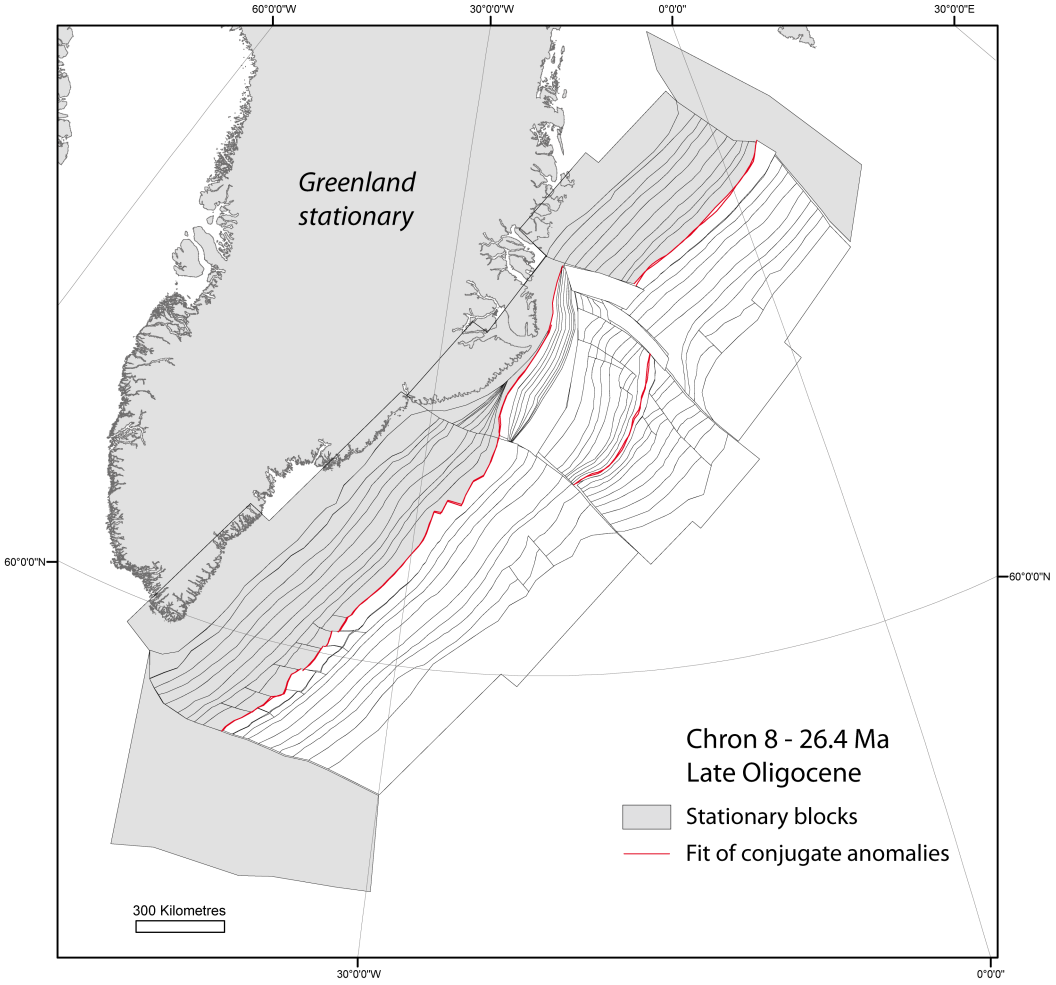


Figure 9: Restoration at Chron 13 - 33.3 Ma - MODEL 1 *(G = 0.0023)*

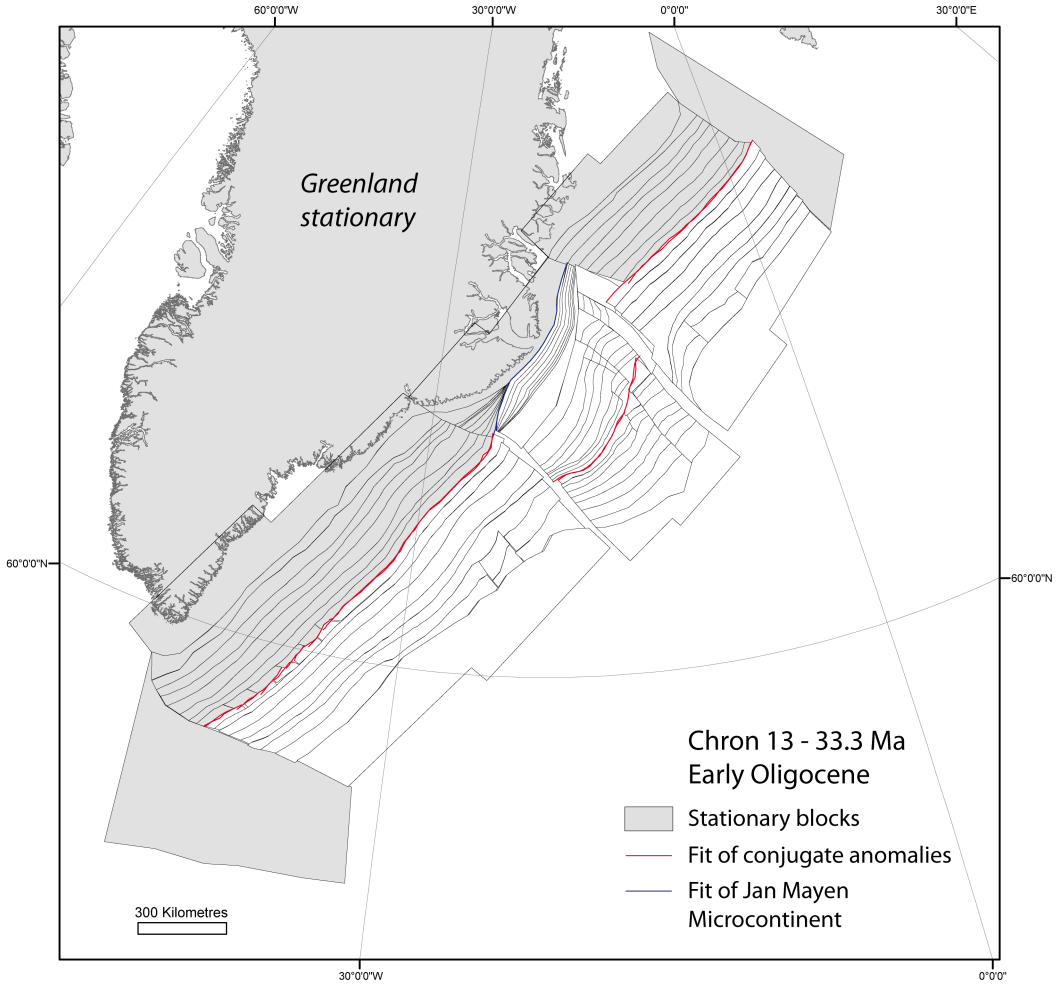



Figure 10: Restoration at Chron 13 - 33.3 Ma - MODEL 2 *(G = 0.0037)*

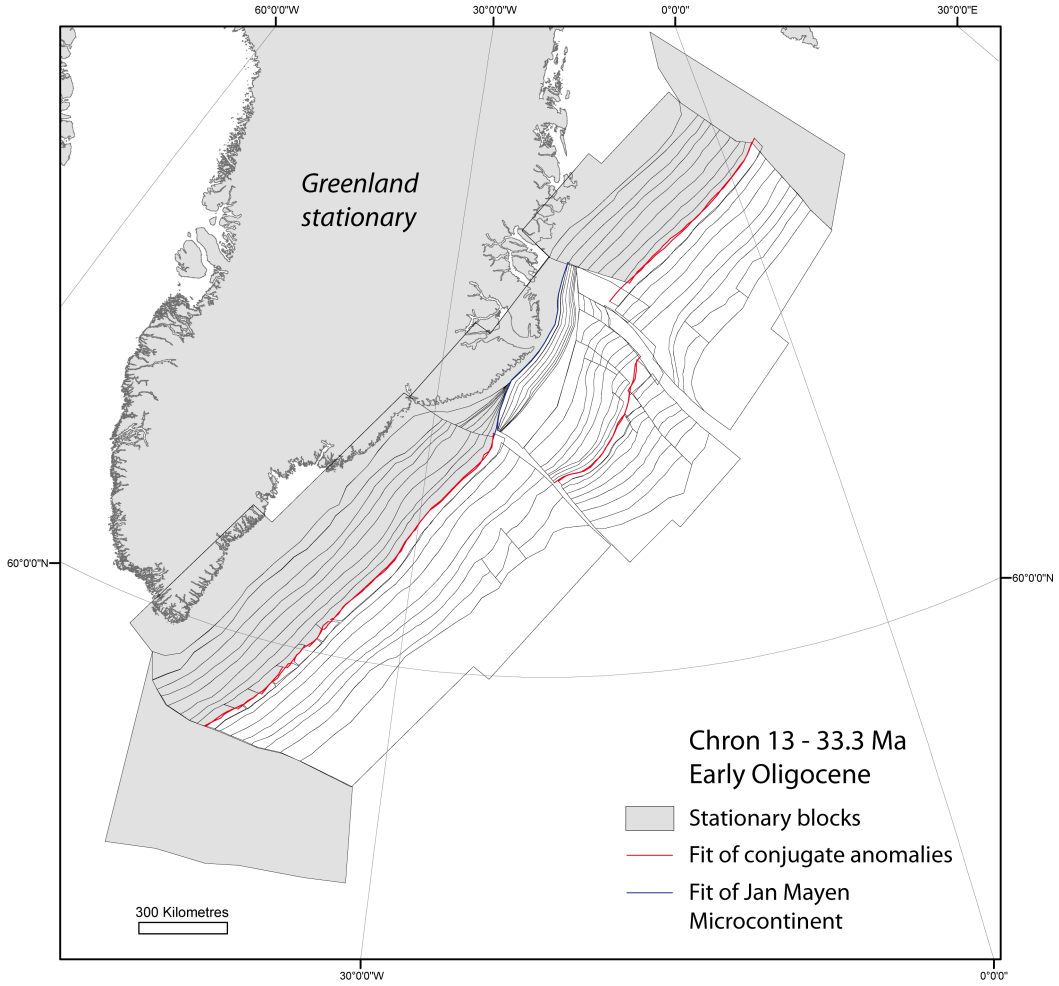


Figure 11: Restoration at Chron 17 - 36.6 Ma MODEL 1 *(G = 0.0026)*

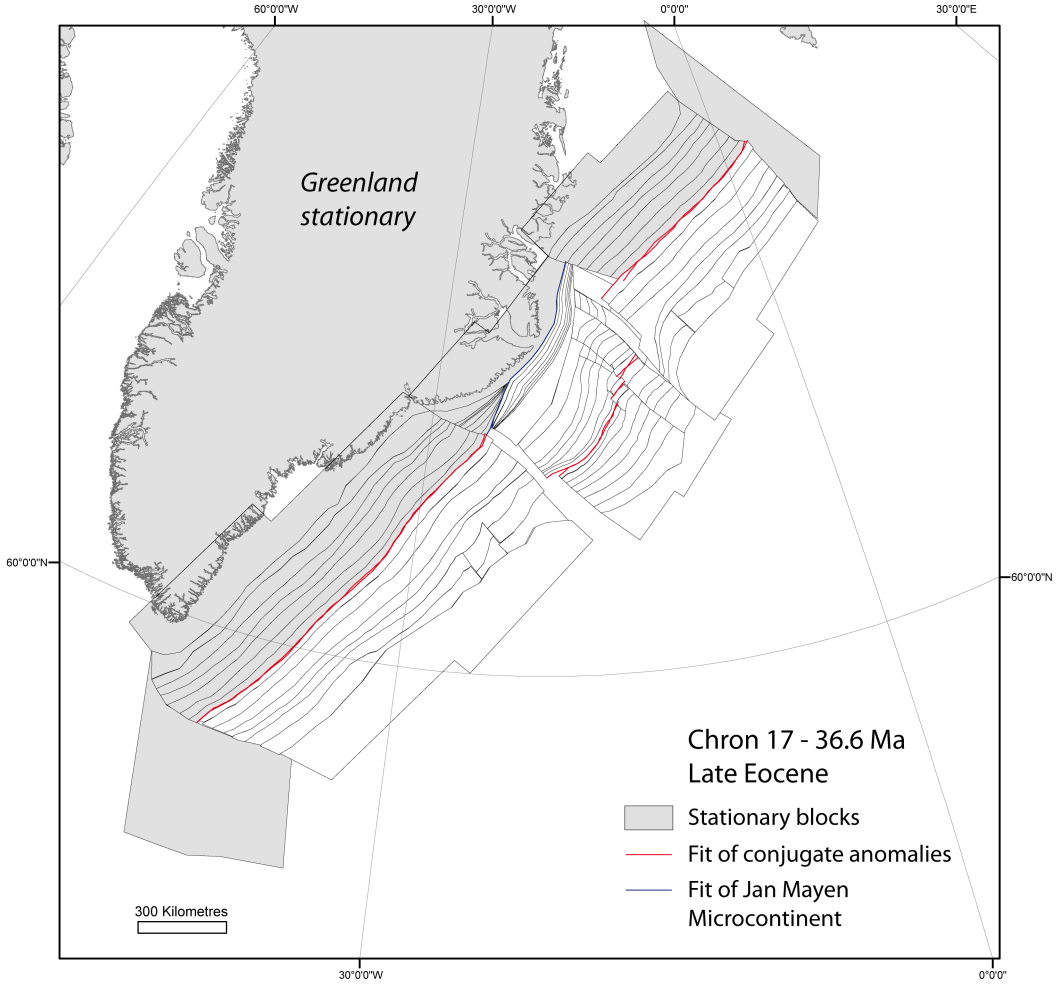



