Supplementary Data: The source of topography across the Cumberland Peninsula, Baffin Island, Arctic Canada: differential exhumation of a North Atlantic rift flank

Thermal models

Isostatic modelling
Thermal history models

Each sample includes the expected, max-likelihood and max-mode model outputs, fission track and (U-Th)/He predictions and a plot showing the comparison between observed and predicted ages.
Ec1

TLA O: 372.1 P: 384.3 SP: 367.1 + 8.224
MTL Op: 13.30 P: 13.53 SP: 13.42 + 0.113
VR P: 0.546534
HeO: 721.0 P: 63.43 SP: 56.92 + 13.49 tc: 487.0
HeO: 206.0 P: 52.49 SP: 47.97 + 12.11 tc: 487.0
HeO: 179.0 P: 70.69 SP: 62.71 + 14.22 tc: 487.0

MTL microns
0 5 10 15 20
Ec2

Ec2_Run1 : Expected
FT Age
0
AHe Age
0
Predicted Age (Ma)
0
200
400
Observed Age (Ma)
0 200 400

LL= -549.48
Ec2_Run1 : Expected

FT Age
0
AHe Age
0
Predicted Age (Ma)
0
200
400
Observed Age (Ma)
0 200 400

LL= -571.18
Ec3

EC3_Run2: EC 3 AFT 3rd

Temperature (°C)

Time (Ma)

Max Like. Model
Max. Post. Model
Expected Model
Max. Mode Model

LL = -499.62
FTA O: 322.0 P: 322.3 SP: 320.1 +13.85 Oldest track: 388.0
MTL O: 13.17 P: 12.90 SP: 12.92 +0.169
VR P: 0.681294

EC 3_Run2: Expected

No. of tracks (m)

MTL microns

LL = -500.43

EC 3_Run2: Expected

FT Age

Predicted Age (Ma)

Observed Age (Ma)

LL = -500.43

EC 3_Run2: Expected
Ec5a

Temperature (°C)

Time (Ma)

LL = -471.75
FTA O: 213.0 P: 236.5 SP: 232.6 + 5.057 Oldest track: 280.0
MTL Op: 14.02 P: 14.18 SP: 14.11 + 0.053
VR P: 0.919138

Ec5_run1 : Expected

FT Age
0
0
AHe Age
Predicted Age (Ma)
0
200
400
Observed Age (Ma)
0
200
400

Ec10

LL = -516.45
FTA O: 279.2 P: 284.5 SP: 279.9 + 7.707
Oldest track: 357.0

MTL Op: 13.92 P: 13.98 SP: 14.01 + 0.152

VR P: 0.703916

EC10_AFT_Run2: EC 10 AFT.txt

Predicted Age (Ma)
Observed Age (Ma)

LL = -520.48

EC10_AFT_Run2: Expected

Ec13

EC13_Run1 : EC13 AFT + AHe.txt 0.000m : Expected

No. of tracks (m)

MTL microns

LL= -601.58
FTA O:296.4 P:320.0 SP: 304.1+7.958 Oldest track:356.0
MTL Op : 13.90 P: 14.36 SP: 14.21+0.143
VR P: 0.876198
HeO: 210.0 P:201.2 SP: 172.8+23.71 tc: 346.0
HeO: 278.1 P:203.5 SP: 175.4+23.57 tc: 347.0
HeO: 187.6 P:192.0 SP: 162.4+24.29 tc: 345.0
HeO: 202.1 P:172.2 SP: 140.9+25.12 tc: 342.0
HeO: 222.6 P:182.4 SP: 151.8+24.76 tc: 343.0

FT Age
AHe Age
P predicted Age (Ma)
Observed Age (Ma)
Ec14

EC14_RGau_Run2 : EC 14A AFT + AHe.txt 0.000m : Expected

FT Age
0
AHe Age
Predicted Age (M a)
0
200
400
Observed Age (M a)
0 200 400

LL = -392.64
Ec16a
Ec16b

Max. Like. Model
Max. Post. Model
Expected Model
Max. Mode Model

| No. of tracks (m) | MTL microns |
|------------------|-------------|
| 0                | 0           |
| 10               | 5           |
| 20               | 10          |
| 30               | 15          |
| 40               | 20          |
| 50               | 25          |

