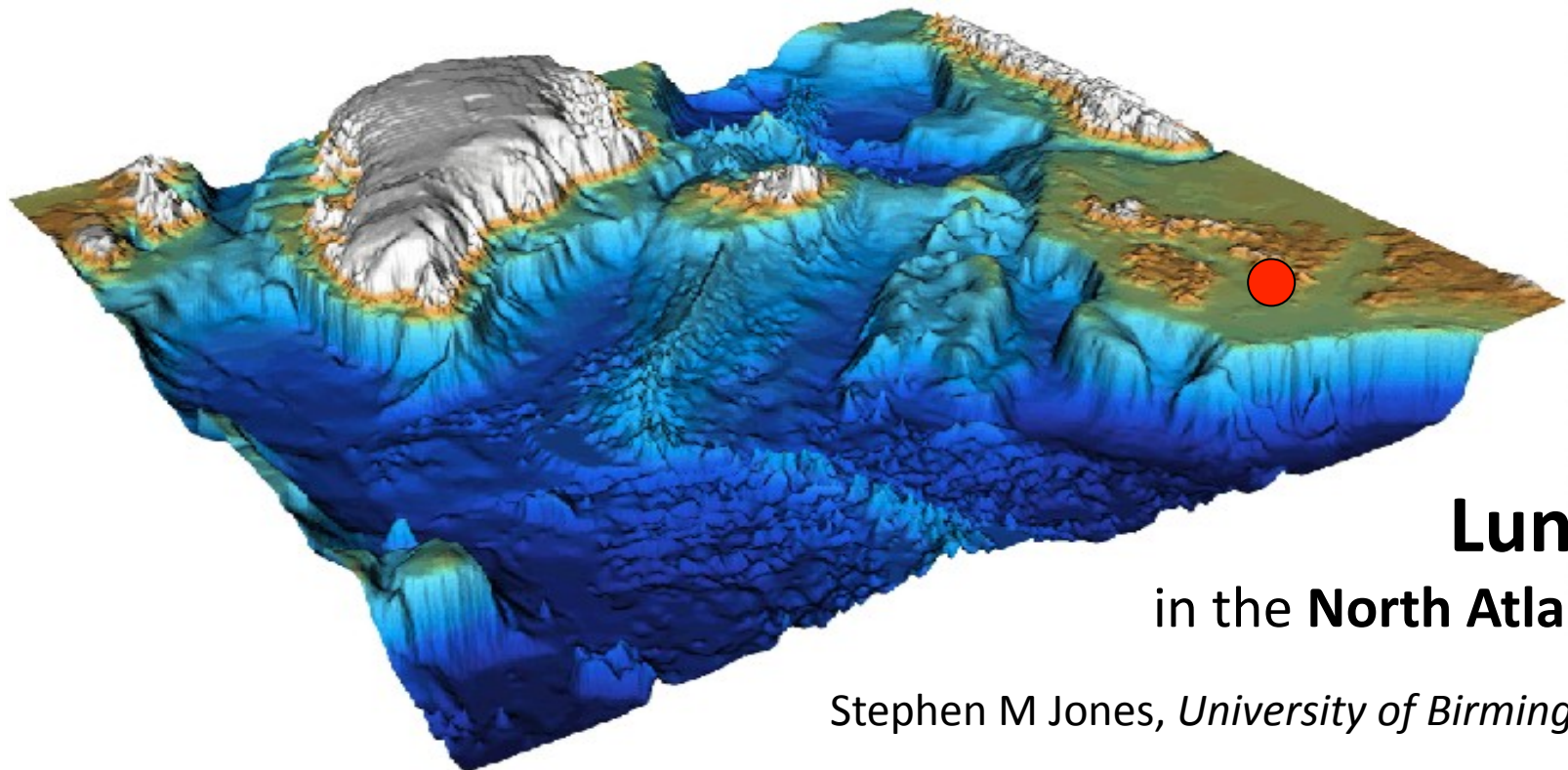
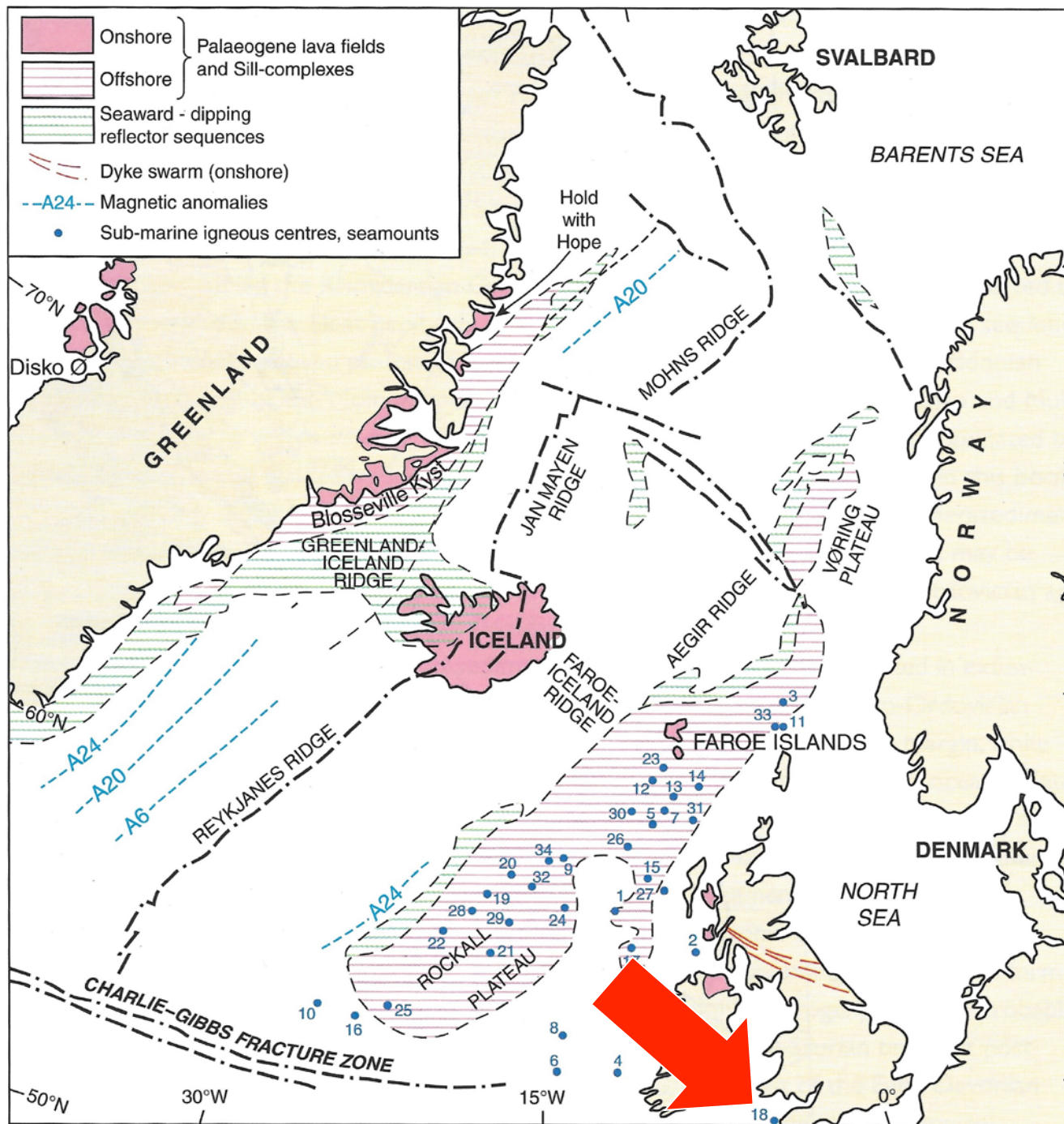