Figure 12: Restoration at Chron 17 - 36.6 Ma - MODEL 2 *(G = 0.0041)*

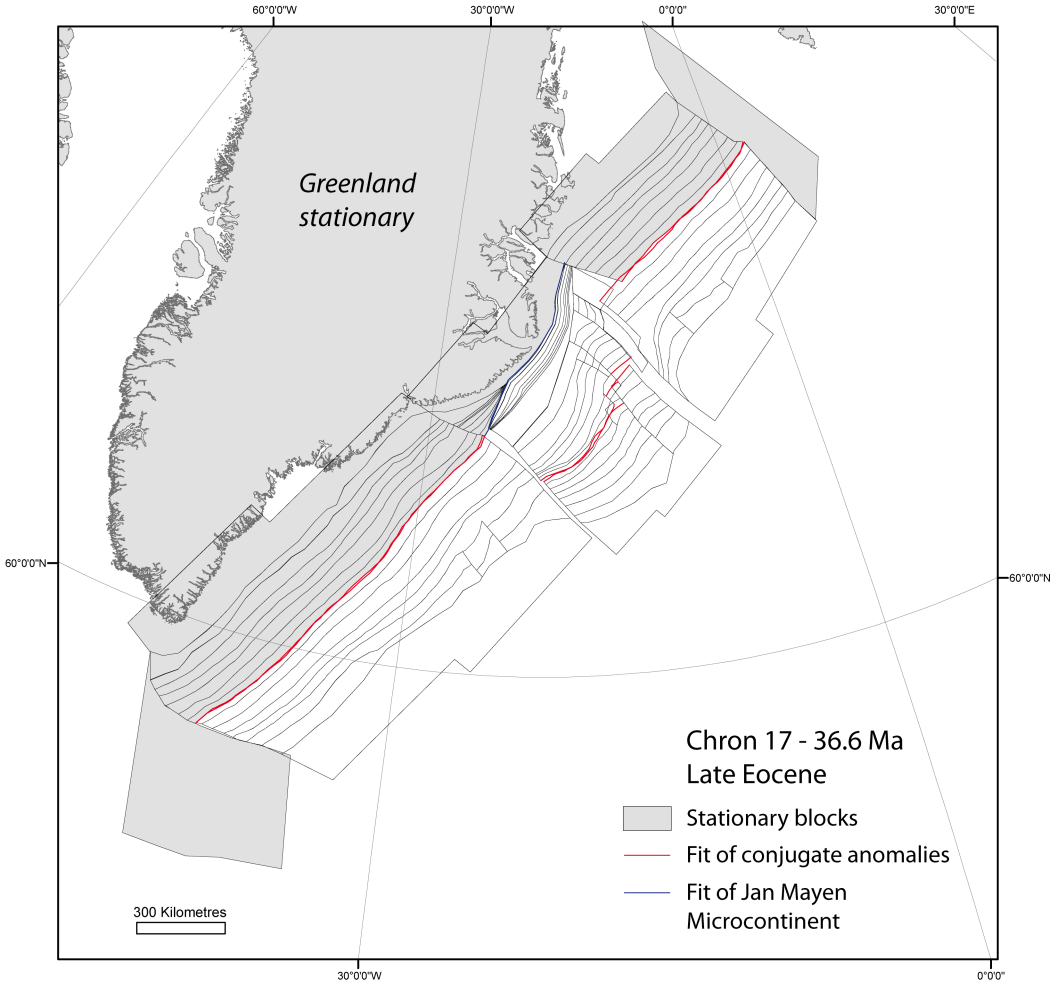


Figure 13: Restoration at Chron 18 - 39.4 Ma - MODEL 1 *(G = 0.0017)*

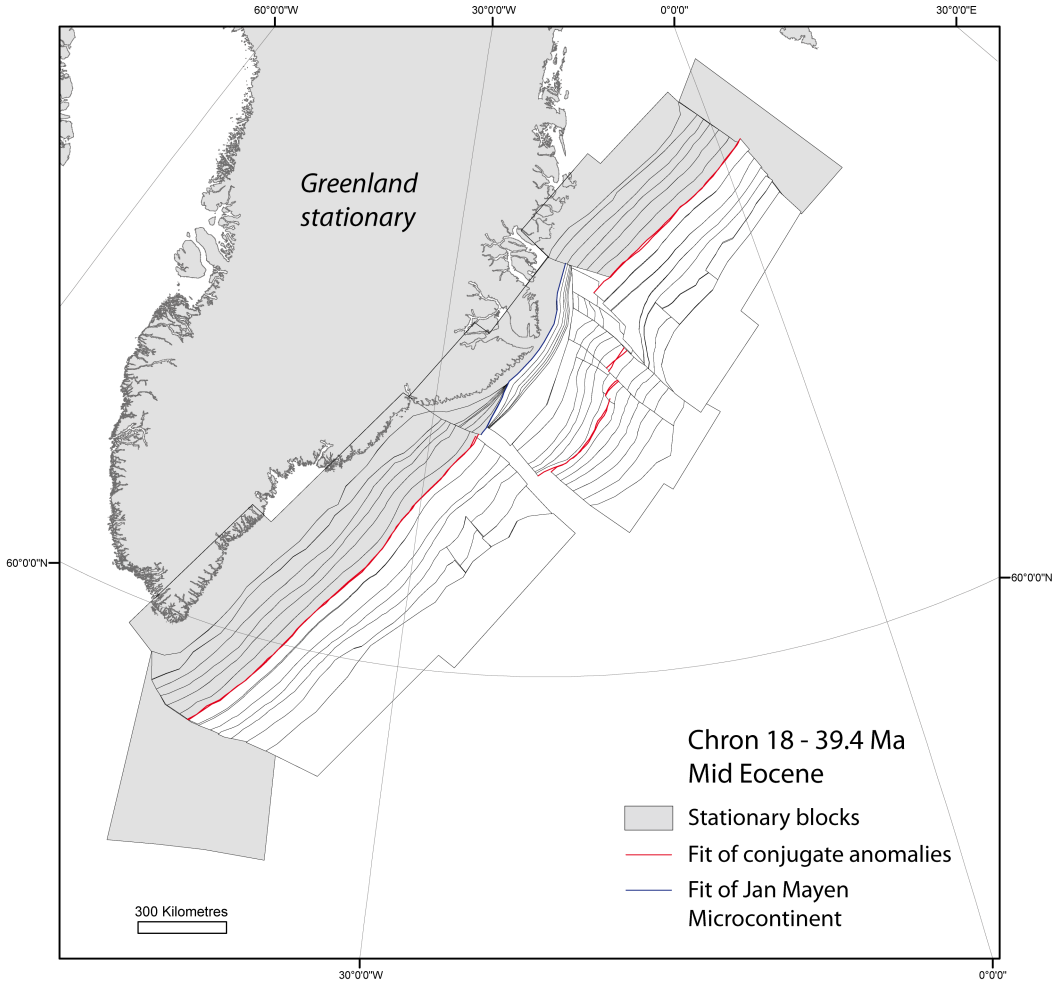



Figure 14: Restoration at Chron 18 - 39.4 Ma - MODEL 2 *(G = 0.0040)*

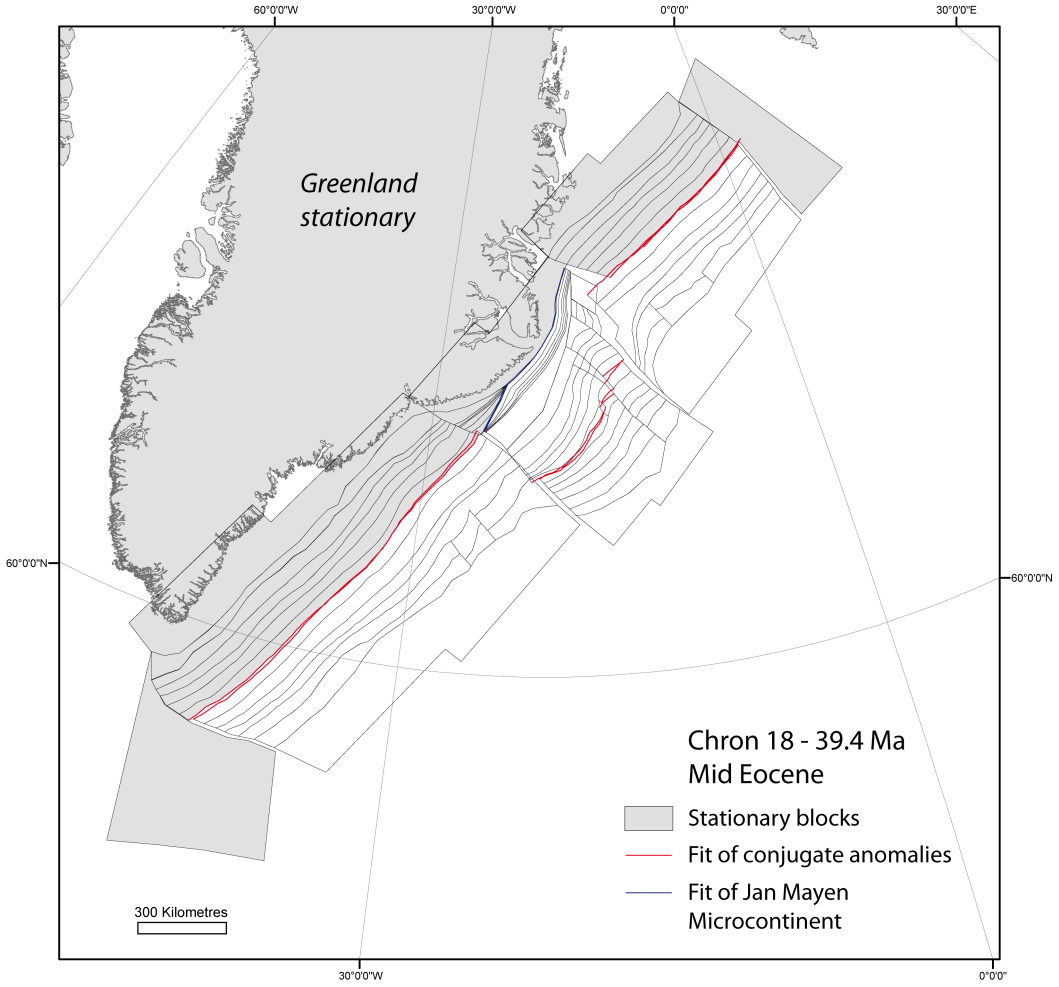


Figure 15: Restoration at Chron 20 - 43.2 Ma - MODEL 1 *(G = 0.0017)*

