Supplementary Information: Additional evidence for a floristically diverse rainforest on the Falkland archipelago in the remote South Atlantic during the mid-late Cenozoic

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Figure S1. Left: Excavation of deposit, right: large wood fragments excavated

Table S1a. Samples collected

Drillhole	Depth below top of lignite	Maximum age	Minimum age	Palaeovegetation
Lignite: TH20-3-1	0 to 40 cm	Early Oligocene	Early Miocene	Nothofagus-podocarp rainforest/scrub
Lignite: TH20-3-2	20 to 60 cm	Early Oligocene	Early Miocene	Nothofagus-podocarp rainforest/scrub
Lignite: TH20-3-3	> 1.6 m	Early Oligocene	Early Miocene	Nothofagus-podocarp rainforest/scrub
Wood: TH20-2-3	~1m			
Wood: TH20-2-5	~1m			
Wood: TH20-2-6	~1m			
Wood: TH20-2-7	~1m			
Wood: TH20-2-8	~1m			

Figure 2. Wood fragments from the lignite deposit

Table S1b. Radiocarbon determinations for Tussac House wood fragments

Sample number	Lab number	Material	Pre-treatment	^{14}C age (years BP)
TH20-2-7	UNSW-149	Wood	BABAB	Infinite (beyond 50,000 years)
TH20-2-8	UNSW-150	Wood	BABAB	Infinite (beyond 50,000 years)

Palaeoclimate model simulations

Here we present additional paleoclimate modelling data from Farnsworth et al (2019). We show a selection of their simulations covering the period shown in Table S3:

Table S3: Simulations used to generate climate anomalies in this work. Note, simulation names correspond to experiment names listed on the University of Bristol model database: https://www.paleo.bristol.ac.uk/ummodel/scripts/papers/Farnsworth_et_al_2019b.html

Period	Age (Ma)	CO2 (ppmv)	Simulation name
Pre-industrial	Modern	280	tdzvg
Langhian	13.8-16.0	400	tdqpl
Burdigalian	16.0-20.4	400	tdqpk
Aquitanian	20.4-23.0	400	tdqpj
Chattian	23.0-27.8	560	tdluq
Rupelian	27.8-33.9	560	tdlup

To compare the Falkland Islands climatology back in time, we reconstructed its paleolatitude and paleolongitude position using GPlates for comparison with the model coordinates. Here we used the default plate boundaries and plate rotations given in the GPlates version 2.3 distribution to relocate the coordinates back in time:
https://www.earthbyte.org/download-gplates-2-3/

We used a representative coordinate for the modern Falkland Islands of (51.8 °S, 59.2 °W) and rotated this to representative time points for each interval, giving the following paleo-coordinates:

Table S4: Representative paleolatitudes and paleolongitudes for the Falklands over the 5 timeslices, generated using GPlates plate rotations.

Period	Time point (Ma)	Paleolatitude (°S)	Paleolongitude (°W)
Langhian	15	53.38	57.91
Burdigalian	18	53.60	57.16
Aquitanian	22	53.94	56.26
Chattian	25	54.25	55.67
Rupelian	31	54.94	54.36

We then used the nearest model data point in each case to generate anomalies with respect to the pre-industrial simulation. These anomalies were then used to adjust a high-resolution 30 arc-second climatology of WorldClim version 2 (Fick and Hijmans, 2017) to give realistic modern values of temperature and precipitation for the Falklands. Paleo-temperatures were generated by adding the model-based anomaly, paleo-precipitation was generated by multiplying an anomaly-ratio of precipitation from the pre-industrial to the paleo simulations. Results are shown below.