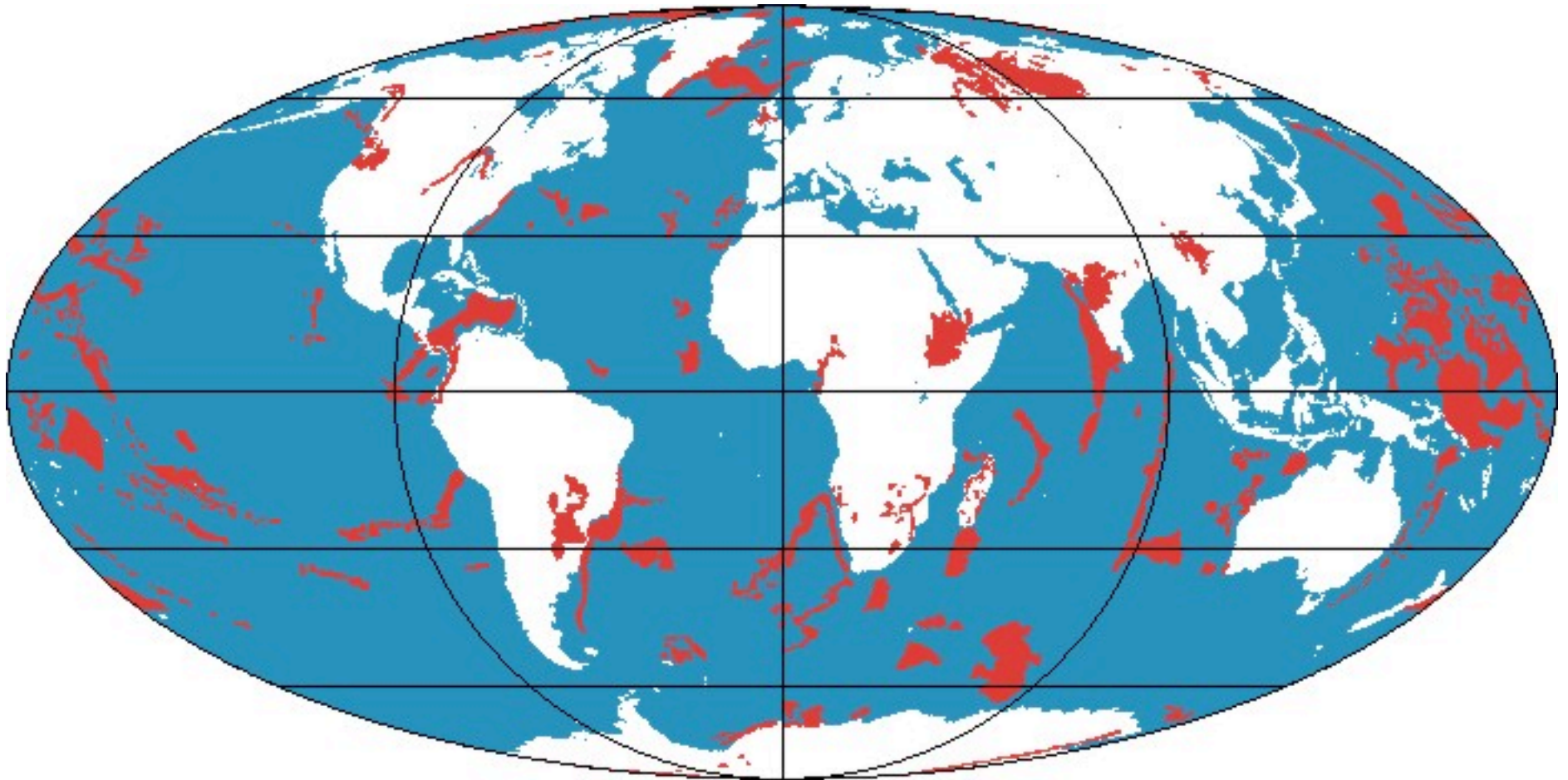
Lundy in the **North Atlantic**

Stephen M Jones, *University of Birmingham*

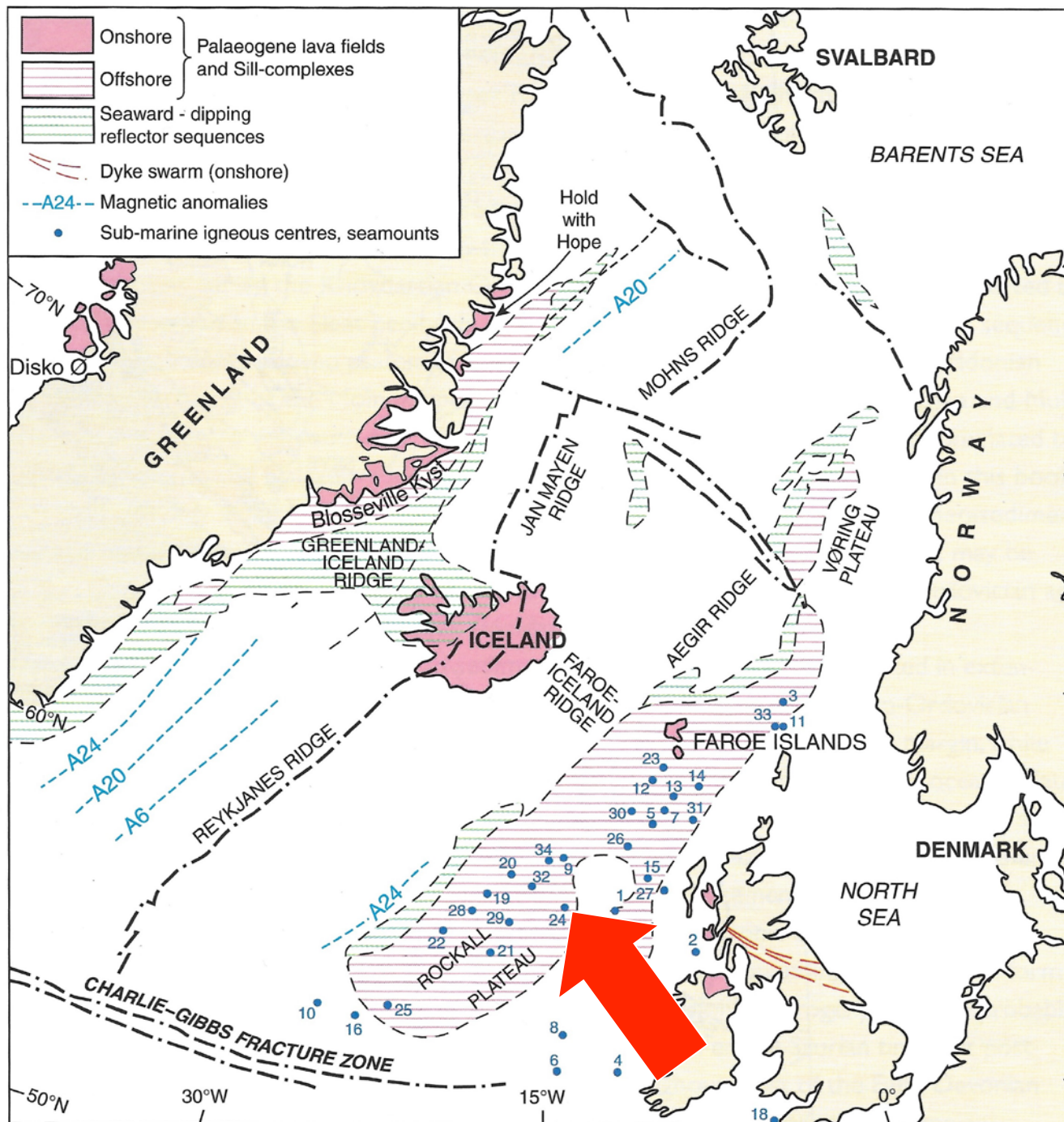


North Atlantic Igneous Province

Large Igneous Provinces

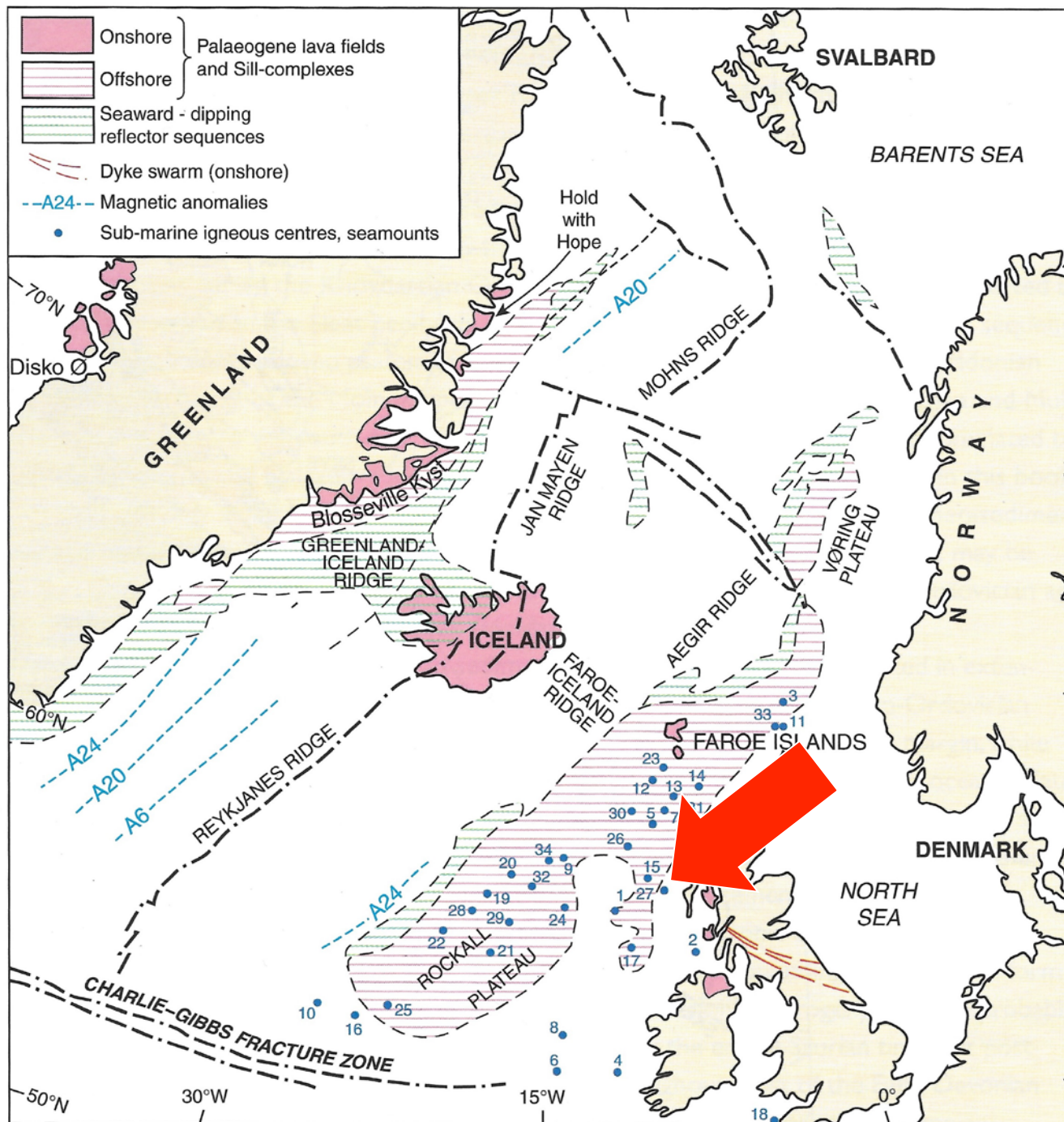






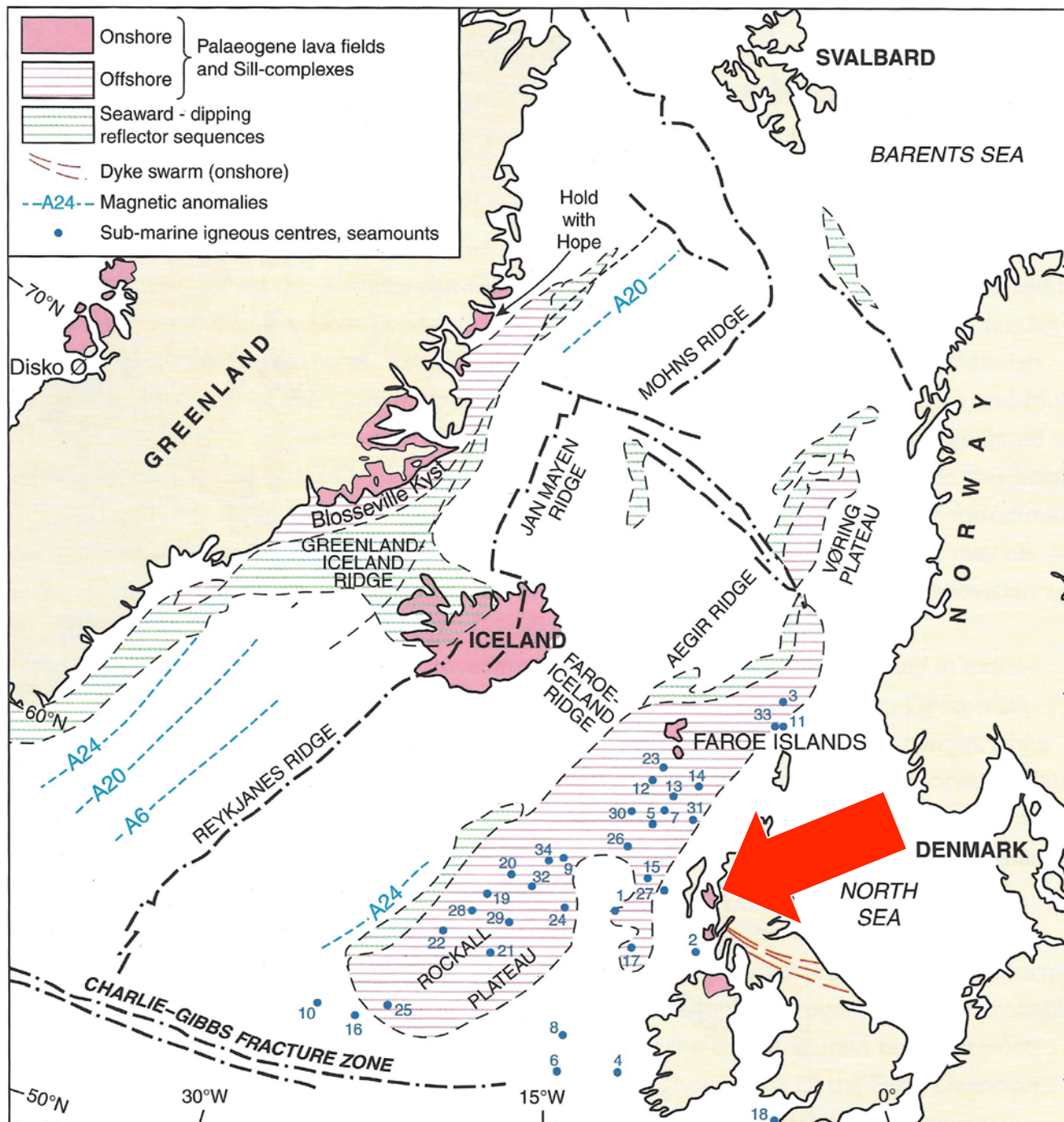
Rockall



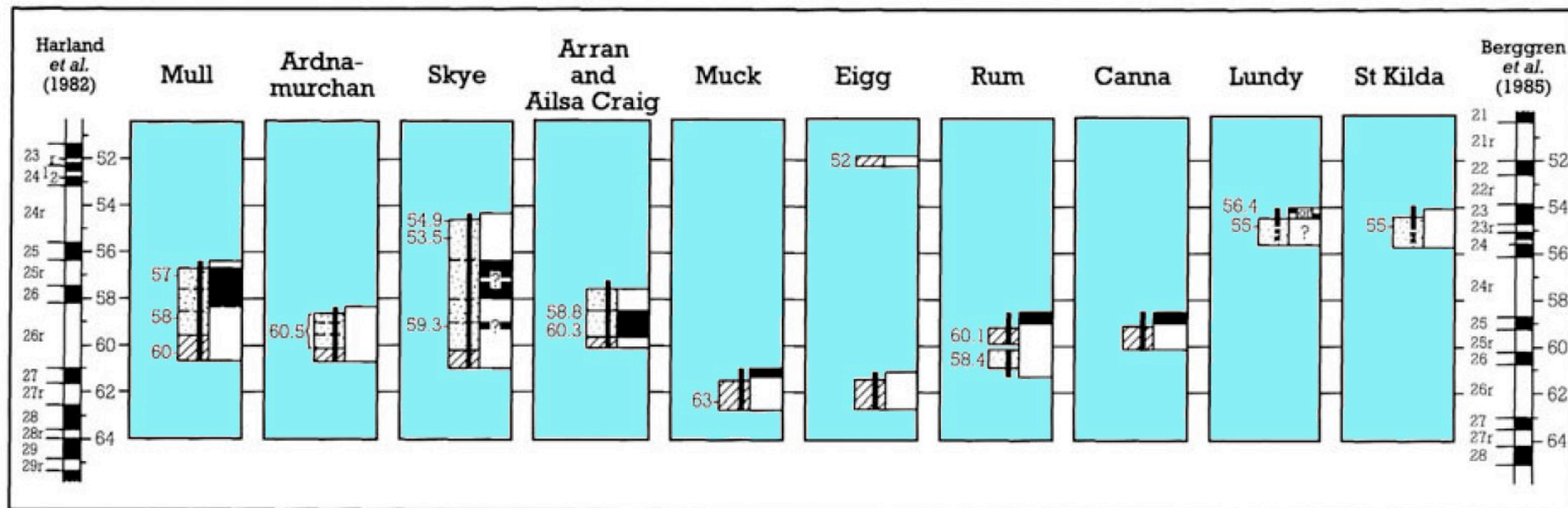