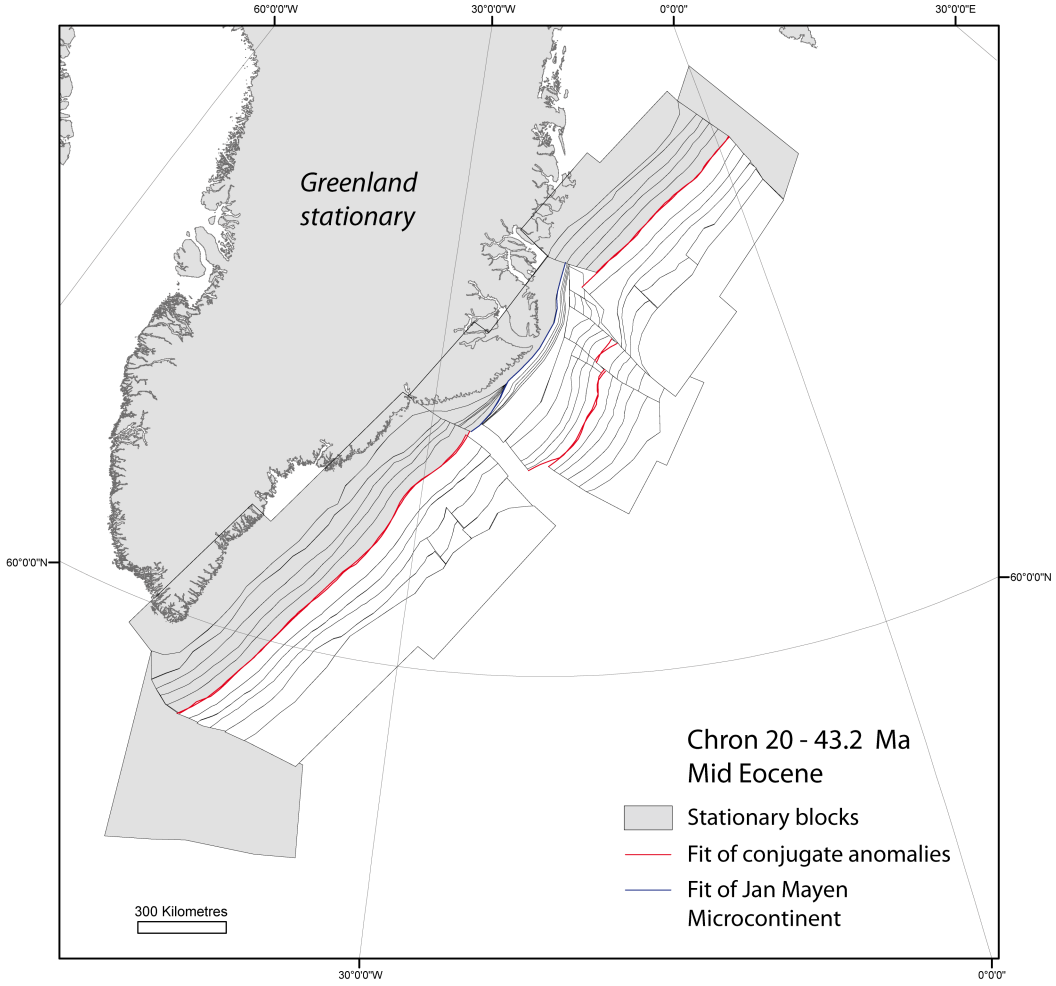



Figure 16: Restoration at Chron 20 - 43.2 Ma - MODEL 2 *(G = 0.0050)*

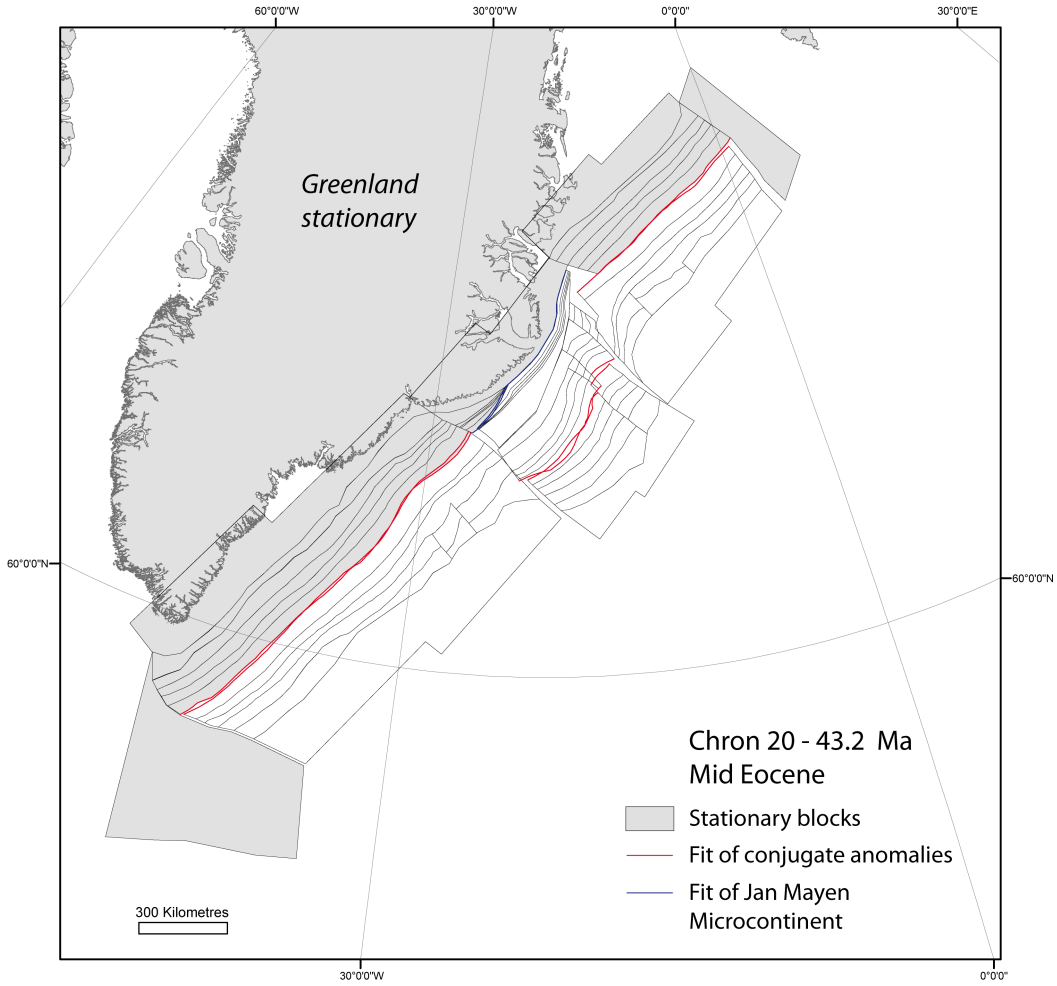


Figure 17: Restoration at Chron 21 - 47.1 Ma - MODEL 1 *(G = 0.0017)*

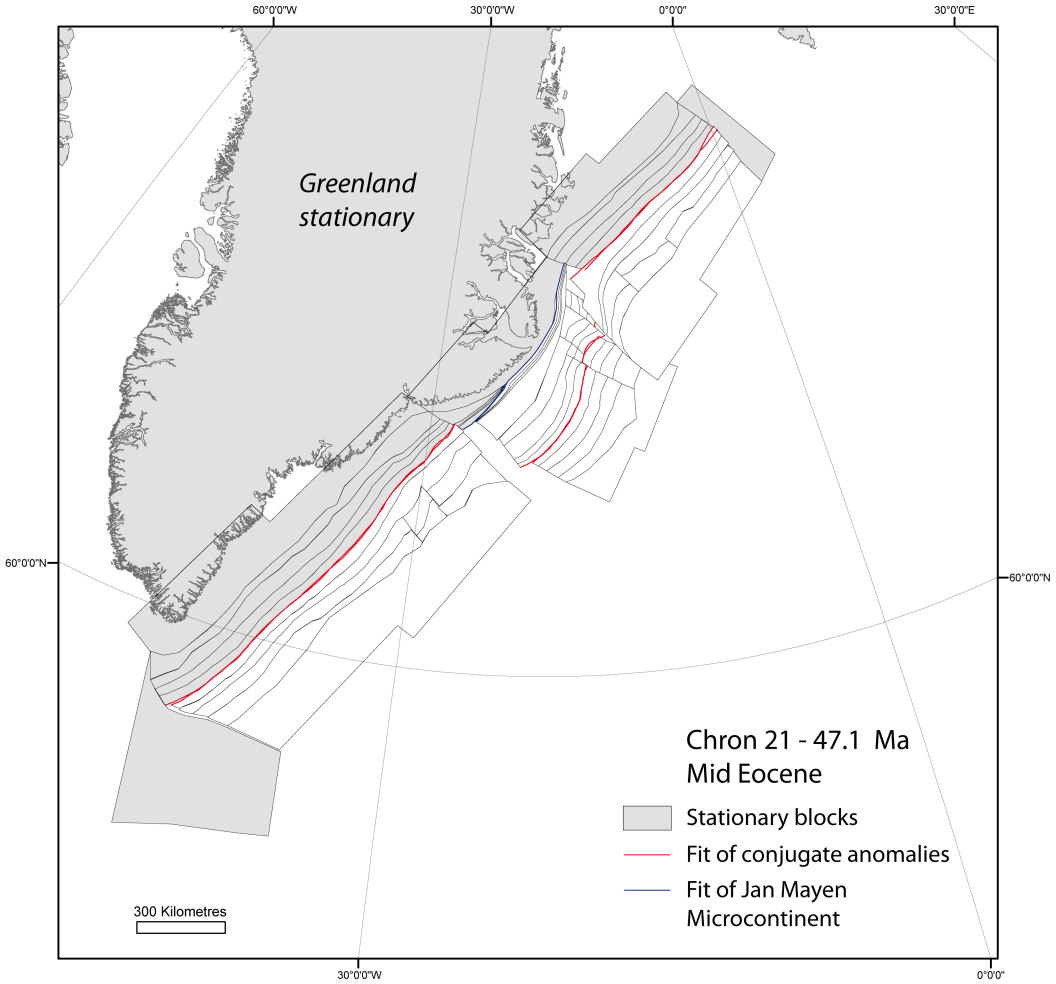



Figure 18: Restoration at Chron 21 - 47.1 Ma - MODEL 2 *(G = 0.0048)*

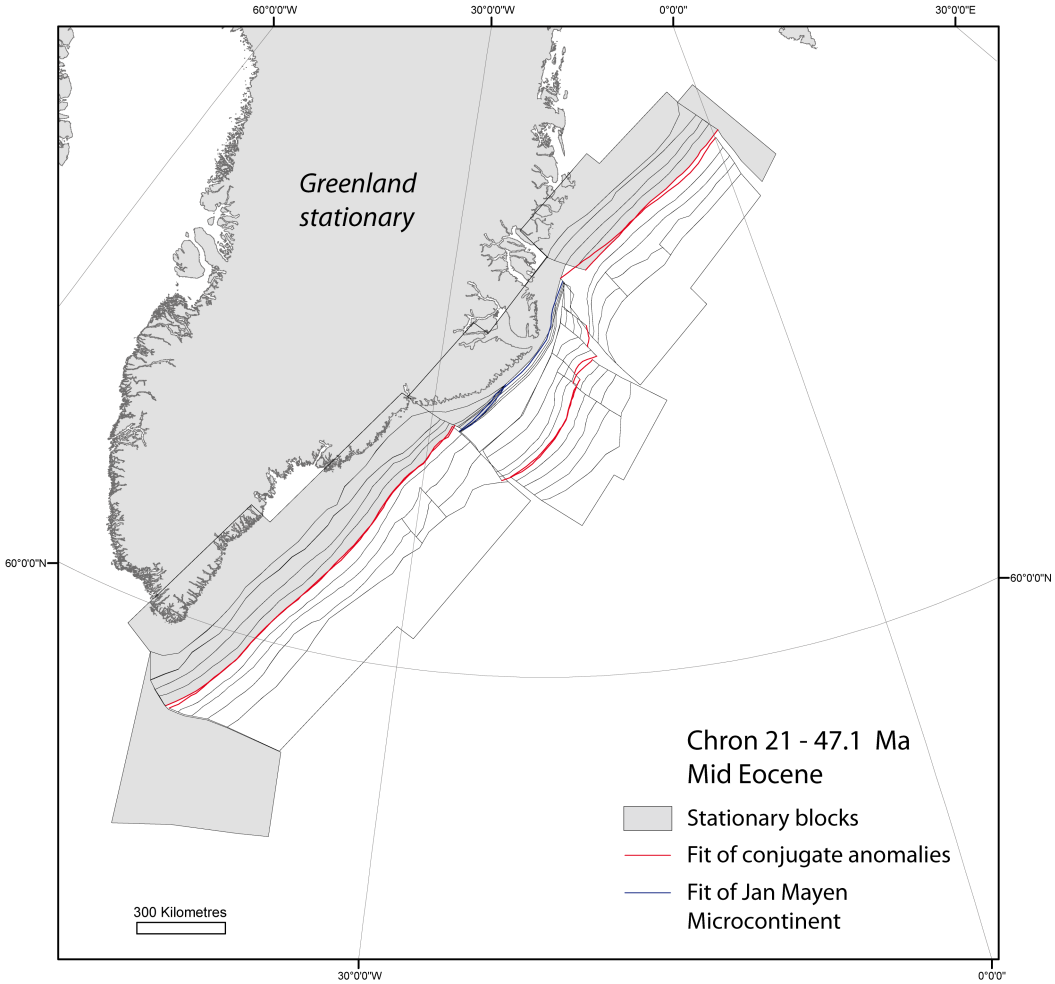