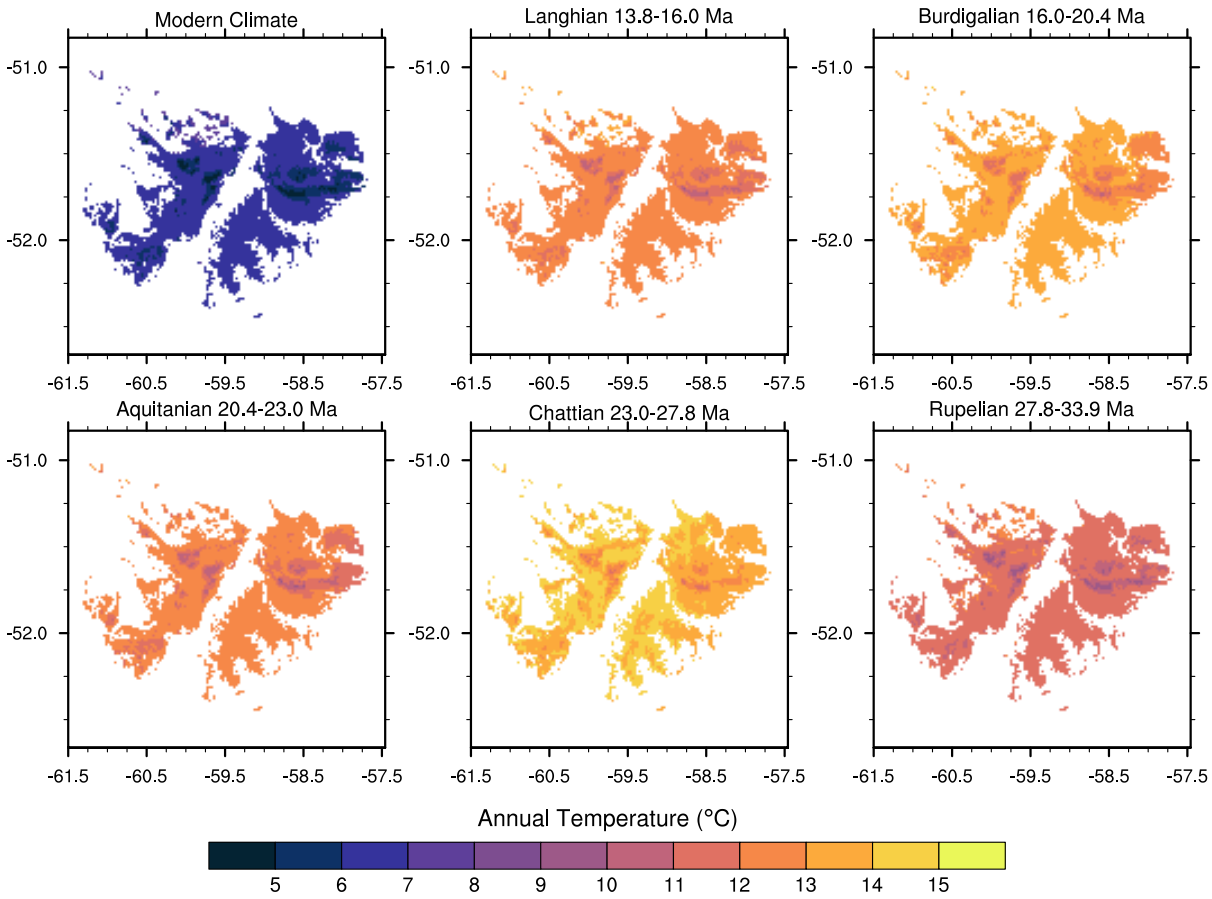

Figure S3: Reconstructed annual mean temperatures for the Falklands, showing the modern climatology (WorldClim v2), and anomaly-based temperature reconstructions for the 5 paleo-simulations of the Langhian, Burdigalian, Aquitanian, Chattian and Rupelian (see Table S3).