St Kilda

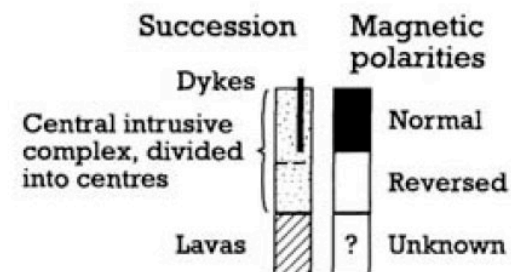


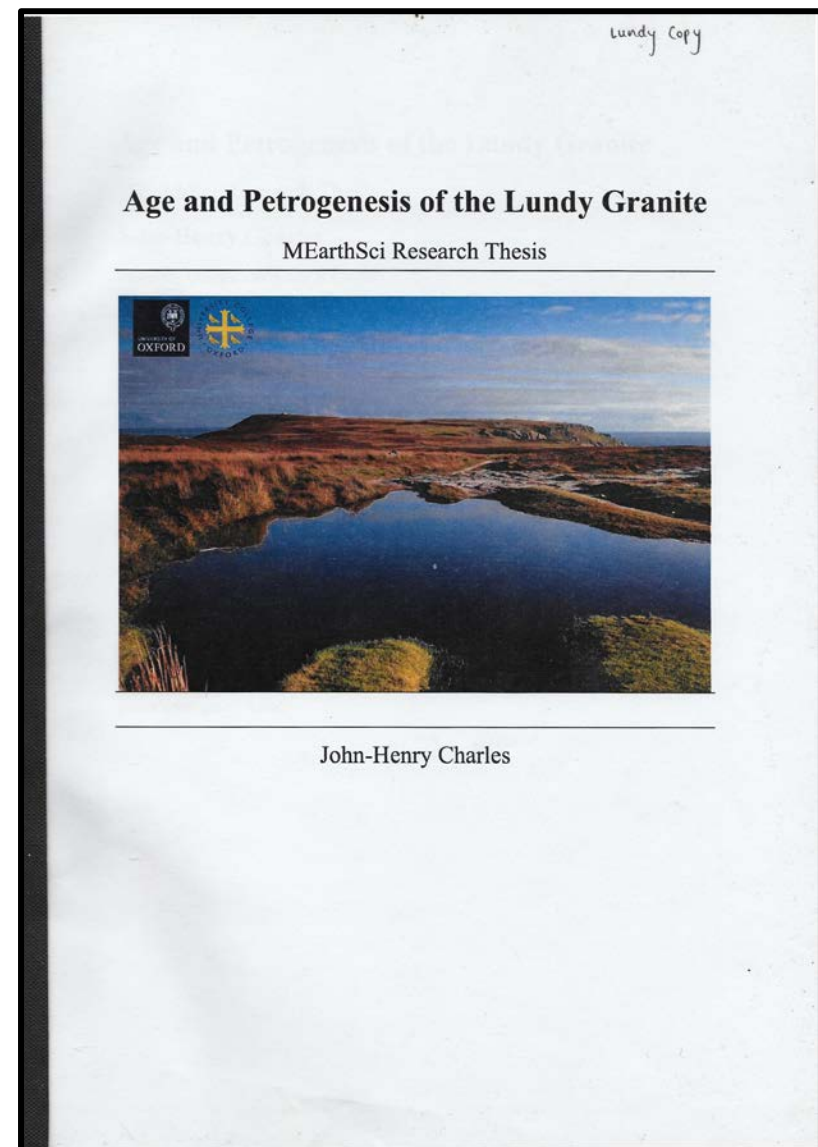
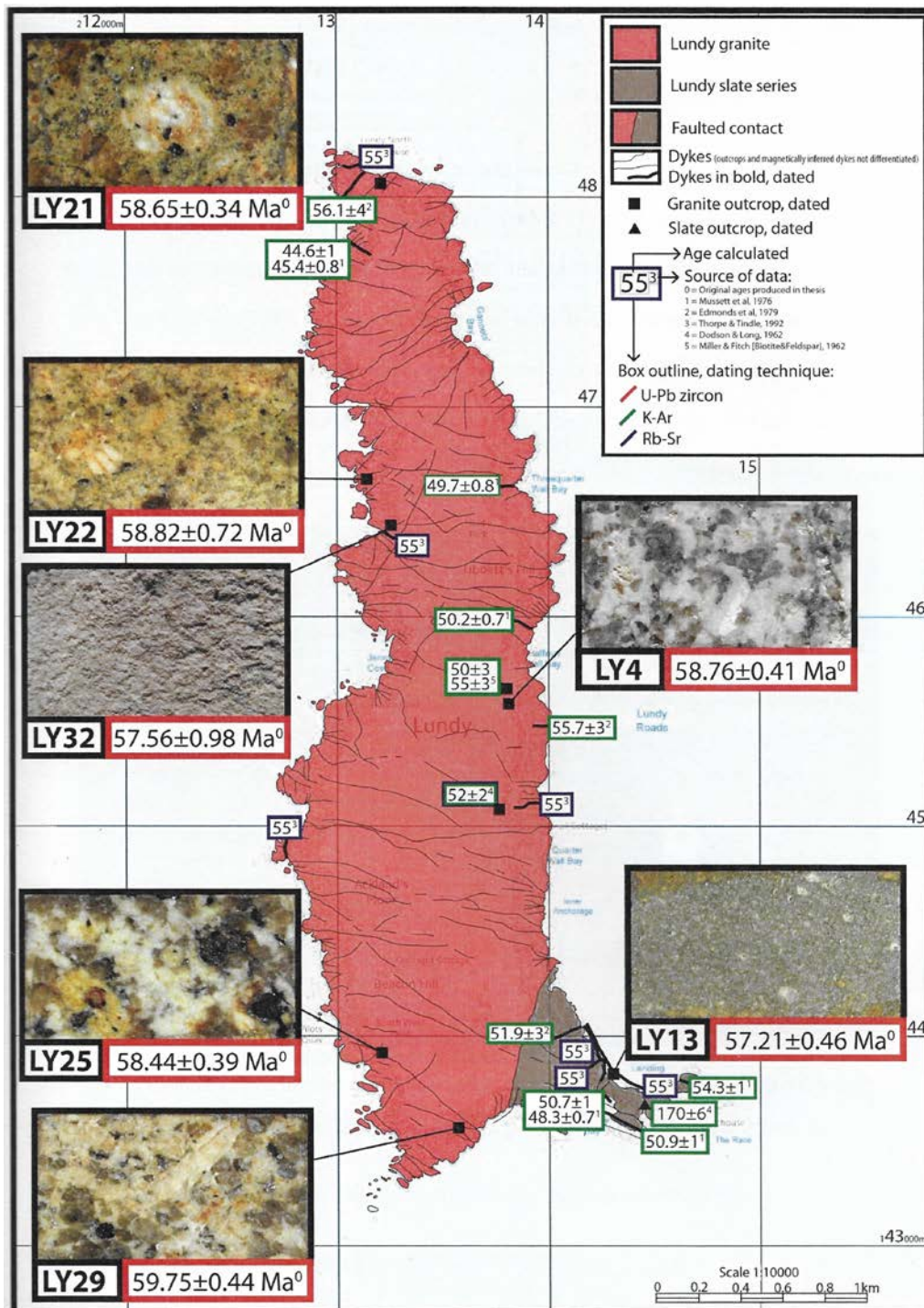


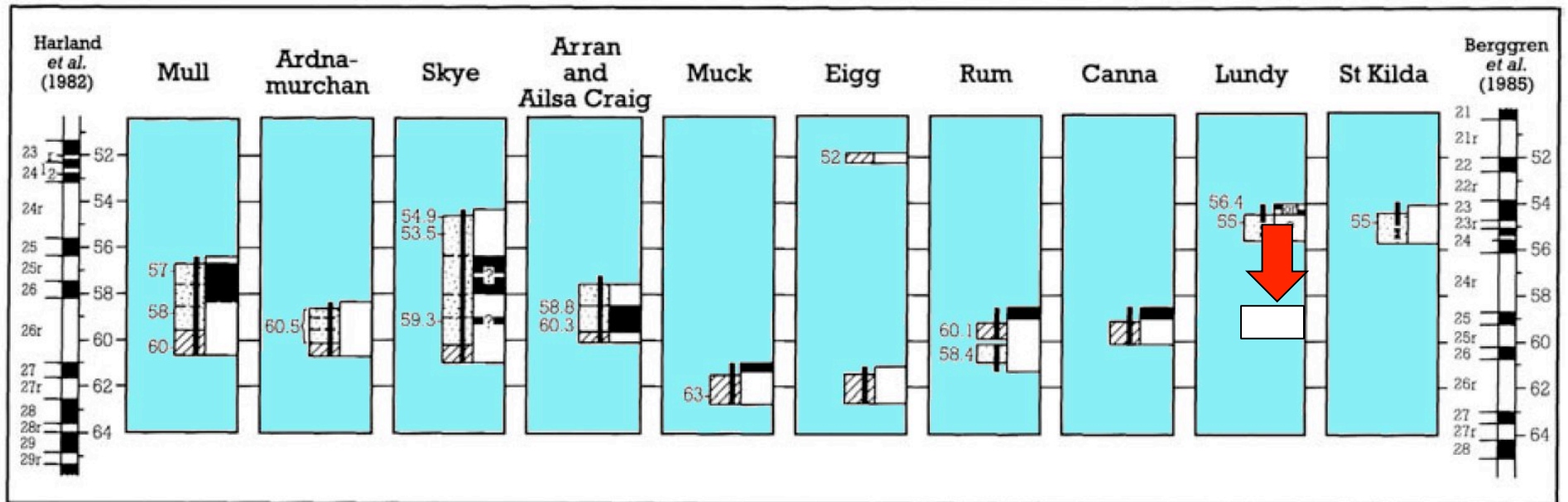
Skye:
 Red Cuillen
 Black Cuillen



after Mussett *et al.* (1988)







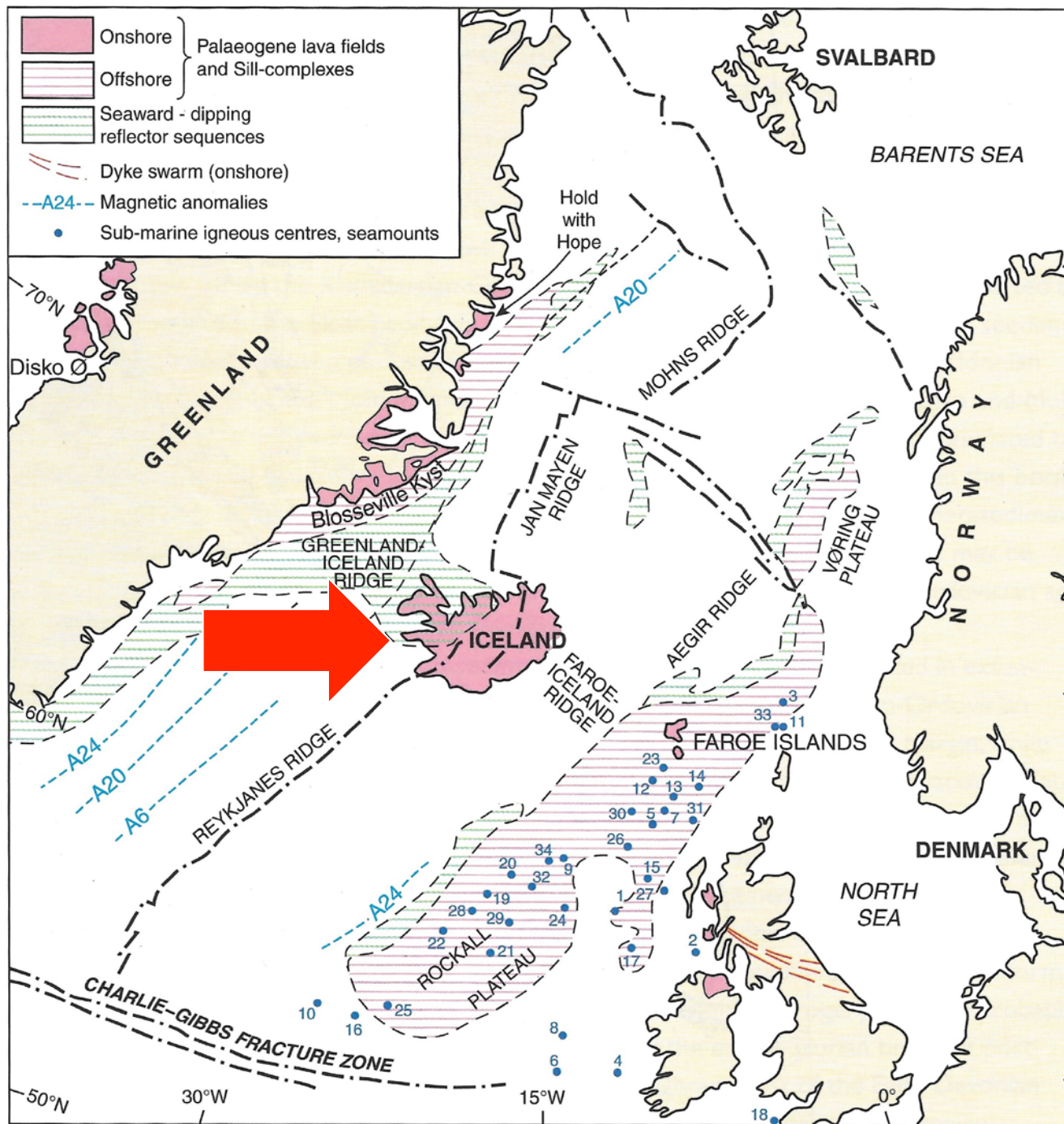
after Mussett *et al.* (1988)