Figure 19: Restoration at Chron 22 - 49.4 Ma - MODEL 1 *(G = 0.0028)*

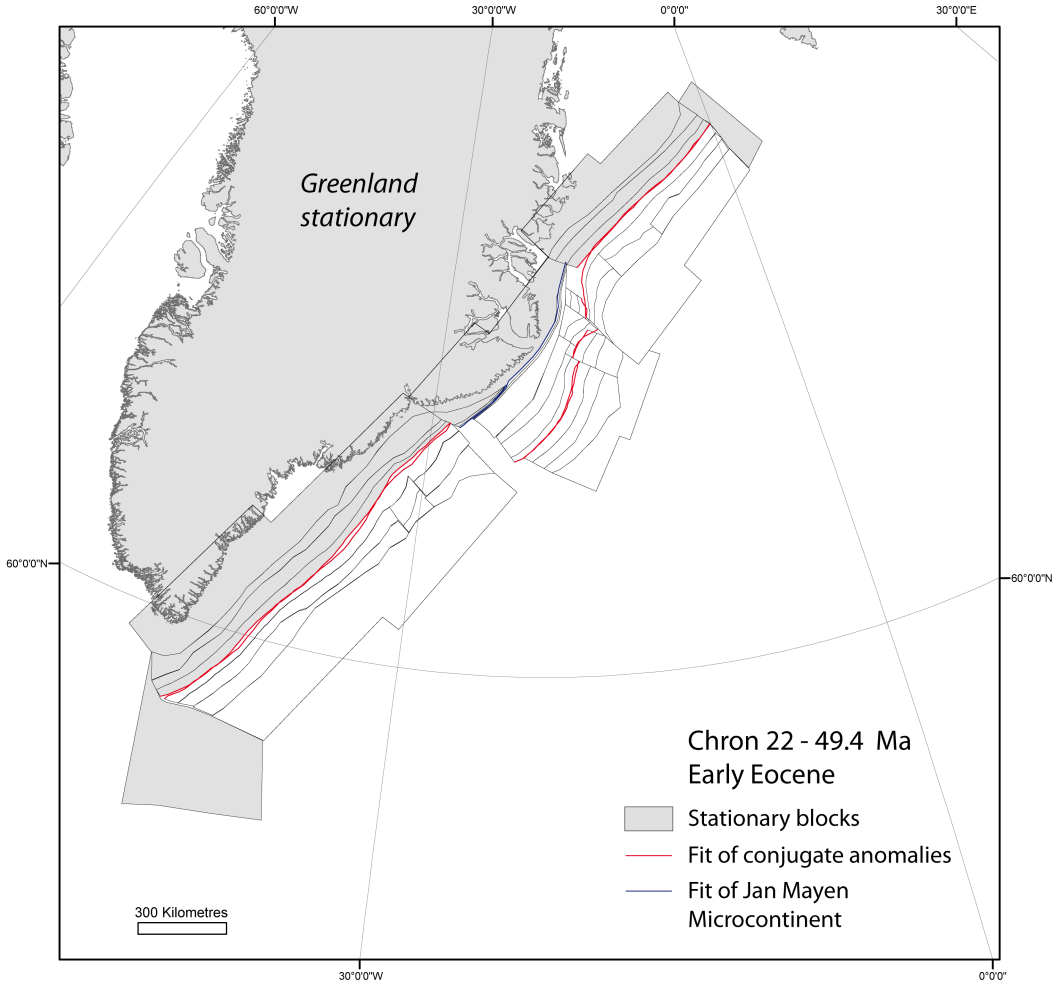



Figure 20: Restoration at Chron 22 - 49.4 Ma - MODEL 2 *(G = 0.0058)*

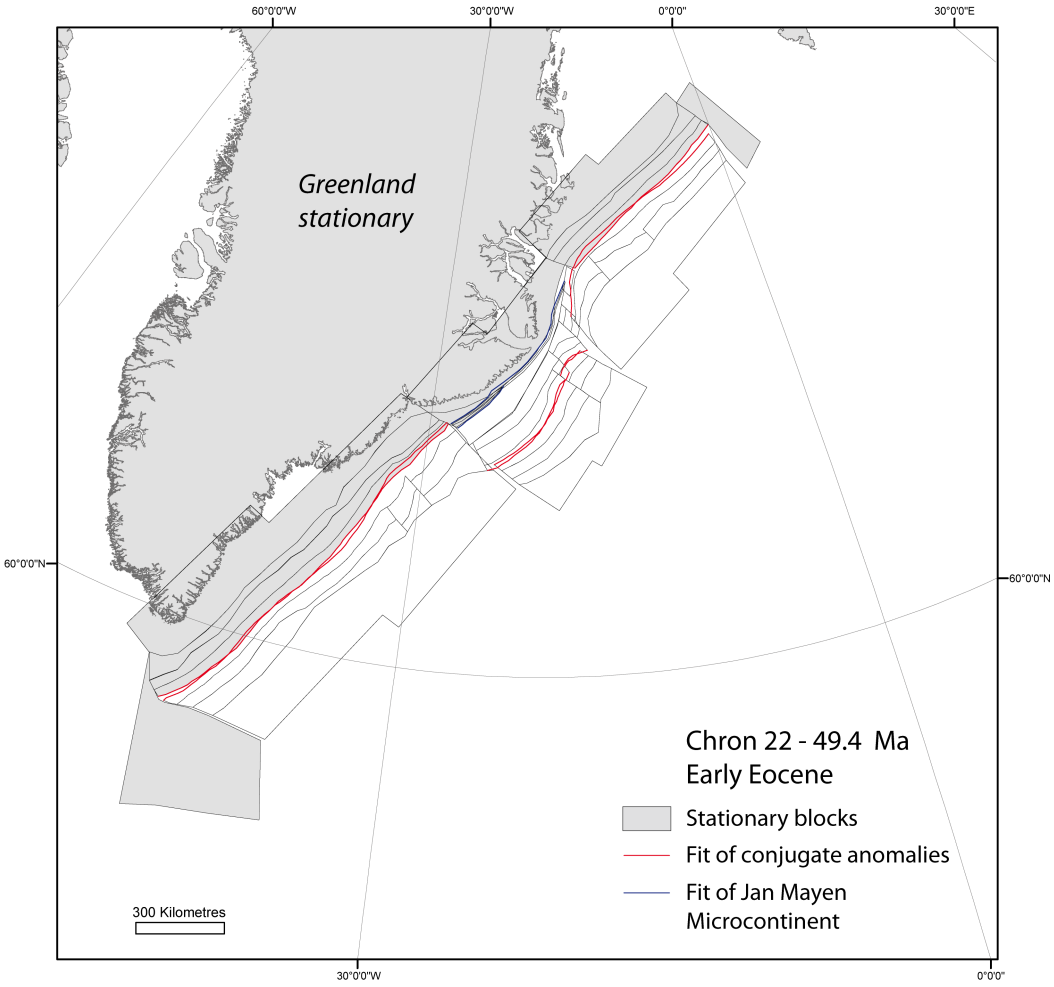


Figure 21: Restoration at Chron 23 - 51.3 Ma - MODEL 1 *(G = 0.0039)*

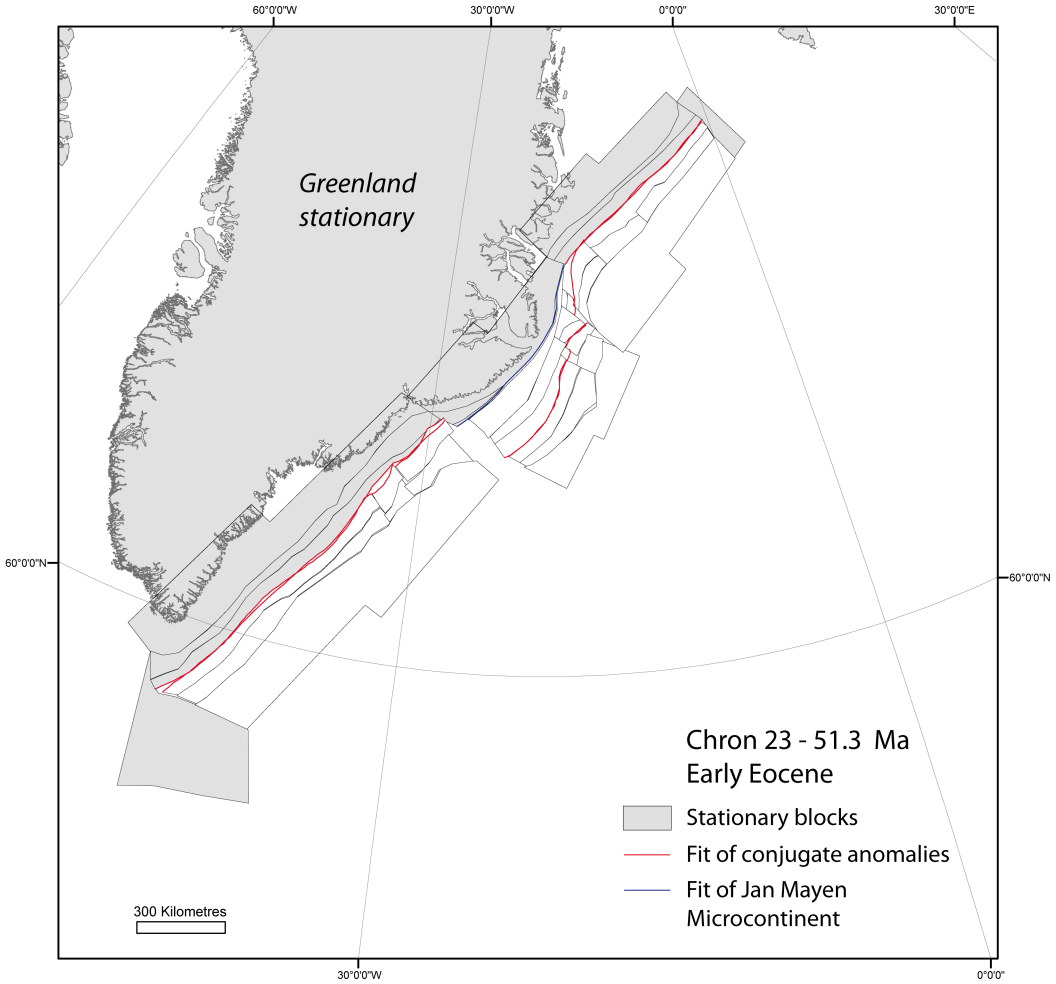



Figure 22: Restoration at Chron 23 - 51.3 Ma - MODEL 2 *(G = 0.0050)*