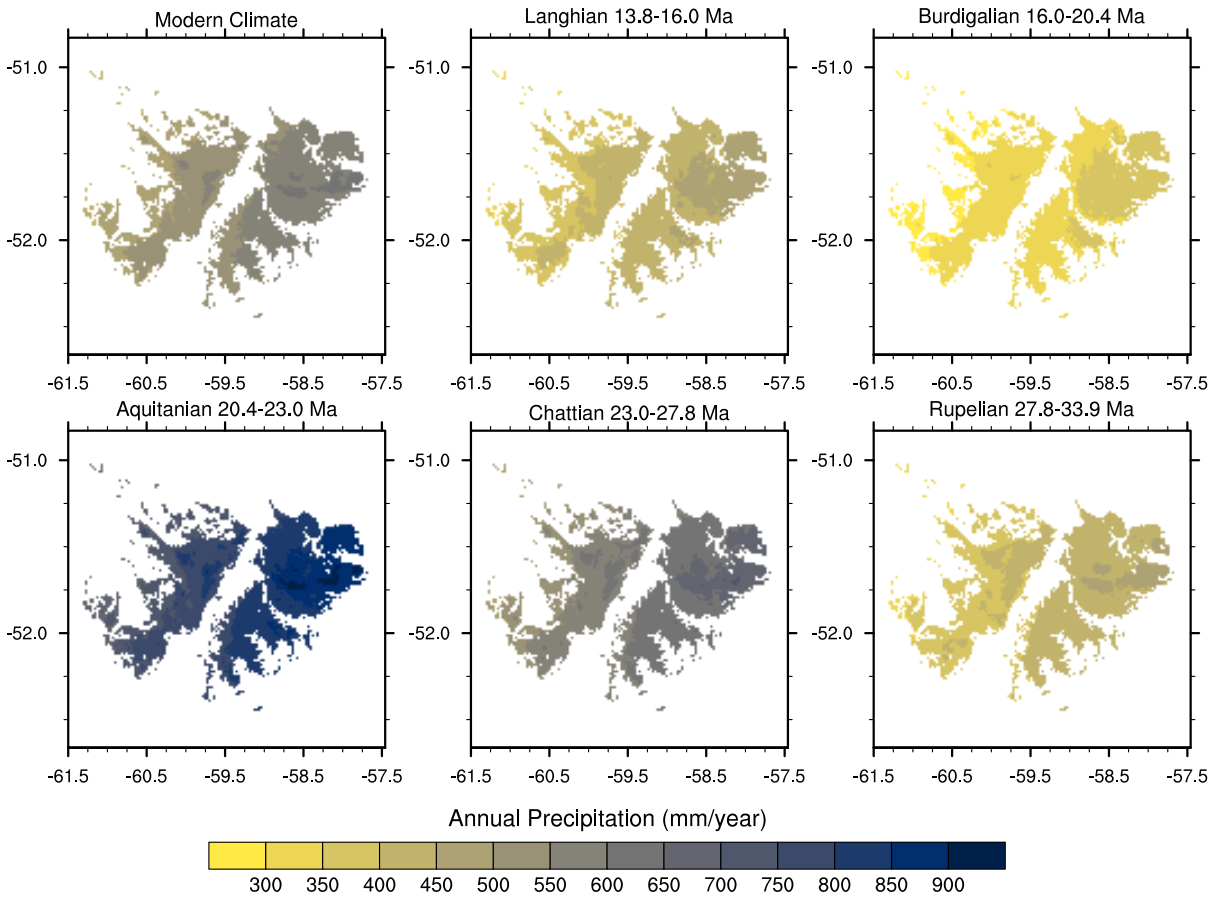

Figure S4: Reconstructed annual mean precipitation for the Falklands, showing the modern climatology (WorldClim v2), and anomaly-based precipitation reconstructions for the 5 paleo-simulations of the Langhian, Burdigalian, Aquitanian, Chattian and Rupelian.

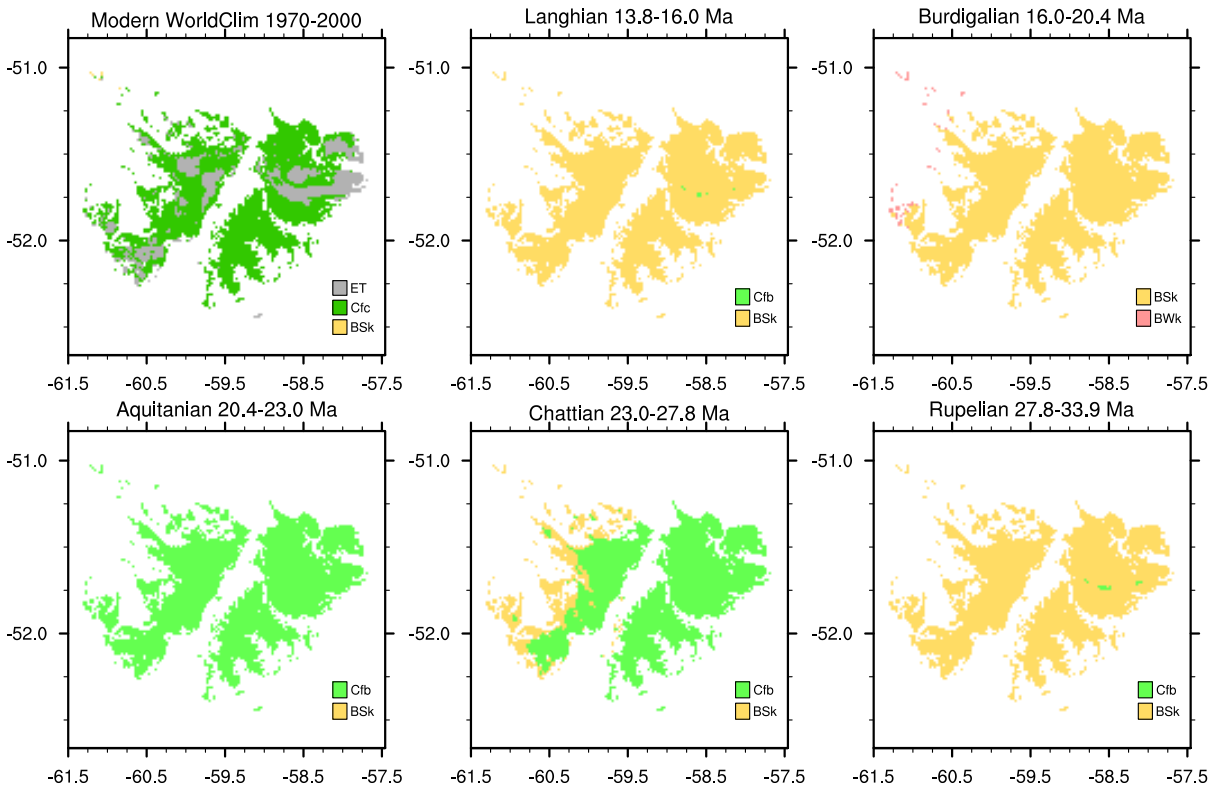

Figure S5: Reconstructed Köppen climate classifications for the Falklands (Beck et al. 2018), based on a modern climatology (WorldClim v2), and anomaly-based temperature and precipitation reconstructions for the 5 paleo-simulations of the Langhian, Burdigalian, Aquitanian, Chattian and Rupelian. ET = Mild tundra climate; Cfc = Subpolar oceanic climate; Cfb = Temperate oceanic climate; BSk = Cold semi-arid climate; BWk = Cold desert climate.

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