Lundy Granite:
59.8 – 58.4 million years old







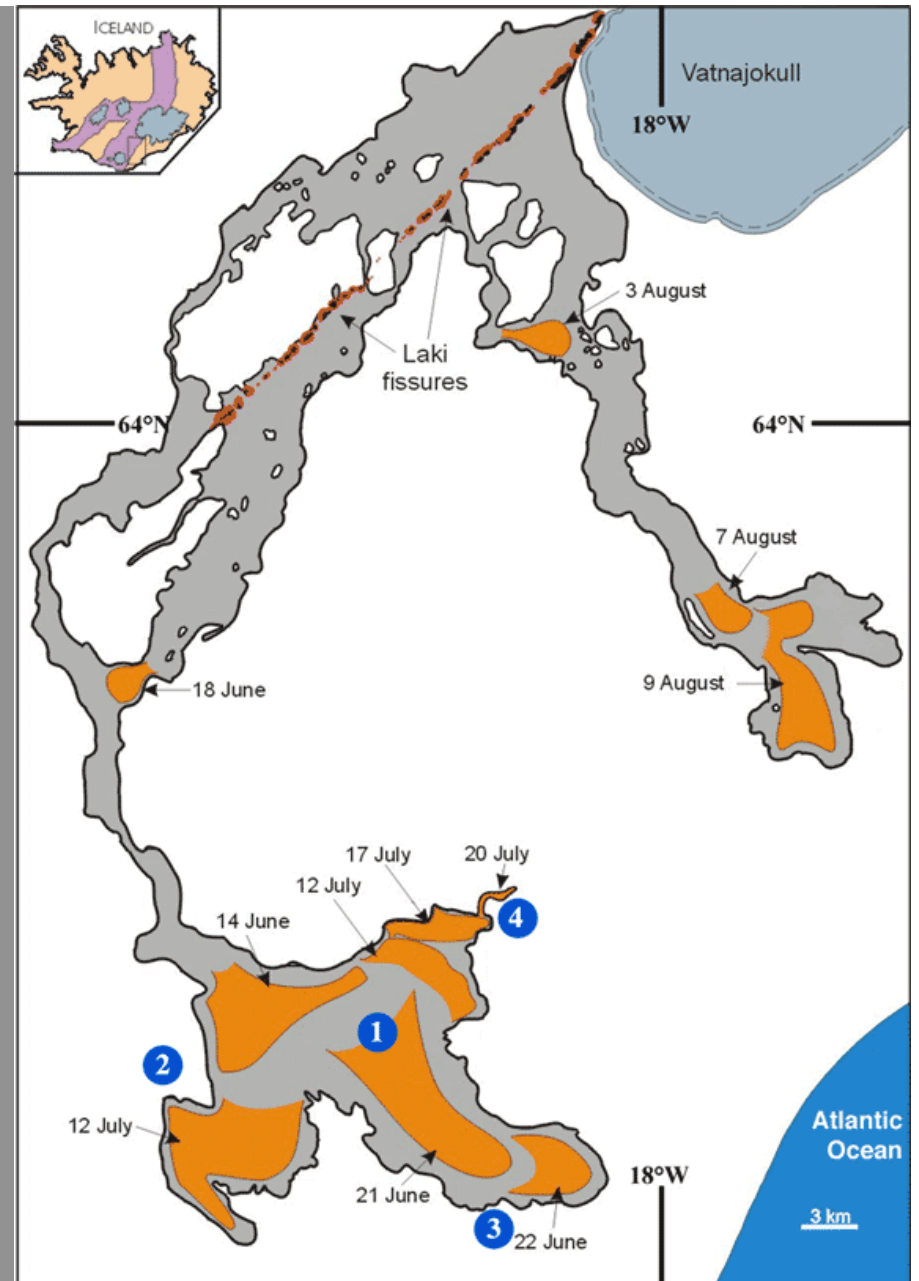


Iceland



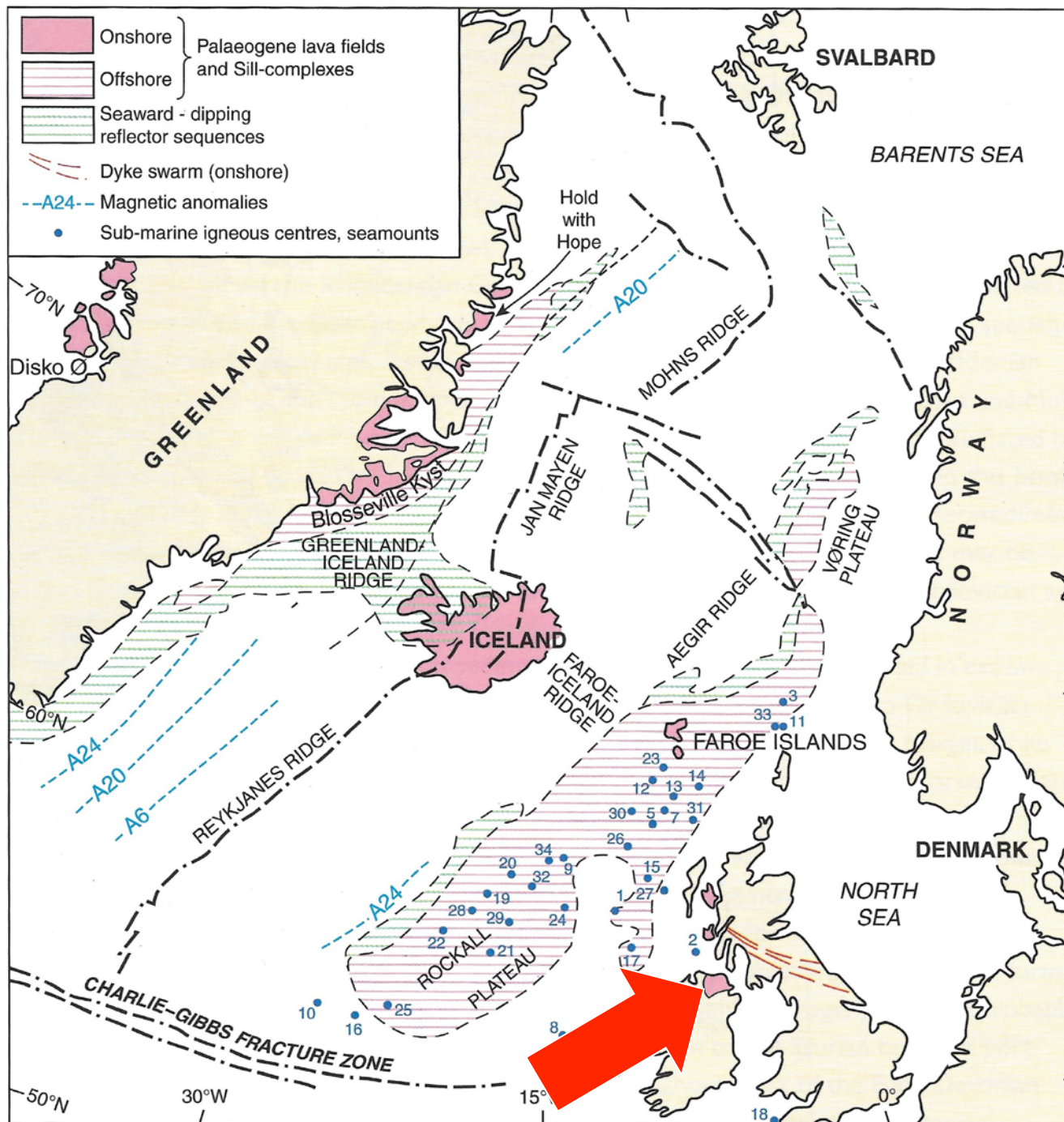
Krafla, N. Iceland

Laki Eruption, 1783





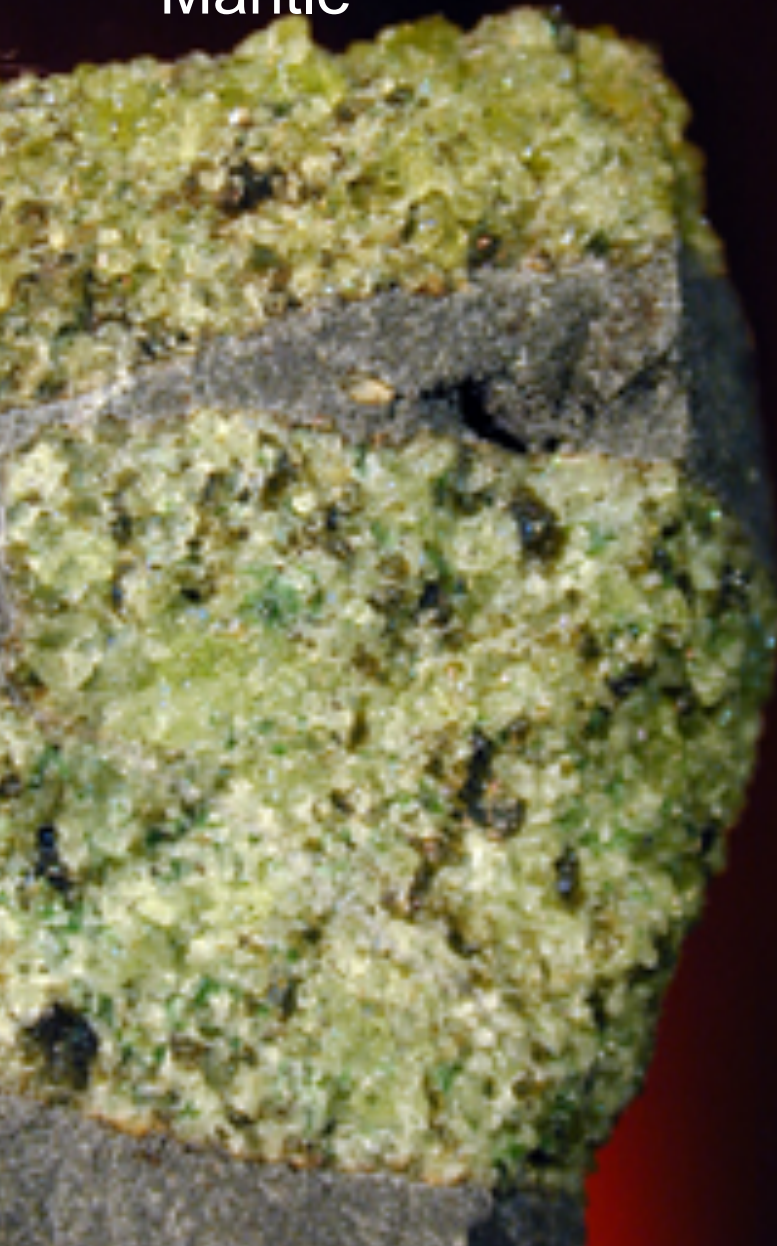