LL = -631.55
FTA O: 409.3 P: 458.9 SP: 426.2 + 9.071
Oldest track: 541.0

MTL Op: 13.74 P: 13.99 SP: 13.93 + 0.065

VR P: 1.075730

HeO: 510.4 P: 240.5 SP: 218.4 + 7.394 tc: 533.0
HeO: 290.5 P: 153.4 SP: 128.5 + 5.769 tc: 522.0
HeO: 257.9 P: 164.8 SP: 139.8 + 5.590 tc: 523.0
HeO: 157.0 P: 180.1 SP: 155.2 + 5.542 tc: 525.0

Ec16_BP_Run1: Expected

No. of tracks (m)
0
10
20
30
40
50

MTL microns
0 5 10 15 20

LL = -1282.88

Ec16_BP_Run1: Expected

FT Age
0
0
0

AHe Age

Predicted Age (Ma)
0
250
500

Observed Age (Ma)
0 250 500
| Max Like. Model | Max. Post. Model | Expected Model | Max. Mode Model |
|-----------------|-----------------|----------------|-----------------|
| 120             | 60              | 0              | 400 200 0       |

LL = -555.67
FTA O: 329.0 P: 341.7 SP: 333.3 + 8.993
Oldest track: 397.0
MTL Op: 13.94 P: 14.16 SP: 14.01 + 0.094
VR P: 0.868821
HeO: 194.8 P: 212.1 SP: 178.9 + 8.495 tc: 372.0
HeO: 182.6 P: 217.0 SP: 186.4 + 8.063 tc: 372.0
HeO: 277.0 P: 174.5 SP: 141.6 + 8.803 tc: 363.0
HeO: 256.1 P: 170.7 SP: 140.3 + 8.044 tc: 362.0
HeO: 262.0 P: 171.5 SP: 136.0 + 9.974 tc: 363.0

Ec17_Run1 EC 17 AFT + AHe.txt 0.000m : Expected
No. of tracks (m)
0
10
20
30
40
50
MTL microns
0 5 10 15 20

LL = -549.00
Ec17_Run1 : Expected
FT Age
0
AHe Age
Predicted Age (Ma)
0
200
400
Observed Age (Ma)
0 200 400
Ec18

LL = -406.34
FTA O: 292.1 P: 286.5 SP: 279.7 + 12.81 Oldest track: 334.0
MTL Op: 13.78 P: 14.02 SP: 13.94 + 0.153
VR P: 0.872255
HeO: 195.4 P: 229.3 SP: 217.5 + 16.77 tc: 339.0

Ec18_Run1: Expected

FT Age
0
AHe Age
P Predicted Age (Ma)
0
200
400
Observed Age (Ma)
0 200 400
Ec19

c19_Run1 : EC 19 A/F + AHe.txt

FTA O:271.8 P:290.9 SP: 275.3+7.092 Oldest track:338.0

MTL Op : 13.71 P: 14.01 SP: 13.80+0.110

VR P: 0.898527

HeO: 196.7 P:163.8 SP: 137.2+14.60 tc: 328.0
HeO: 232.4 P:175.0 SP: 148.5+14.30 tc: 328.0
HeO: 214.6 P:189.4 SP: 160.2+14.76 tc: 331.0
HeO: 204.4 P:130.1 SP: 104.9+13.49 tc: 324.0
HeO: 210.3 P:178.9 SP: 152.1+14.21 tc: 328.0

No. of tracks (m)
0
10
20
30
40
50

MTL microns
0 5 10 15 20

LL= -562.53 c19_Run1 : Expected

FT Age
0
AHe Age

P Predicted Age (Ma)
0
200
400

Observed Age (Ma)
0 200 400

18
Ec20

### LL = -615.46
FTA O: 420.8 P: 428.9 SP: 422.0 + 10.69 Oldest track: 533.0
MTL Op : 13.84 P: 13.91 SP: 13.87 + 0.144
VR P: 0.802052
HeO: 277.1 P: 285.1 SP: 264.7 + 13.17 tc: 522.0
HeO: 52.70 P: 228.9 SP: 211.5 + 12.41 tc: 502.0
HeO: 326.6 P: 299.4 SP: 281.2 + 12.70 tc: 527.0
HeO: 249.8 P: 260.9 SP: 241.4 + 13.36 tc: 516.0
HeO: 156.9 P: 261.1 SP: 241.8 + 12.97 tc: 514.0