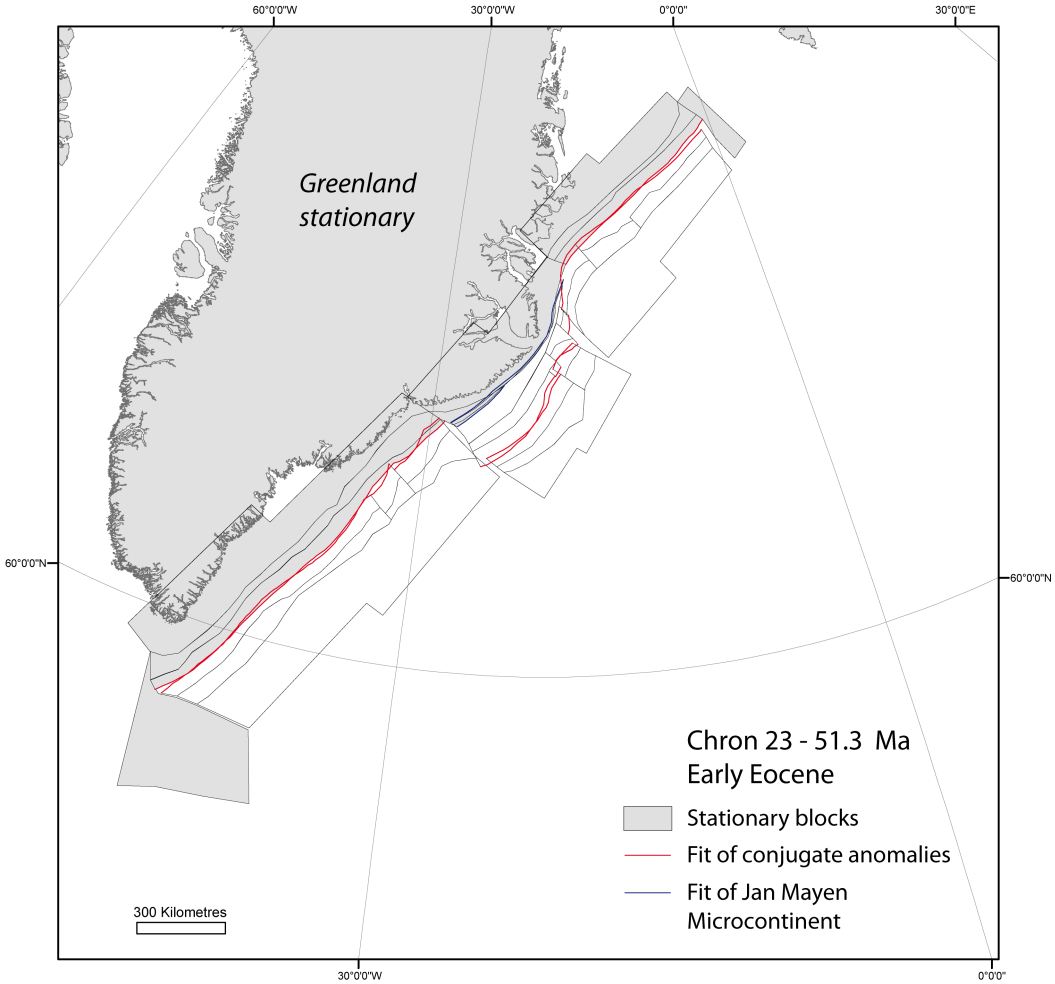


Figure 23: Restoration at Chron 24 - 52.9 Ma - MODEL 1 *(G = 0.0043)*

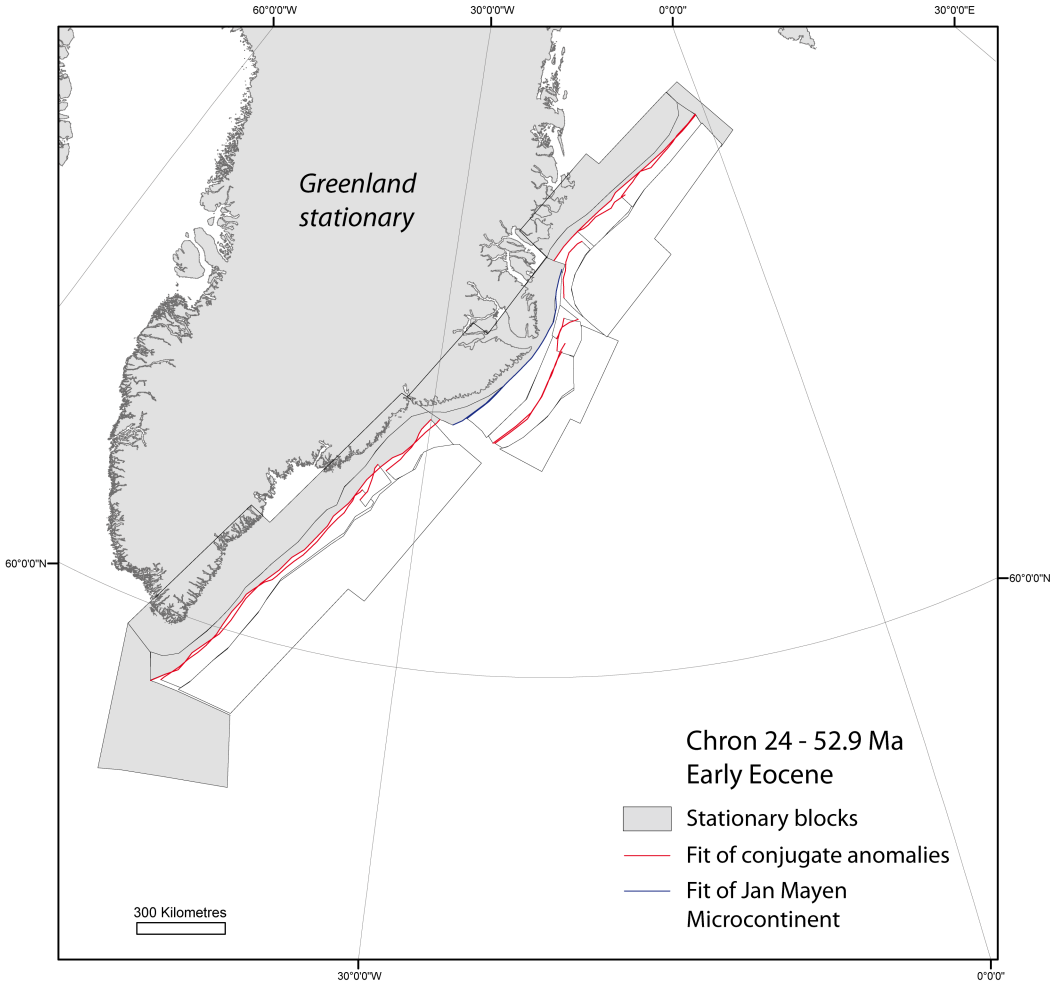



Figure 24: Restoration at Chron 24 - 52.9 Ma - MODEL 2 *(G = 0.0052)*

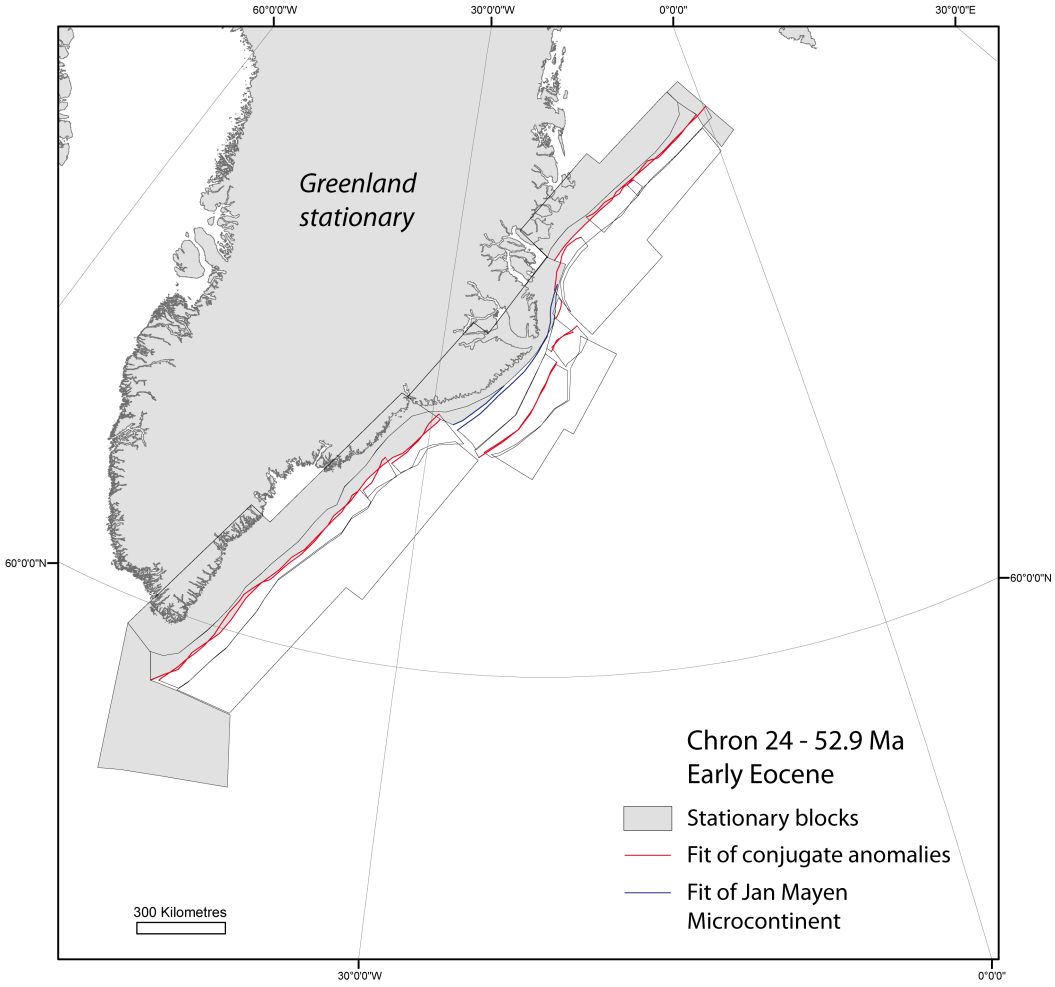


Figure 25: Final Restoration at 55.9 Ma - MODEL 1 *(G = 0.0037)*

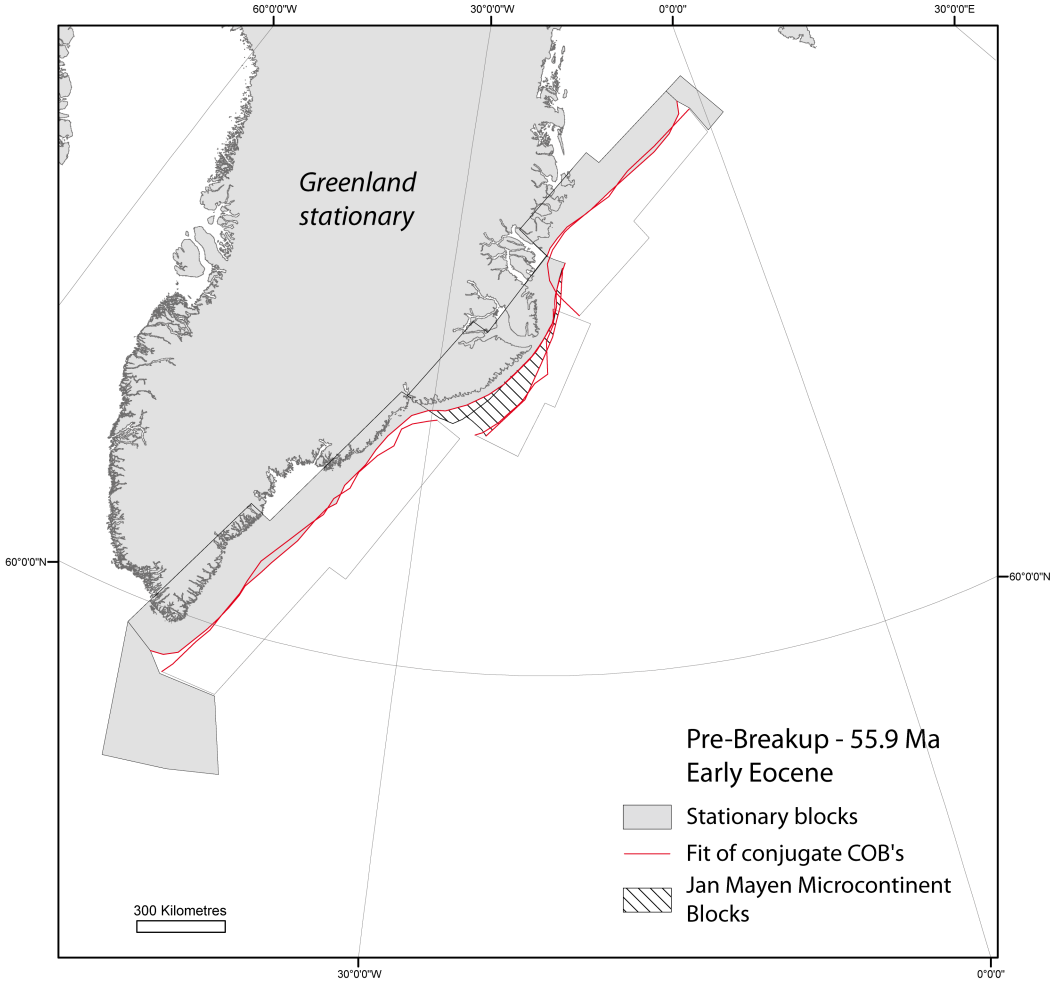
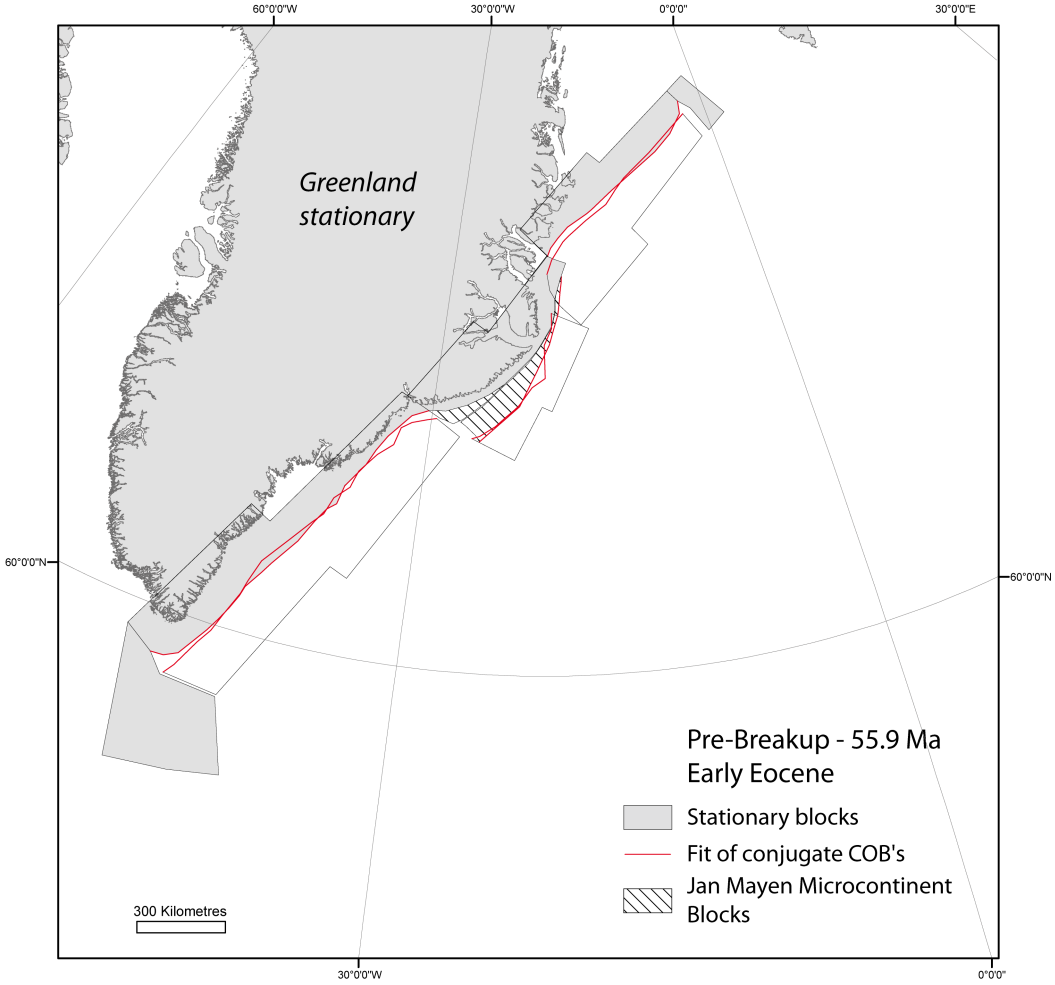