Antrim:
Giant's
Causeway

Peridotite

Mantle



Basalt

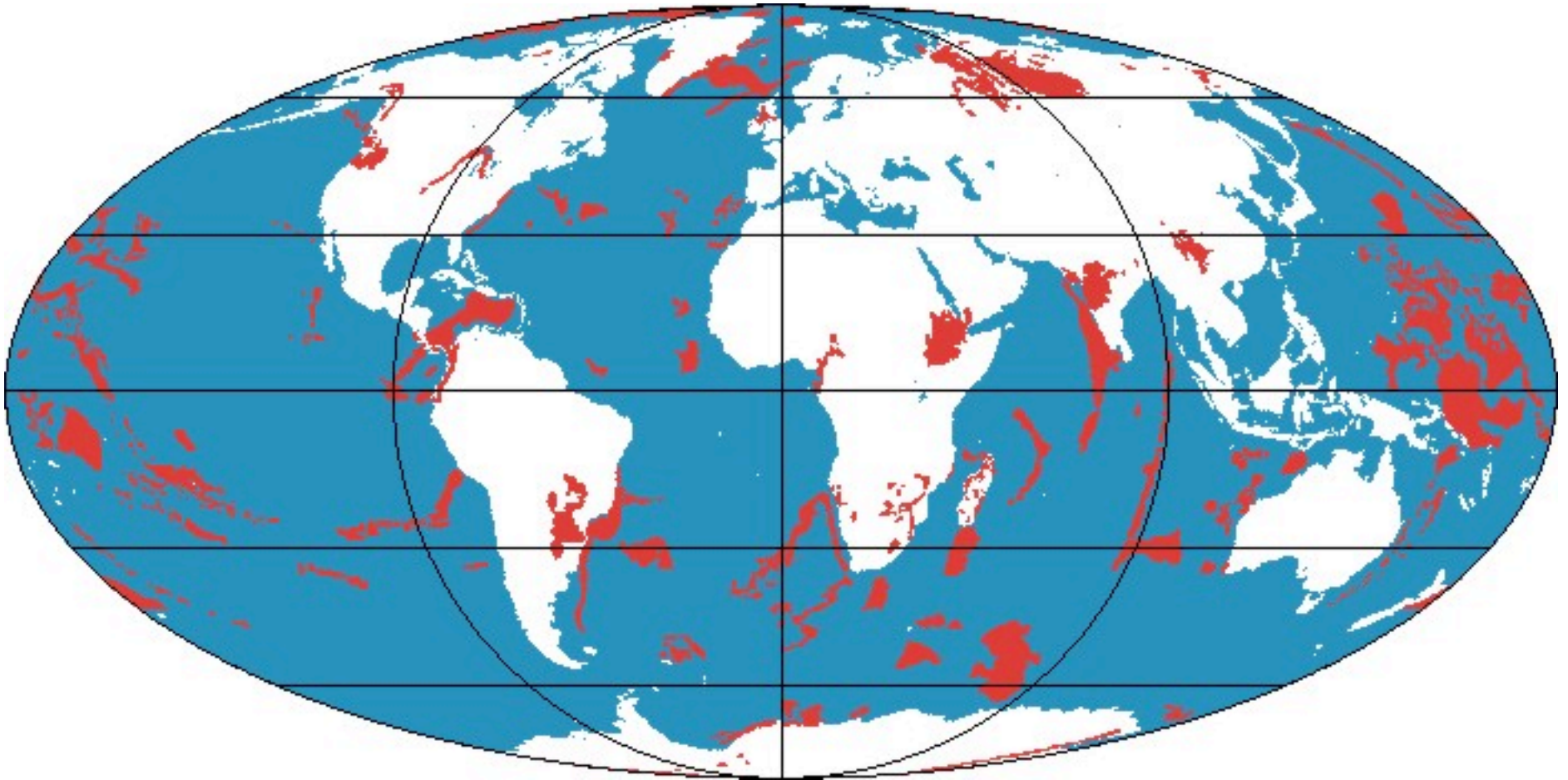
Oceanic
crust



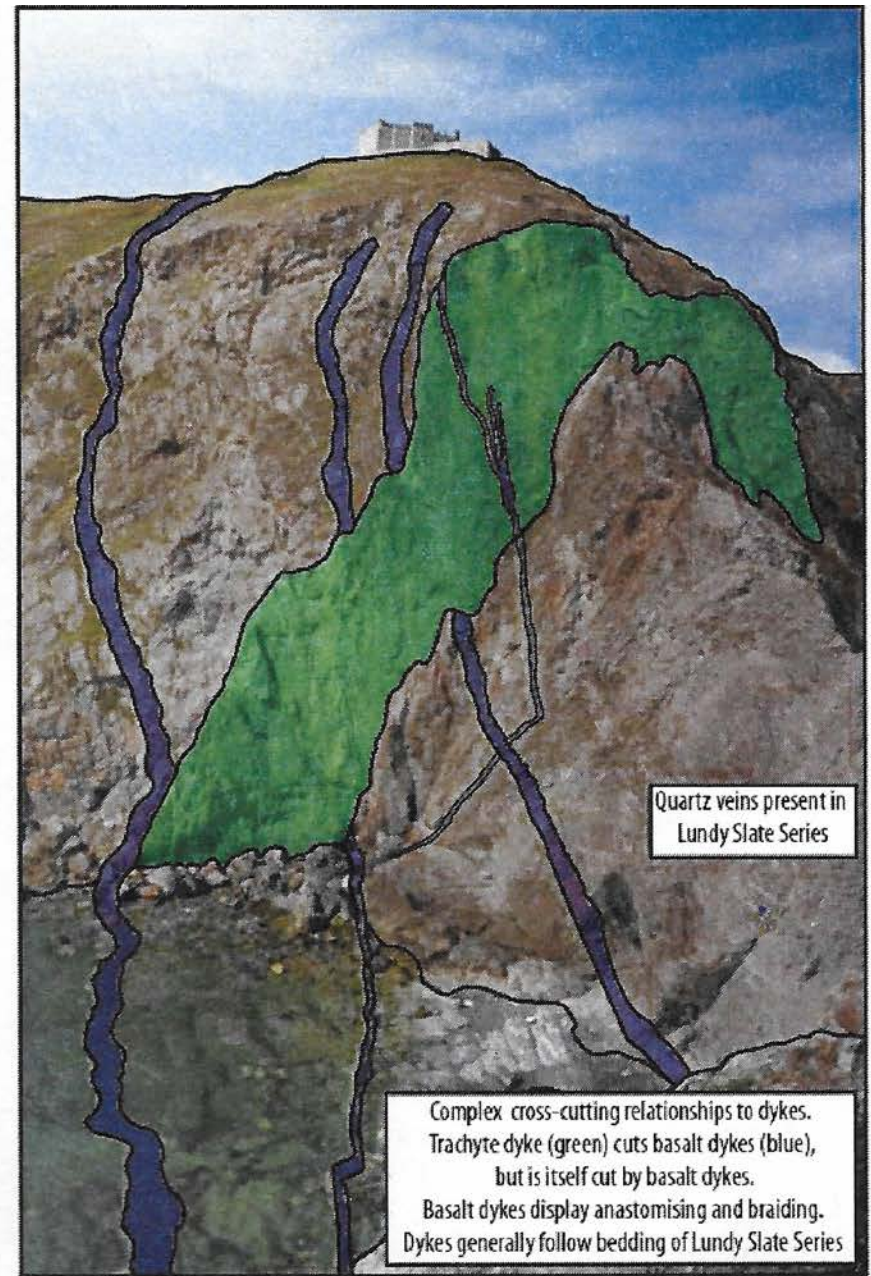
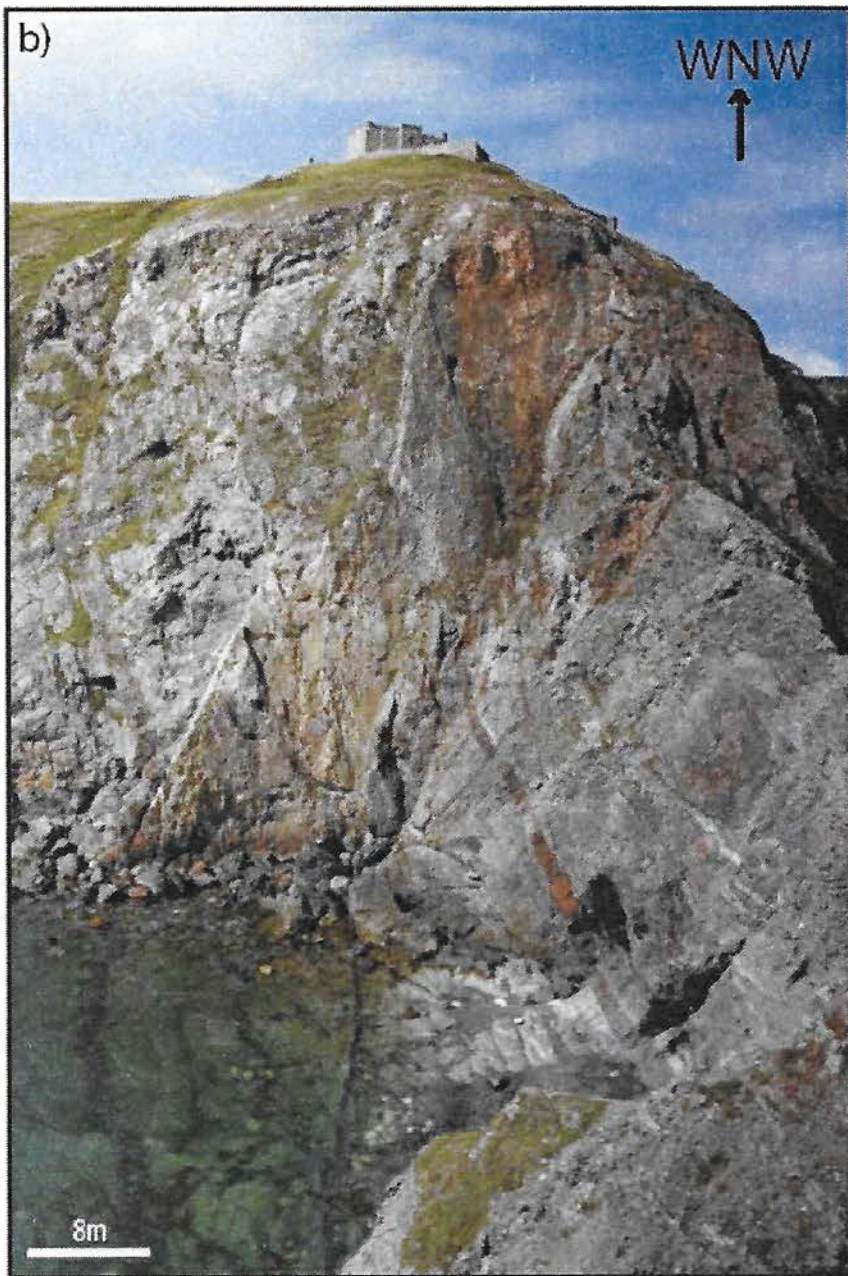
Granite