### Ec20_Run1: EC 20 AFT + AHe.txt 0.000 m: Expected

| No. of tracks (m) | MTL microns |
|-------------------|-------------|
| 0                 | 5           |
| 10                | 10          |
| 20                | 15          |
| 30                | 20          |
| 40                | 25          |

### FT Age

0

### AHe Age

0

### Predicted Age (Ma)

0
250
500

### Observed Age (Ma)

0
250
500

### Graphs

- **Temperature vs. Time (Ma)**
- **Age vs. Error**
  - Predicted Age vs. Error
  - Observed Age vs. Error

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19
Ec21

Ec21_Run1 : Expected

FT Age
0
AHe Age
P predicted Age (Ma)
0
200
400
Observed Age (Ma)
0 200 400

LL= -584.03
FTA O:286.7 P:287.7 SP: 279.6+6.446 Oldest track:341.0
MTL Op : 13.84 P: 13.85 SP: 13.83+0.104
VR P: 0.560008
HeO: 141.4 P:149.6 SP: 141.7+2.113 tc: 337.0
HeO: 226.9 P:175.6 SP: 165.0+2.132 tc: 339.0
HeO: 179.3 P:191.6 SP: 179.8+2.385 tc: 341.0
HeO: 211.1 P:128.5 SP: 122.7+2.205 tc: 334.0
Ec23

Ec23_Run1: EC 23 AFT + AHe.txt

No. of tracks (m)

MTL microns

LL = -548.91
FTA O: 278.6 P: 274.5 SP: 273.9 + 5.667 Oldest track: 340.0
MTL Op: 13.98 P: 14.04 SP: 14.02 + 0.129
VR P: 0.858207
HeO: 216.9 P: 153.0 SP: 146.0 + 2.299 tc: 315.0
HeO: 261.8 P: 192.4 SP: 185.1 + 3.585 tc: 340.0
HeO: 156.4 P: 162.7 SP: 155.8 + 1.993 tc: 320.0
HeO: 142.4 P: 152.0 SP: 144.9 + 2.539 tc: 315.0

Ec23_Run1: Expected

FT Age

AHe Age

Predicted Age (Ma)

Observed Age (Ma)

LL = -551.13
Ec24

FT Age
Predicted Age (Ma)
0
200
400
Observed Age (Ma)
0 200 400

LL = -470.25
EC24_Run2 : Expected

Temperature (°C)

Time (Ma)

Max. Like. Model
Max. Post. Model
Expected Model
Max. Mode Model

No. of tracks (m)
0 5 10 15 20 25 30

MTL microns
0 5 10 15 20
**Isostatic modelling**

Flexure of the lithosphere from loading was calculated using Flex2D (Allmendinger et al., 2011). This script was used in conjunction with MATLAB and calculates the deflection of the lithosphere under a defined load, using the solution from Hetenyi (1946). The lithosphere is treated as continuous, underlain by a fluid asthenosphere. The model requires three defined variables (outlined in the table below) and the geometry of the load, a series of point loads separated by a set interval (600 m).

| Variable                                | Value                                      |
|-----------------------------------------|--------------------------------------------|
| Effective elastic thickness             | 25 km (Pilkington, 1991)                   |
| Density of Asthenosphere ($\rho_a$)     | 3300 kg m$^{-3}$                           |
| Density of eroded mass ($\rho_r$)       | 2800 kg m$^{-3}$                           |

Table 1: values of each variable within model

![Graphs showing topography, load profile, and deflection](image)

Figure 1: Three graphs outlining the line of topography across the Cumberland Peninsula, the fill of the fjords, load profile and the resulted deflection calculated through Flex2D.