Figure 26: Final Restoration at 55.9 Ma - MODEL 2 *(G = 0.0037)*



## Calculation of criterion G for each restoration stage, for each model

The criterion $G$ represents the fractional area of gaps and overlaps:

$$G = S_g/S_b$$

where $S_g$ is the total surface area of all gaps and overlaps, and $S_b$ is the total surface area of all the blocks (*Rouby et al.*, 1993). A good approximation to $S_g$ is:

$$S_g = L^*(D/n)^{1/2}$$

where $L$ is the length of a line element, n is the total number of line elements, and $(D/n)^{1/2}$ is the root-mean-square gap width (*Rouby et al.*, 1993).

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | G | it | G | it |
| Chron 5 - 10.3 Ma | 0.0017 | 1000 | 0.0009 | 1000 |
| Chron 5A - 14.2 Ma | 0.0016 | 1000 | 0.0007 | 1000 |
| Chron 6 - 19.6 Ma | 0.0021 | 500 | 0.0009 | 1000 |
| Chron 8 - 26.4 Ma | 0.0018 | 200 | 0.0024 | 750 |
| Chron 13 - 33.3 Ma | 0.0023 | 750 | 0.0037 | 750 |
| Chron 17 - 36.6 Ma | 0.0026 | 500 | 0.0041 | 500 |
| Chron 18 - 39.4 Ma | 0.0017 | 500 | 0.0040 | 1000 |
| Chron 20 - 43.2 Ma | 0.0017 | 500 | 0.0050 | 600 |
| Chron 21 - 47.1 Ma | 0.0017 | 500 | 0.0048 | 700 |
| Chron 22 - 49.4 Ma | 0.0028 | 200 | 0.0058 | 500 |
| Chron 23 - 51.3 Ma | 0.0039 | 100 | 0.0050 | 250 |
| Chron 24 - 51.3 Ma | 0.0043 | 10 | 0.0052 | 50 |
| COB - 55.9 Ma | 0.0037 | 10 | 0.0037 | 10 |
| Mean G | 0.0025 | | 0.0035 | |
| G minimal | 0.0016 | | 0.0007 | |
| G maximal | 0.0043 | | 0.0058 | |

it = number of iteration

# MODEL 1

Finite Rotation of the eastern Reykjanes Segment relative to a stationary Greenland plate *(Reykjanes Ridge)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrix | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 71.65 | 136.17 | -2.71 | 0.202 | 37 | 183.60 | (50,5) | 6.90360E-06 | -2.34442E-06 | 1.23087E-05 | 8.93597E-07 | -4.19974E-06 | 2.24086E-05 |
| Chron 5A | 14.2 | 73.65 | 128.08 | -3.90 | 0.289 | 37 | 128.00 | (50,5) | 6.69182E-06 | -2.45570E-06 | 1.21442E-05 | 1.00014E-06 | -4.48139E-06 | 2.25113E-05 |
| Chron 6 | 19.6 | 76.27 | 124.52 | -5.71 | 0.202 | 37 | 183.60 | (50,5) | 6.42987E-06 | -2.62878E-06 | 1.19256E-05 | 1.17637E-06 | -4.90825E-06 | 2.26015E-05 |
| Chron 8 | 26.4 | 71.72 | 132.23 | -6.96 | 0.397 | 37 | 93.21 | (50,5) | 6.11536E-06 | -2.81647E-06 | 1.16531E-05 | 1.40164E-06 | -5.41070E-06 | 2.27074E-05 |
| Chron 13 | 33.3 | 68.42 | 133.40 | -7.85 | 0.500 | 37 | 74.06 | (50,5) | 5.84945E-06 | -2.92330E-06 | 1.14228E-05 | 1.56788E-06 | -5.76157E-06 | 2.28269E-05 |
| Chron 17 | 36.6 | 65.01 | 134.75 | -8.16 | 0.631 | 37 | 58.61 | (50,5) | 5.69249E-06 | -2.97719E-06 | 1.12837E-05 | 1.66542E-06 | -5.96037E-06 | 2.29002E-05 |
| Chron 18 | 39.4 | 58.34 | 137.60 | -8.15 | 0.708 | 37 | 52.27 | (50,5) | 5.55298E-06 | -3.02943E-06 | 1.11549E-05 | 1.76216E-06 | -6.15119E-06 | 2.29566E-05 |
| Chron 20 | 43.2 | 59.39 | 135.98 | -9.01 | 0.860 | 37 | 43.07 | (50,5) | 5.35639E-06 | -3.08041E-06 | 1.09756E-05 | 1.88349E-06 | -6.38489E-06 | 2.30539E-05 |
| Chron 21 | 47.1 | 45.18 | 136.16 | -8.88 | 1.071 | 37 | 34.55 | (50,5) | 5.03877E-06 | -3.06258E-06 | 1.06934E-05 | 1.97511E-06 | -6.58550E-06 | 2.33005E-05 |
| Chron 22 | 49.4 | 46.11 | 134.91 | -9.51 | 1.338 | 37 | 27.65 | (50,5) | 4.86205E-06 | -3.08316E-06 | 1.05234E-05 | 2.07127E-06 | -6.76670E-06 | 2.34017E-05 |
| Chron 23 | 51.3 | 43.42 | 134.32 | -9.98 | 1.691 | 37 | 21.88 | (50,5) | 4.66820E-06 | -3.09008E-06 | 1.03334E-05 | 2.16412E-06 | -6.94313E-06 | 2.35242E-05 |
| Chron 24 | 52.9 | 40.97 | 132.75 | -10.56 | 2.188 | 37 | 16.91 | (50,5) | 4.41898E-06 | -3.06708E-06 | 1.00867E-05 | -3.06708E-06 | -7.11576E-06 | 2.37100E-05 |
| COB fit | 55.9 | 33.12 | 132.41 | -11.08 | 2.906 | 37 | 12.73 | (50,5) | 4.13972E-06 | -3.03226E-06 | 9.79752E-06 | 2.34679E-06 | -7.30847E-06 | 2.39254E-05 |

Finite Rotation of the eastern Mohns Segment relative to a stationary Greenland plate *(Mohns Ridge)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrix | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 82.19 | 83.35 | -4.71 | 0.757 | 37 | 48.86 | (50,5) | 1.13846E-05 | 9.28870E-07 | 2.78877E-05 | 2.01685E-07 | 2.32923E-06 | 6.89130E-05 |
| Chron 5A | 14.2 | 78.61 | 106.84 | -5.11 | 1.214 | 37 | 30.48 | (50,5) | 1.10403E-05 | 6.78475E-07 | 2.75064E-05 | 1.66916E-07 | 1.74043E-06 | 6.91472E-05 |
| Chron 6 | 19.6 | 78.06 | 104.94 | -6.75 | 1.934 | 37 | 19.13 | (50,5) | 1.06802E-05 | 3.40517E-07 | 2.70920E-05 | 1.35724E-07 | 9.05389E-07 | 6.93536E-05 |
| Chron 8 | 26.4 | 72.79 | 123.40 | -6.96 | 2.856 | 37 | 12.96 | (50,5) | 1.02647E-05 | -2.25357E-08 | 2.65984E-05 | 1.23976E-07 | -2.31012E-08 | 6.95782E-05 |
| Chron 13 | 33.3 | 59.49 | 134.49 | -6.11 | 3.573 | 37 | 10.36 | (50,5) | 9.73399E-06 | -2.31960E-07 | 2.59661E-05 | 1.28218E-07 | -5.84361E-07 | 6.99629E-05 |
| Chron 17 | 36.6 | 56.59 | 132.89 | -6.47 | 4.033 | 37 | 9.18 | (50,5) | 9.35852E-06 | -3.54206E-07 | 2.55073E-05 | 1.35866E-07 | -9.33766E-07 | 7.02450E-05 |
| Chron 18 | 39.4 | 47.41 | 135.90 | -6.37 | 4.609 | 37 | 8.03 | (50,5) | 8.97396E-06 | -5.11627E-07 | 2.50199E-05 | 1.50831E-07 | -1.39713E-06 | 7.05139E-05 |
| Chron 20 | 43.2 | 57.53 | 126.47 | -8.39 | 5.293 | 37 | 6.99 | (50,5) | 8.44346E-06 | -6.92658E-07 | 2.43309E-05 | 1.79541E-07 | -1.97683E-06 | 7.09050E-05 |
| Chron 21 | 47.1 | 48.36 | 128.60 | -8.26 | 5.919 | 37 | 6.25 | (50,5) | 7.84366E-06 | -8.19679E-07 | 2.35172E-05 | 2.07606E-07 | -2.44145E-06 | 7.13668E-05 |
| Chron 22 | 49.4 | 55.37 | 121.72 | -10.11 | 6.414 | 37 | 5.77 | (50,5) | 7.35696E-06 | -9.31726E-07 | 2.28314E-05 | 2.41171E-07 | -2.88545E-06 | 7.17562E-05 |
| Chron 23 | 51.3 | 54.30 | 121.00 | -10.66 | 6.789 | 37 | 5.45 | (50,5) | 6.98572E-06 | -1.01454E-06 | 2.22858E-05 | 2.70720E-07 | -3.23618E-06 | 7.20436E-05 |
| Chron 24 | 52.9 | 55.07 | 118.30 | -11.71 | 7.153 | 37 | 5.17 | (50,5) | 6.52936E-06 | -1.08135E-06 | 2.15925E-05 | 3.03147E-07 | -3.58362E-06 | 7.24139E-05 |
| COB fit | 55.9 | 62.94 | 109.08 | -15.24 | 7.571 | 37 | 4.89 | (50,5) | 6.01707E-06 | -1.18949E-06 | 2.07759E-05 | 3.62037E-07 | -4.13488E-06 | 7.28101E-05 |

Parameters: *r*, total misfit; *K*, estimated quality factor; *dF*, degrees of freedom; *N*, number of data points; *s*, number of great circle segments; the unvertainty of fracture zone and magnetic anomaly identification is $\sigma$ = 5.00 km; ages are after Cande and Kent (1995) timescale.