Continental crust

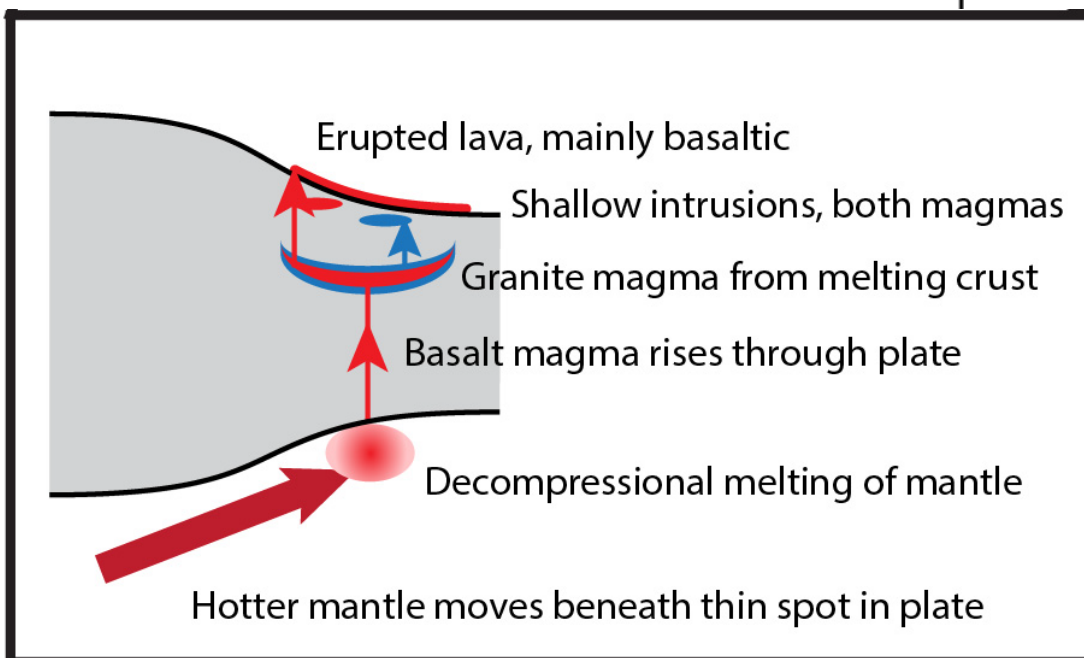
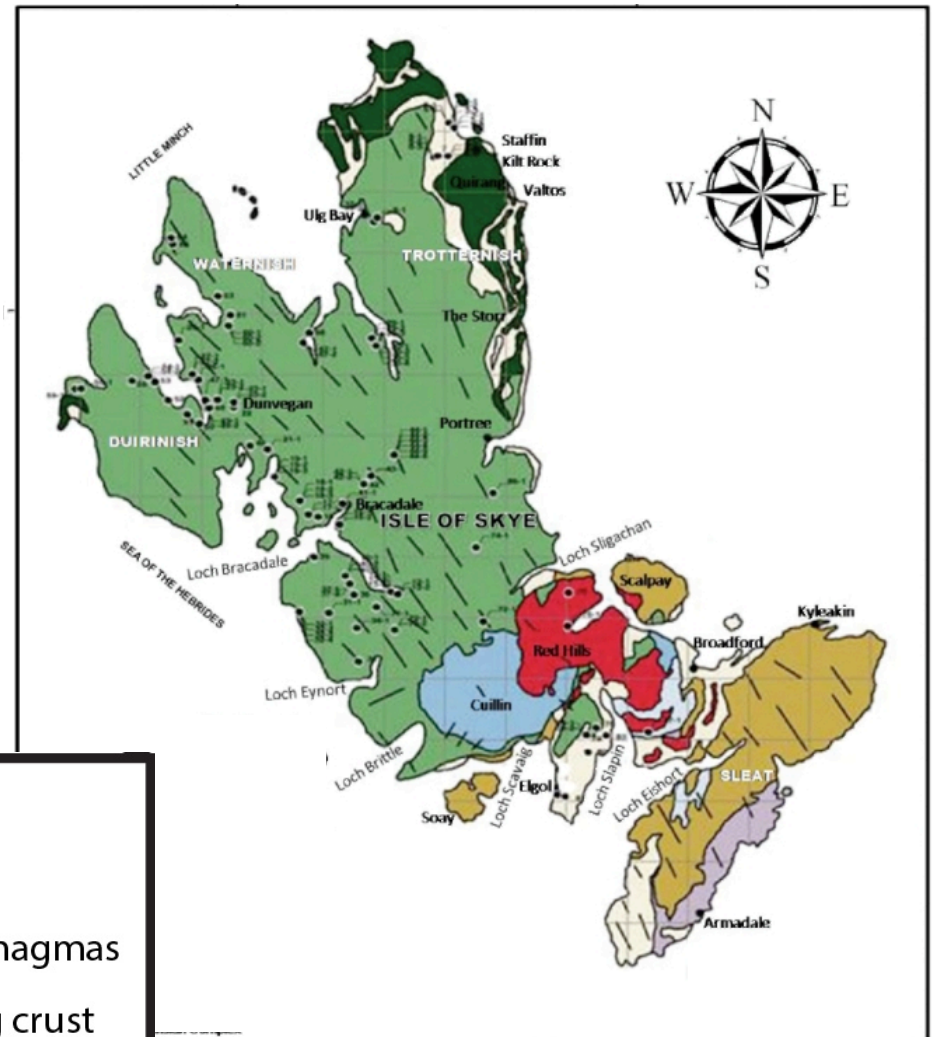
Large Igneous Provinces