Covariance matrix:

| | | |
|---|---|---|
| a | b | c |
| b | d | e |
| c | e | f |

The units of the matrix elements are radians squared

# MODEL 1

Finite Rotation of the eastern Aegir Segment relative to a stationary Greenland plate *(Kolbeinsey Ridge from present-day to Chron 6 ; Aegir Ridge and formation of the Jan Mayen microcontinent from Chron 6 to 55.9 Ma)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrix | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 69.45 | 130.89 | -2.57 | 0.248 | 37 | 149.33 | (50,5) | 3.35120E-05 | -2.57099E-06 | 6.80240E-05 | 3.04155E-07 | -5.18912E-06 | 1.38574E-04 |
| Chron 5A | 14.2 | 66.23 | 133.28 | -3.35 | 0.431 | 37 | 85.81 | (50,5) | 3.26758E-05 | -3.30713E-06 | 6.72789E-05 | 4.41502E-07 | -6.78447E-06 | 1.39032E-04 |
| Chron 6 | 19.6 | 63.92 | 133.63 | -4.50 | 0.732 | 37 | 50.57 | (50,5) | 3.14336E-05 | -4.28433E-06 | 6.61493E-05 | 6.90794E-07 | -8.99812E-06 | 1.39727E-04 |
| Chron 8 | 26.4 | 74.23 | 123.88 | -7.42 | 1.134 | 37 | 32.64 | (50,5) | 3.03916E-05 | -5.62214E-06 | 6.51054E-05 | 1.14885E-06 | -1.20369E-05 | 1.39997E-04 |
| Chron 13 | 33.3 | 72.14 | 126.48 | -8.15 | 1.354 | 37 | 27.32 | (50,5) | 2.94412E-05 | -6.24277E-06 | 6.41959E-05 | 1.43294E-06 | -1.36110E-05 | 1.40519E-04 |
| Chron 17 | 36.6 | -7.60 | 149.05 | -6.25 | 1.403 | 37 | 26.37 | (50,5) | 2.78213E-05 | -5.75421E-06 | 6.27766E-05 | 1.29226E-06 | -1.29800E-05 | 1.42263E-04 |
| Chron 18 | 39.4 | -7.65 | 147.66 | -6.67 | 1.501 | 37 | 24.64 | (50,5) | 2.70598E-05 | -5.94188E-06 | 6.20355E-05 | 1.40679E-06 | -1.36210E-05 | 1.42847E-04 |
| Chron 20 | 43.2 | -36.96 | 151.87 | -12.08 | 1.608 | 37 | 23.02 | (50,5) | 2.55566E-05 | -5.78563E-06 | 6.05788E-05 | 1.40698E-06 | -1.37178E-05 | 1.44294E-04 |
| Chron 21 | 47.1 | -40.63 | 152.22 | -15.12 | 1.796 | 37 | 20.60 | (50,5) | 2.42245E-05 | -6.17182E-06 | 5.91660E-05 | 1.66807E-06 | -1.50877E-05 | 1.45259E-04 |
| Chron 22 | 49.4 | -41.72 | 151.73 | -16.92 | 1.910 | 37 | 19.37 | (50,5) | 2.31476E-05 | -6.43141E-06 | 5.79872E-05 | 1.88202E-06 | -1.61333E-05 | 1.46058E-04 |
| Chron 23 | 51.3 | -32.22 | 148.87 | -13.97 | 2.012 | 37 | 18.39 | (50,5) | 2.25475E-05 | -7.05571E-06 | 5.72548E-05 | 2.30611E-06 | -1.79447E-05 | 1.46179E-04 |
| Chron 24 | 52.9 | -25.96 | 145.53 | -13.31 | 2.068 | 37 | 17.89 | (50,5) | 2.10777E-05 | -7.33247E-06 | 5.55567E-05 | 2.65098E-06 | -1.93648E-05 | 1.47273E-04 |
| COB fit | 55.9 | -27.84 | 145.32 | -15.10 | 2.093 | 37 | 17.68 | (50,5) | 1.97342E-05 | -7.68793E-06 | 5.39159E-05 | 3.09584E-06 | -2.10572E-05 | 1.48204E-04 |

Finite Rotation of the eastern Kolbeinsey Segment relative to a stationary Greenland plate *(Kolbeinsey Ridge from present-day to Chron 6 ; Aegir Ridge and formation of the Jan Mayen microcontinent from Chron 6 to 55.9 Ma)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrix | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 70.83 | 129.69 | -2.68 | 19.778 | 117 | 5.92 | (132,6) | 3.89111E-06 | -1.01950E-06 | 1.05461E-05 | 3.59204E-07 | -2.81065E-06 | 2.87972E-05 |
| Chron 5A | 14.2 | 67.43 | 132.17 | -3.48 | 19.825 | 117 | 5.90 | (132,6) | 3.74889E-06 | -1.10396E-06 | 1.03626E-05 | 4.18531E-07 | -3.10401E-06 | 2.88676E-05 |
| Chron 6 | 19.6 | 65.04 | 132.68 | -4.65 | 19.877 | 117 | 5.89 | (132,6) | 3.54422E-06 | -1.20958E-06 | 1.00915E-05 | 5.08446E-07 | -3.50432E-06 | 2.89723E-05 |
| Chron 8 | 26.4 | 83.13 | 69.32 | -11.00 | 19.918 | 117 | 5.87 | (132,6) | 3.37296E-06 | -1.27921E-06 | 9.85280E-06 | 5.84298E-07 | -3.82645E-06 | 2.90655E-05 |
| Chron 13 | 33.3 | 81.71 | 19.99 | -16.65 | 19.921 | 117 | 5.87 | (132,6) | 3.31102E-06 | -1.29598E-06 | 9.76109E-06 | 6.07226E-07 | -3.93254E-06 | 2.91070E-05 |
| Chron 17 | 36.6 | 81.61 | 18.77 | -17.36 | 19.310 | 117 | 6.06 | (132,6) | 3.19851E-06 | -1.27880E-06 | 9.45614E-06 | 6.11210E-07 | -3.89717E-06 | 2.82928E-05 |
| Chron 18 | 39.4 | 81.11 | 13.74 | -18.87 | 19.959 | 117 | 5.86 | (132,6) | 3.26734E-06 | -1.31686E-06 | 9.69578E-06 | 6.31280E-07 | -4.02907E-06 | 2.91253E-05 |
| Chron 20 | 43.2 | 80.70 | 11.23 | -20.26 | 19.935 | 117 | 5.87 | (132,6) | 3.23202E-06 | -1.32432E-06 | 9.64455E-06 | 6.43425E-07 | -4.07911E-06 | 2.91493E-05 |
| Chron 21 | 47.1 | 80.40 | 9.80 | -21.41 | 19.250 | 117 | 6.08 | (132,6) | 3.18890E-06 | -1.32307E-06 | 9.57186E-06 | 6.49318E-07 | -4.10454E-06 | 2.91135E-05 |
| Chron 22 | 49.4 | 80.12 | 8.69 | -22.43 | 19.953 | 117 | 5.86 | (132,6) | 3.16746E-06 | -1.33034E-06 | 9.55147E-06 | 6.59875E-07 | -4.14839E-06 | 2.91997E-05 |
| Chron 23 | 51.3 | 79.99 | 6.63 | -23.33 | 19.956 | 117 | 5.86 | (132,6) | 3.16730E-06 | -1.34514E-06 | 9.54761E-06 | 6.72477E-07 | -4.19484E-06 | 2.91864E-05 |
| Chron 24 | 52.9 | 80.03 | 7.03 | -23.45 | 19.961 | 117 | 5.86 | (132,6) | 3.15087E-06 | -1.34682E-06 | 9.52418E-06 | 6.77101E-07 | -4.21210E-06 | 2.91978E-05 |
| COB fit | 55.9 | 80.03 | 7.03 | -23.45 | 19.961 | 117 | 5.86 | (132,6) | 3.15087E-06 | -1.34682E-06 | 9.52418E-06 | 6.77101E-07 | -4.21210E-06 | 2.91978E-05 |

Parameters: *r*, total misfit; *K*, estimated quality factor; *dF*, degrees of freedom; *N*, number of data points; *s*, number of great circle segments; the unvertainty of fracture zone and magnetic anomaly identification is $\sigma$ = 5.00 km; ages are after Cande and Kent (1995) timescale.

Covariance matrix:

| | | |
|---|---|---|
| a | b | c |
| b | d | e |
| c | e | f |

The units of the matrix elements are radians squared

# MODEL 2

Finite Rotation of the eastern Reykjanes Segment relative to a stationary Greenland plate *(Reykjanes Ridge)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrice | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 68.32 | 136.10 | -2.54 | 0.198 | 37 | 187.04 | (50,5) | 6.89438E-06 | -2.33052E-06 | 1.23057E-05 | 8.85047E-07 | -4.17941E-06 | 2.24287E-05 |
| Chron 5A | 14.2 | 64.37 | 136.08 | -3.35 | 0.294 | 37 | 126.00 | (50,5) | 6.68605E-06 | -2.44794E-06 | 1.21413E-05 | 9.94685E-07 | -4.47069E-06 | 2.25233E-05 |
| Chron 6 | 19.6 | 71.02 | 131.59 | -5.15 | 0.402 | 37 | 92.07 | (50,5) | 6.42664E-06 | -2.62193E-06 | 1.19244E-05 | 1.17078E-06 | -4.89802E-06 | 2.26112E-05 |
| Chron 8 | 26.4 | 68.65 | 133.54 | -6.57 | 0.496 | 37 | 74.63 | (50,5) | 6.10898E-06 | -2.79759E-06 | 1.16526E-05 | 1.38518E-06 | -5.38006E-06 | 2.27312E-05 |
| Chron 13 | 33.3 | 61.63 | 135.43 | -7.08 | 0.560 | 37 | 66.07 | (50,5) | 5.83533E-06 | -2.88718E-06 | 1.14192E-05 | 1.53445E-06 | -5.70318E-06 | 2.28730E-05 |
| Chron 17 | 36.6 | 56.96 | 135.53 | -7.33 | 0.606 | 37 | 61.04 | (50,5) | 5.66252E-06 | -2.92003E-06 | 1.12715E-05 | 1.61288E-06 | -5.87165E-06 | 2.29792E-05 |
| Chron 18 | 39.4 | 51.64 | 136.11 | -7.50 | 0.658 | 37 | 56.21 | (50,5) | 5.51124E-06 | -2.94792E-06 | 1.11385E-05 | 1.68494E-06 | -6.02299E-06 | 2.30701E-05 |
| Chron 20 | 43.2 | 53.07 | 135.80 | -8.37 | 0.802 | 37 | 46.13 | (50,5) | 5.32812E-06 | -3.02311E-06 | 1.09643E-05 | 1.82607E-06 | -6.29393E-06 | 2.31352E-05 |
| Chron 21 | 47.1 | 44.30 | 136.60 | -8.84 | 1.078 | 37 | 34.32 | (50,5) | 5.04326E-06 | -3.06856E-06 | 1.06968E-05 | 1.98071E-06 | -6.59472E-06 | 2.32945E-05 |
| Chron 22 | 49.4 | 42.99 | 135.05 | -9.32 | 1.301 | 37 | 28.44 | (50,5) | 4.85047E-06 | -3.06388E-06 | 1.05174E-05 | 2.05106E-06 | -6.73745E-06 | 2.34346E-05 |
| Chron 23 | 51.3 | 41.19 | 134.30 | -9.87 | 1.660 | 37 | 22.28 | (50,5) | 4.65189E-06 | -3.07398E-06 | 1.03218E-05 | 2.14971E-06 | -6.92425E-06 | 2.35571E-05 |
| Chron 24 | 52.9 | 37.90 | 133.52 | -10.52 | 2.264 | 37 | 16.34 | (50,5) | 4.39888E-06 | -3.07206E-06 | 1.00647E-05 | 2.26756E-06 | -7.14612E-06 | 2.37199E-05 |
| COB fit | 55.9 | 30.92 | 132.71 | -11.04 | 2.885 | 37 | 12.82 | (50,5) | 4.13289E-06 | -3.02589E-06 | 9.79066E-06 | 2.34095E-06 | -7.30097E-06 | 2.39345E-05 |

Finite Rotation of the eastern Mohns Segment relative to a stationary Greenland plate *(Mohns Ridge)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrice | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 81.60 | 81.76 | -4.81 | 0.770 | 37 | 48.05 | (50,5) | 1.13319E-05 | 9.23722E-07 | 2.78340E-05 | 2.01224E-07 | 2.32272E-06 | 6.89691E-05 |
| Chron 5A | 14.2 | 78.91 | 103.96 | -5.29 | 1.920 | 37 | 19.27 | (50,5) | 1.10280E-05 | 6.66715E-07 | 2.74944E-05 | 1.65562E-07 | 1.71174E-06 | 6.91638E-05 |
| Chron 6 | 19.6 | 76.53 | 112.58 | -6.25 | 1.230 | 37 | 30.07 | (50,5) | 1.06675E-05 | 3.46215E-07 | 2.70795E-05 | 1.35891E-07 | 9.21729E-07 | 6.93753E-05 |
| Chron 8 | 26.4 | 75.05 | 118.26 | -7.64 | 2.936 | 37 | 12.60 | (50,5) | 1.02656E-05 | -6.35145E-08 | 2.65978E-05 | 1.24563E-07 | -1.31610E-07 | 6.95665E-05 |
| Chron 13 | 33.3 | 69.52 | 125.16 | -7.80 | 3.751 | 37 | 9.86 | (50,5) | 9.75633E-06 | -3.20938E-07 | 2.59878E-05 | 1.34121E-07 | -8.26643E-07 | 6.99097E-05 |
| Chron 17 | 36.6 | 66.99 | 125.60 | -8.06 | 4.191 | 37 | 8.83 | (50,5) | 9.43254E-06 | -4.43809E-07 | 2.55921E-05 | 1.44255E-07 | -1.17880E-06 | 7.01452E-05 |
| Chron 18 | 39.4 | 65.72 | 124.07 | -8.78 | 4.770 | 37 | 7.76 | (50,5) | 9.02739E-06 | -6.03673E-07 | 2.50832E-05 | 1.63765E-07 | -1.65723E-06 | 7.04334E-05 |
| Chron 20 | 43.2 | 64.46 | 123.42 | -9.70 | 5.497 | 37 | 6.73 | (50,5) | 8.56063E-06 | -8.10647E-07 | 2.44734E-05 | 2.00309E-07 | -2,30501E-06 | 7.07401E-05 |
| Chron 21 | 47.1 | 66.41 | 116.71 | -11.68 | 6.177 | 37 | 5.99 | (50,5) | 7.95554E-06 | -9.78334E-07 | 2.36615E-05 | 2.44867E-07 | -2.90832E-06 | 7.11989E-05 |
| Chron 22 | 49.4 | 66.68 | 112.82 | -13.05 | 6.640 | 37 | 5.57 | (50,5) | 7.45547E-06 | -1.07252E-06 | 2.29623E-05 | 2.79622E-07 | -3.31023E-06 | 7.15963E-05 |
| Chron 23 | 51.3 | 64.28 | 114.66 | -13.19 | 7.021 | 37 | 5.27 | (50,5) | 7.07384E-06 | -1.16068E-06 | 2.24053E-05 | 3.15870E-07 | -3.68844E-06 | 7.18865E-05 |
| Chron 24 | 52.9 | 65.28 | 108.62 | -14.98 | 7.302 | 37 | 5.07 | (50,5) | 6.49424E-06 | -1.16957E-06 | 2.15351E-05 | 3.37248E-07 | -3.90018E-06 | 7.24074E-05 |
| COB fit | 55.9 | 58.19 | 116.34 | -13.49 | 7.665 | 37 | 4.83 | (50,5) | 6.13795E-06 | -1.26115E-06 | 2.09638E-05 | 3.84787E-07 | -4.33121E-06 | 7.26627E-05 |

Parameters: *r*, total misfit; *K*, estimated quality factor; *dF*, degrees of freedom; *N*, number of data points; *s*, number of great circle segments; the unvertainty of fracture zone and magnetic anomaly identification is $\sigma$ = 5.00 km; ages are after Cande and Kent (1995) timescale.

Covariance matrix:

| | | |
|---|---|---|
| a | b | c |
| b | d | e |
| c | e | f |

The units of the matrix elements are radians squared

# MODEL 2

Finite Rotation of the eastern Aegir Segment relative to a stationary Greenland plate *(Kolbeinsey Ridge from present-day to Chron 6 ; Aegir Ridge and formation of the Jan Mayen microcontinent from Chron 6 to 55.9 Ma)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrice | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 75.53 | 130.38 | -2.95 | 0.264 | 37 | 140.07 | (50,5) | 3.37604E-05 | -2.72202E-06 | 6.82058E-05 | 3.26634E-07 | -5.47073E-06 | 1.38286E-04 |
| Chron 5A | 14.2 | 71.95 | 131.63 | -3.79 | 0.453 | 37 | 81.63 | (50,5) | 3.28785E-05 | -3.45890E-06 | 6.74273E-05 | 4.71012E-07 | -7.06973E-06 | 1.38781E-04 |
| Chron 6 | 19.6 | 70.26 | 128.88 | -5.11 | 0.752 | 37 | 49.22 | (50,5) | 3.15624E-05 | -4.40582E-06 | 6.62449E-05 | 7.22443E-07 | -9.23033E-06 | 1.39555E-04 |
| Chron 8 | 26.4 | 72.93 | 125.52 | -7.22 | 1.137 | 37 | 32.54 | (50,5) | 3.02996E-05 | -5.60433E-06 | 6.50295E-05 | 1.14522E-06 | -1.20211E-05 | 1.40097E-04 |
| Chron 13 | 33.3 | 67.49 | 131.23 | -7.41 | 1.351 | 37 | 27.39 | (50,5) | 2.92846E-05 | -6.15803E-06 | 6.40681E-05 | 1.40339E-06 | -1.34704E-05 | 1.40714E-04 |
| Chron 17 | 36.6 | 58.63 | 134.63 | -7.14 | 1.499 | 37 | 24.69 | (50,5) | 2.81783E-05 | -6.42865E-06 | 6.30294E-05 | 1.57448E-06 | -1.43812E-05 | 1.41556E-04 |
| Chron 18 | 39.4 | 40.54 | 141.68 | -6.3 | 1.581 | 37 | 23.41 | (50,5) | 2.76918E-05 | -6.57201E-06 | 6.25567E-05 | 1.66589E-06 | -1.48495E-05 | 1.41909E-04 |
| Chron 20 | 43.2 | 9.07 | 147.77 | -6.77 | 1.747 | 37 | 21.18 | (50,5) | 2.67469E-05 | -6.95227E-06 | 6.16049E-05 | 1.91086E-06 | -1.60210E-05 | 1.42518E-04 |
| Chron 21 | 47.1 | -17.37 | 150.55 | -9.54 | 1.908 | 37 | 19.39 | (50,5) | 2.53132E-05 | -7.25509E-06 | 6.01471E-05 | 2.18036E-06 | -1.72551E-05 | 1.43598E-04 |
| Chron 22 | 49.4 | -9.26 | 146.96 | -9.38 | 2.084 | 37 | 17.76 | (50,5) | 2.39508E-05 | -7.53782E-06 | 5.87084E-05 | 2.47477E-06 | -1.85002E-05 | 1.44619E-04 |
| Chron 23 | 51.3 | -9.34 | 145.62 | -10.04 | 2.000 | 37 | 18.50 | (50,5) | 2.28652E-05 | -7.74116E-06 | 5.75163E-05 | 2.72370E-06 | -1.95029E-05 | 1.45426E-04 |
| Chron 24 | 52.9 | -13.14 | 144.00 | -11.09 | 2.059 | 37 | 17.97 | (50,5) | 2.14892E-05 | -7.69752E-06 | 5.59844E-05 | 2.86006E-06 | -2.00914E-05 | 1.46651E-04 |
| COB fit | 55.9 | -26.23 | 145.51 | -14.74 | 2.106 | 37 | 17.57 | (50,5) | 1.98802E-05 | -7.84667E-06 | 5.40631E-05 | 3.19841E-06 | -2.13921E-05 | 1.47910E-04 |

Finite Rotation of the eastern Kolbeinsey Segment relative to a stationary Greenland plate *(Kolbeinsey Ridge from present-day to Chron 6 ; Aegir Ridge and formation of the Jan Mayen microcontinent from Chron 6 to 55.9 Ma)*

| | | Pole of Rotation | | | Parameters/Uncertainties | | | | Covariance matrice | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stage | Age (in Ma) | Latitude (°N) | Longitude (°E) | Angle (°) | *r* (km) | *dF* | *K* | (*N*,*s*) | a | b | c | d | e | f |
| Chron 5 | 10.3 | 74.79 | 131.33 | -2.93 | 19.779 | 117 | 5.92 | (132,6) | 3.91855E-06 | -1.03367E-06 | 1.05774E-05 | 3.64884E-07 | -2.83859E-06 | 2.87650E-05 |
| Chron 5A | 14.2 | 70.94 | 132.21 | -3.73 | 19.812 | 117 | 5.91 | (132,6) | 3.76973E-06 | -1.11473E-06 | 1.03874E-05 | 4.23204E-07 | -3.12510E-06 | 2.88454E-05 |
| Chron 6 | 19.6 | 68.79 | 130.81 | -5.00 | 19.863 | 117 | 5.89 | (132,6) | 3.55452E-06 | -1.21445E-06 | 1.01044E-05 | 5.10734E-07 | -3.51415E-06 | 2.89634E-05 |
| Chron 8 | 26.4 | 83.83 | 74.64 | -10.88 | 19.903 | 117 | 5.88 | (132,6) | 3.40840E-06 | -1.30832E-06 | 9.89661E-06 | 6.01626E-07 | -3.88794E-06 | 2.90161E-05 |
| Chron 13 | 33.3 | 81.65 | 16.52 | -17.25 | 19.908 | 117 | 5.88 | (132,6) | 3.32325E-06 | -1.31057E-06 | 9.77506E-06 | 6.16955E-07 | -3.96893E-06 | 2.90866E-05 |
| Chron 17 | 36.6 | 80.56 | 8.73 | -20.08 | 19.914 | 117 | 5.88 | (132,6) | 3.29100E-06 | -1.32335E-06 | 9.72599E-06 | 6.32305E-07 | -4.03559E-06 | 2.91048E-05 |
| Chron 18 | 39.4 | 81.25 | 12.84 | -18.91 | 19.921 | 117 | 5.87 | (132,6) | 3.28140E-06 | -1.32943E-06 | 9.71402E-06 | 6.39295E-07 | -4.05689E-06 | 2.91086E-05 |
| Chron 20 | 43.2 | 80.30 | 5.28 | -21.90 | 19.936 | 117 | 5.87 | (132,6) | 3.26829E-06 | -1.35301E-06 | 9.68859E-06 | 6.60805E-07 | -4.14300E-06 | 2.91010E-05 |
| Chron 21 | 47.1 | 79.17 | -3.80 | -26.56 | 19.933 | 117 | 5.87 | (132,6) | 3.30338E-06 | -1.41939E-06 | 9.71997E-06 | 7.10129E-07 | -4.32307E-06 | 2.90201E-05 |
| Chron 22 | 49.4 | 79.96 | -1.14 | -25.38 | 19.942 | 117 | 5.87 | (132,6) | 3.25310E-06 | -1.42955E-06 | 9.65214E-06 | 7.29963E-07 | -4.38724E-06 | 2.90525E-05 |
| Chron 23 | 51.3 | 79.55 | 0.98 | -25.62 | 19.934 | 117 | 5.87 | (132,6) | 3.20217E-06 | -1.38660E-06 | 9.58804E-06 | 7.01466E-07 | -4.29867E-06 | 2.91325E-05 |
| Chron 24 | 52.9 | 78.15 | -5.17 | -30.20 | 19.942 | 117 | 5.87 | (132,6) | 3.24697E-06 | -1.40902E-06 | 9.63906E-06 | 7.10087E-07 | -4.34076E-06 | 2.90799E-05 |
| COB fit | 55.9 | 78.41 | -4.51 | -29.79 | 19.944 | 117 | 5.87 | (132,6) | 3.22662E-06 | -1.41396E-06 | 9.61111E-06 | 7.18972E-07 | -4.36974E-06 | 2.90920E-05 |

Parameters: *r*, total misfit; *K*, estimated quality factor; *dF*, degrees of freedom; *N*, number of data points; *s* , number of great circle segments; the unvertainty of fracture zone and magnetic anomaly identification is $\sigma$ = 5.00 km; ages are after Cande and Kent (1995) timescale.

Covariance matrix:

| | | |
|---|---|---|
| a | b | c |
| b | d | e |
| c | e | f |

The units of the matrix elements are radians squared