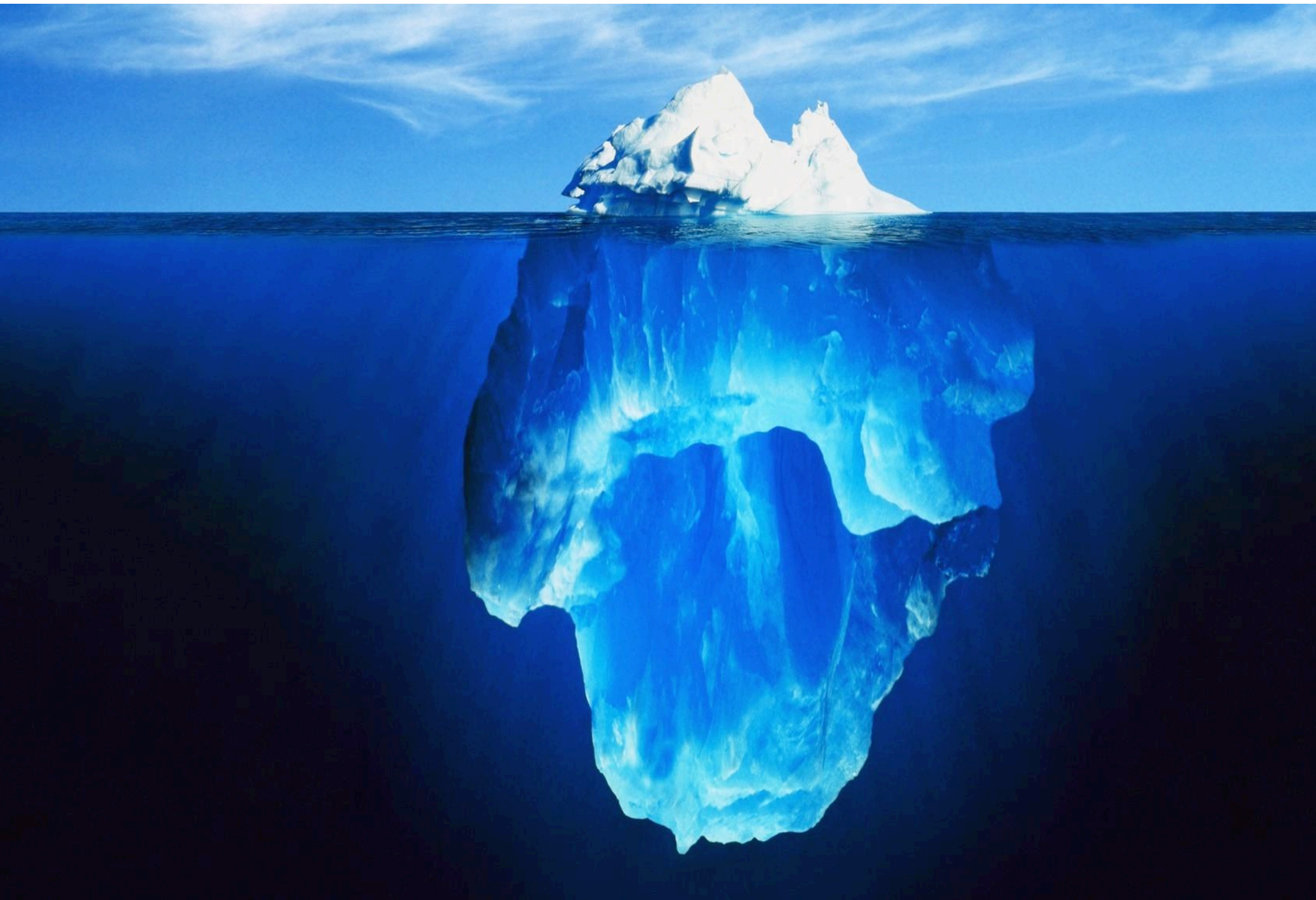


Mostly Basaltic



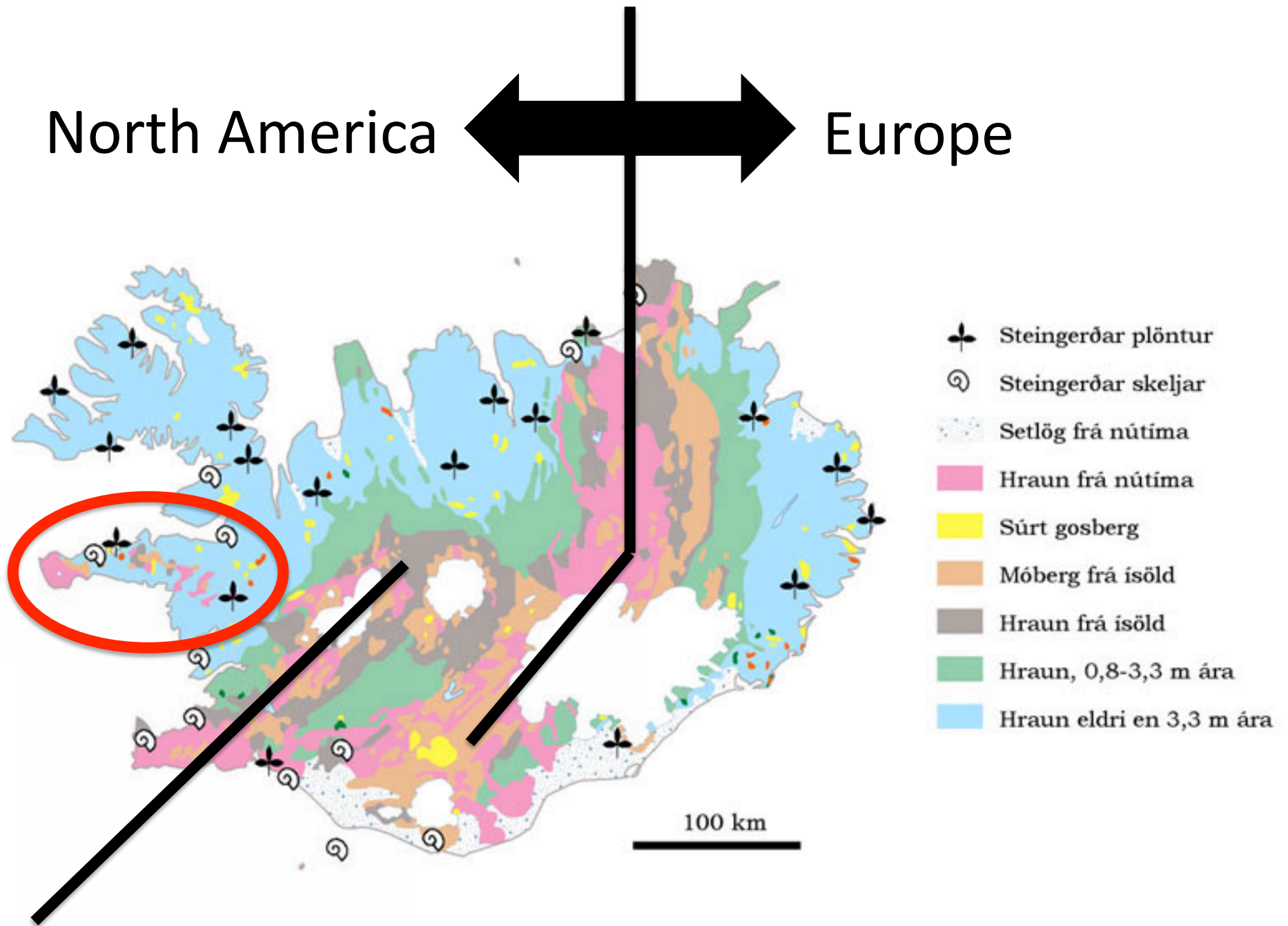




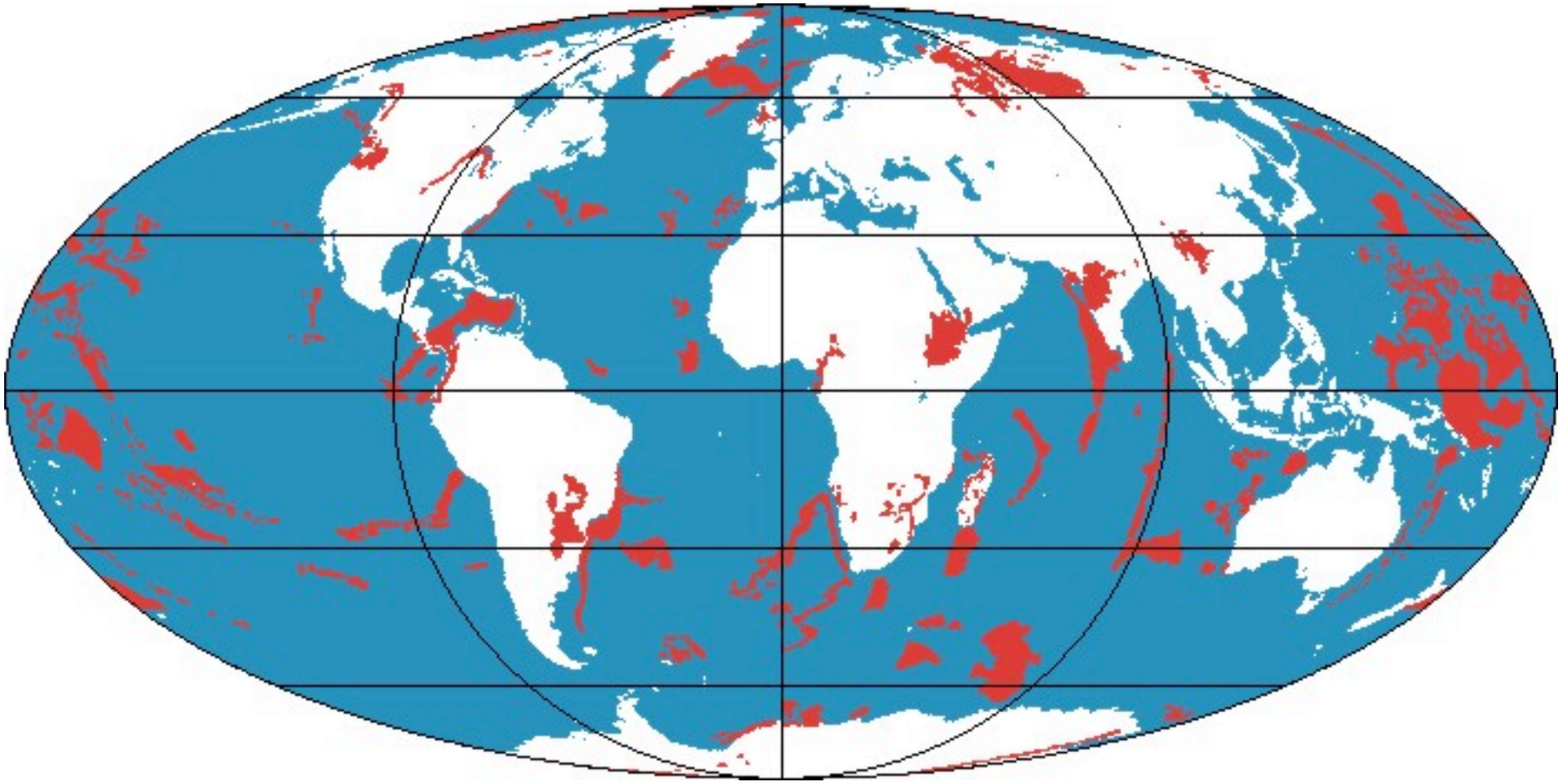


North America

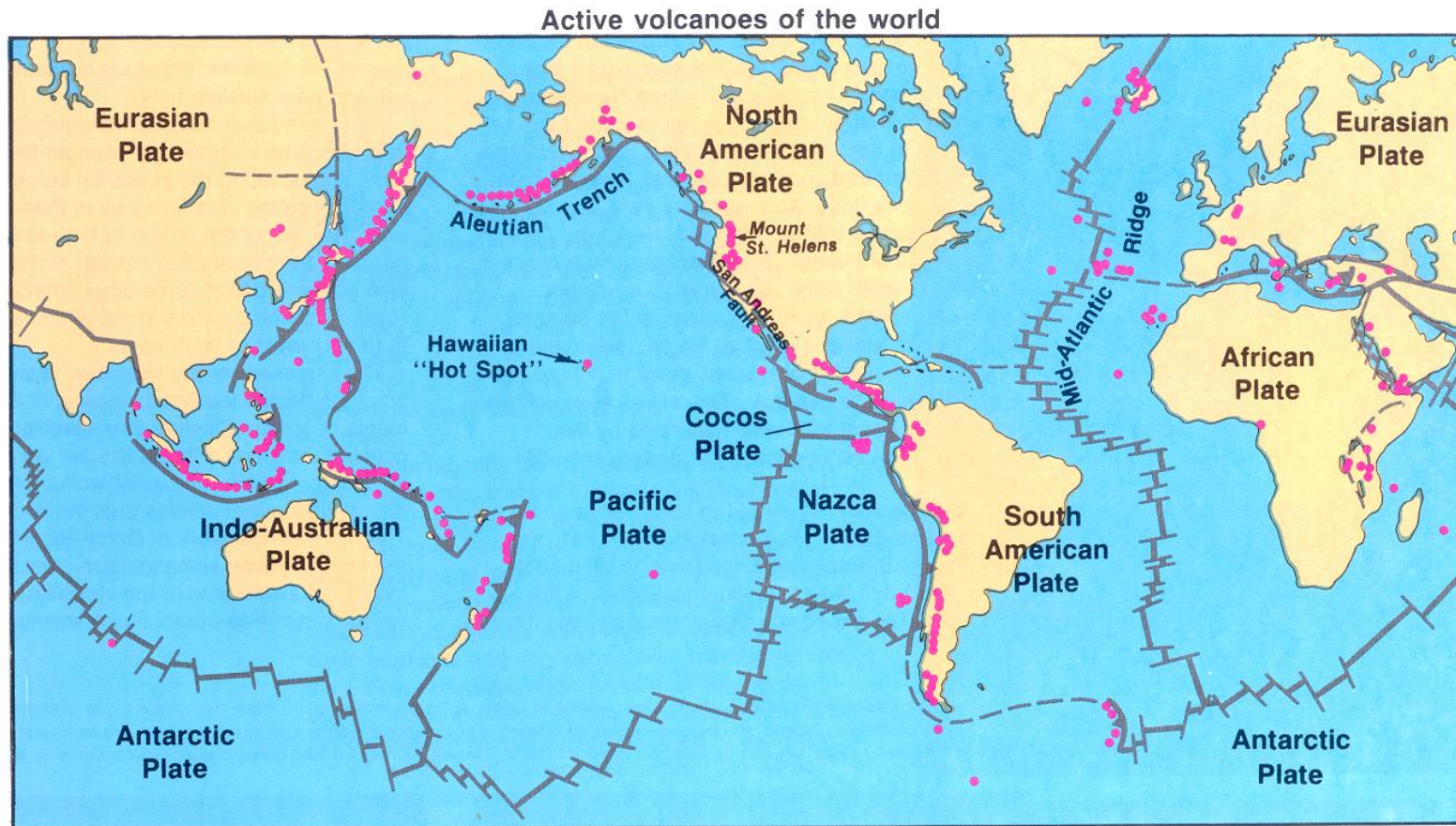
Europe



Large Igneous Provinces

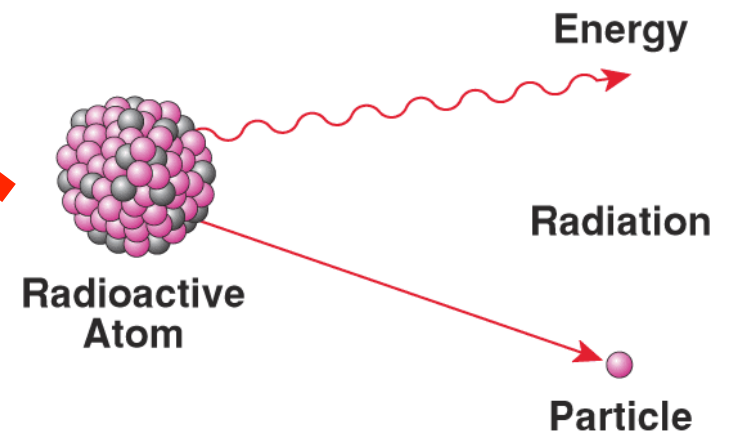
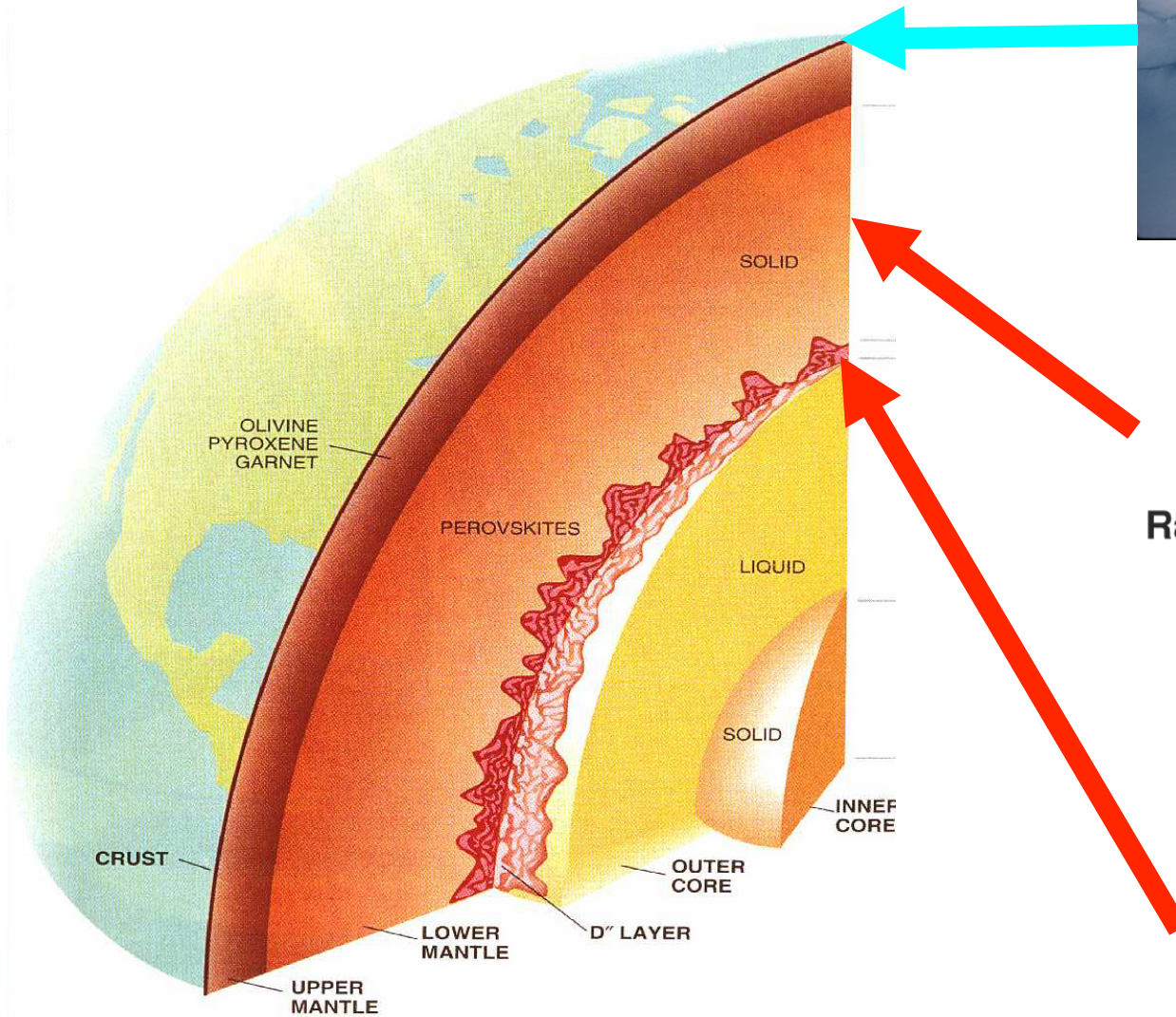


What are they?

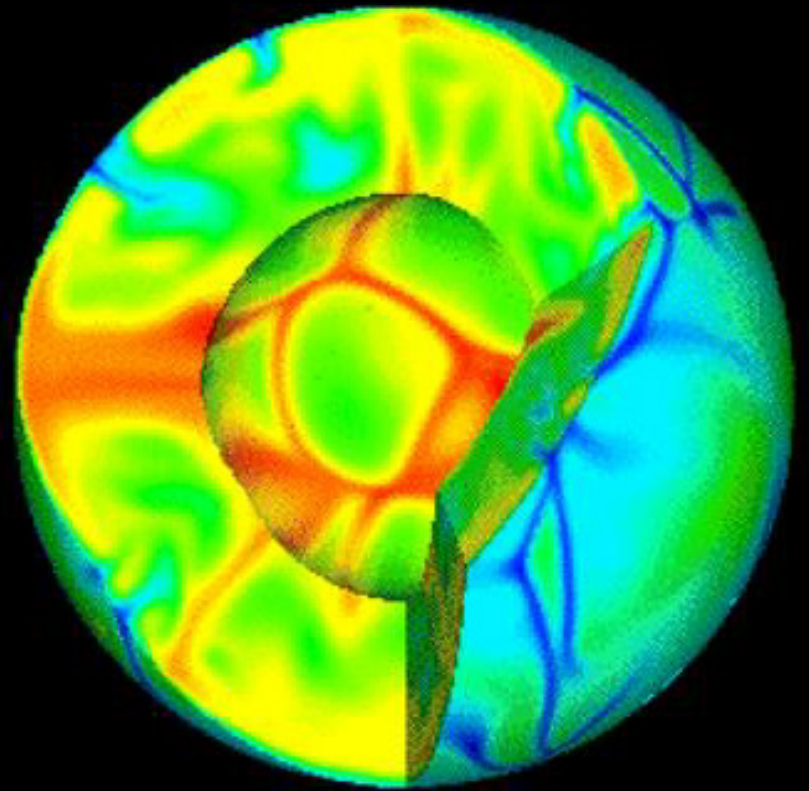


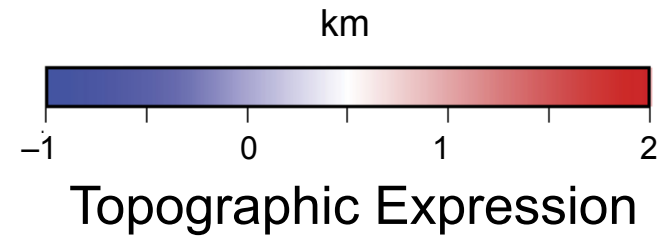
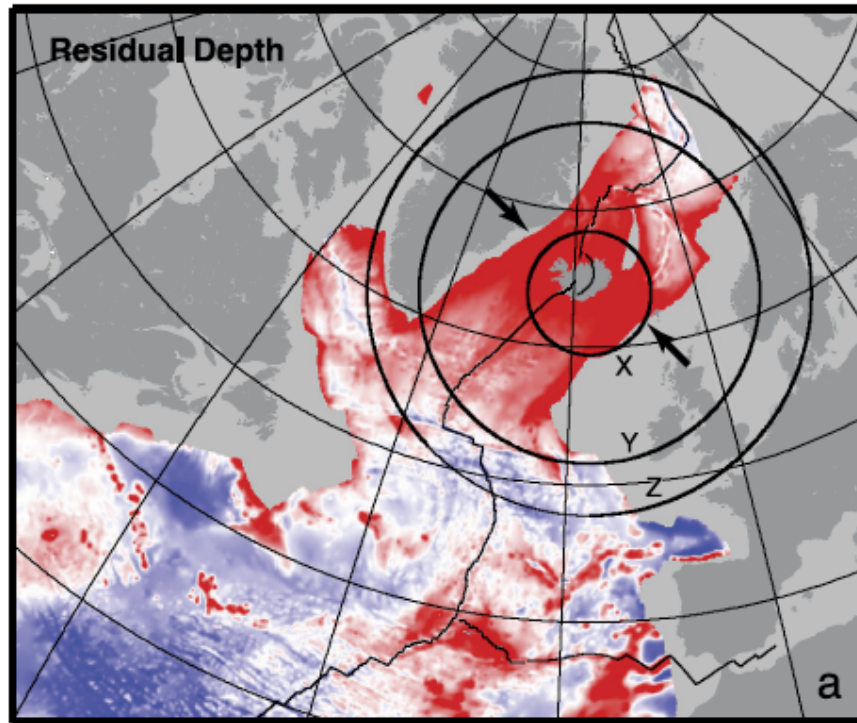
- Active volcanism confined to <0.5% of Earth's surface
- About 30 km³ magma on Earth produced each year
 - 70% in **mid-ocean ridges**
 - 20% in **subduction zones**
 - 10% in **within-plate settings** } Plate boundaries
- 10% erupted from volcanoes, 90% solidifies within the crust

Mantle

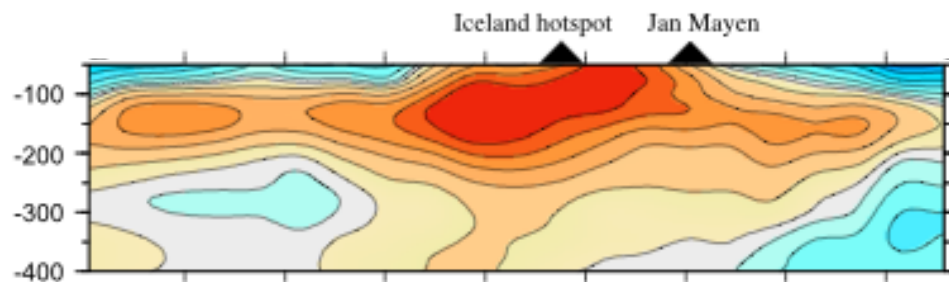


Mantle Convection



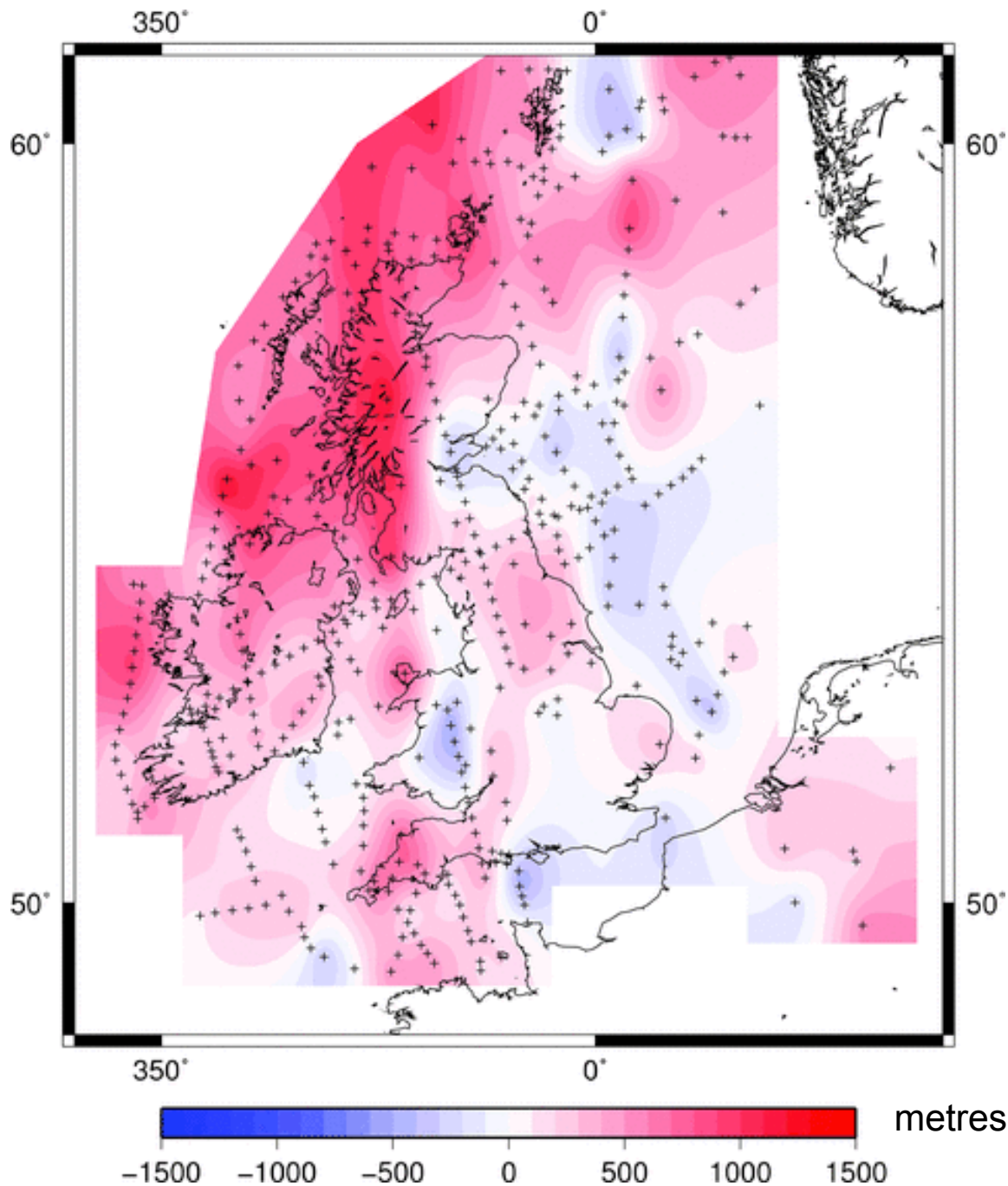


Mantle Plume Head



Seismic Cross-Section





“Dynamic
Support”

Lundy:
+500 m

Lundy, without mantle support



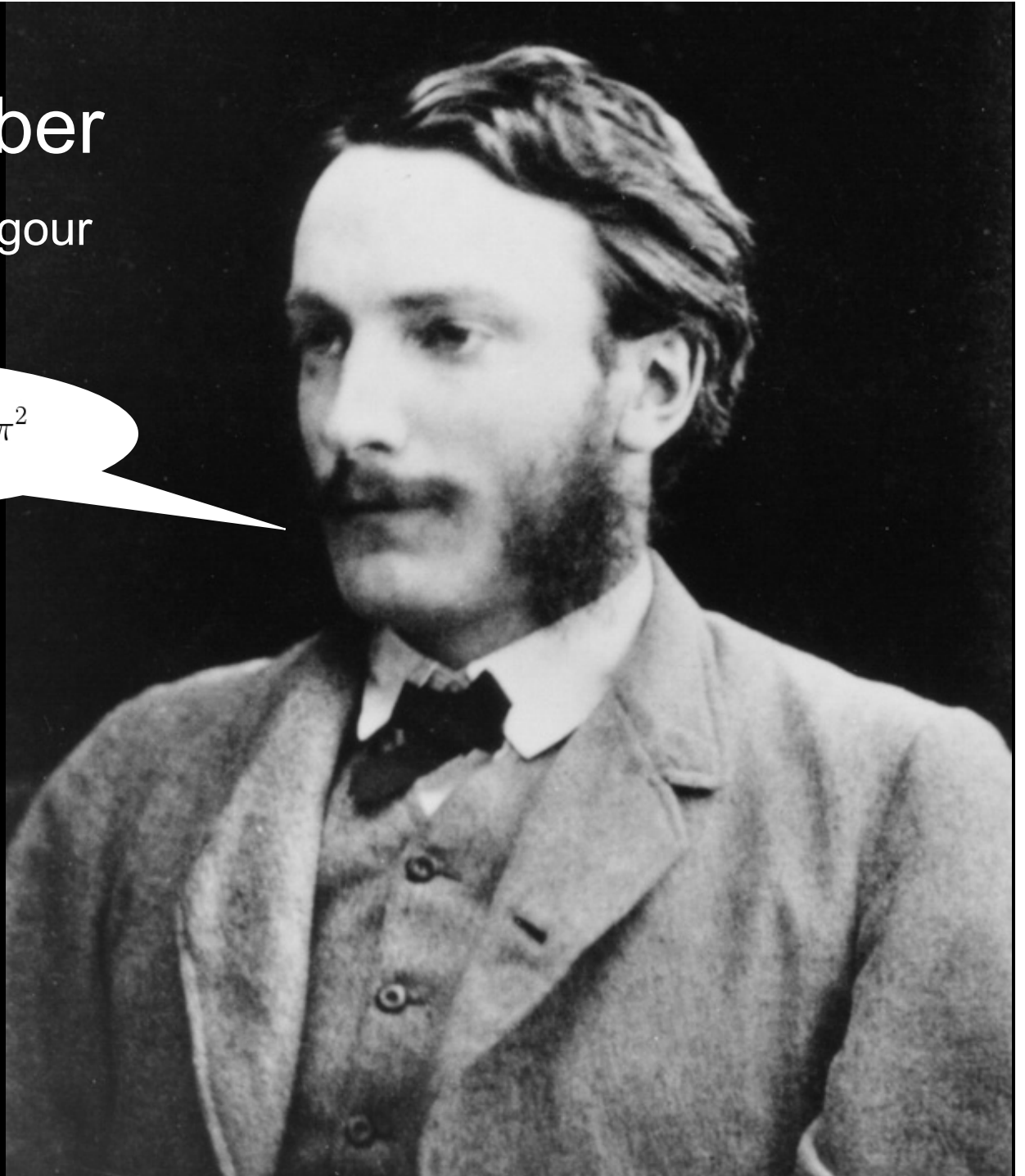


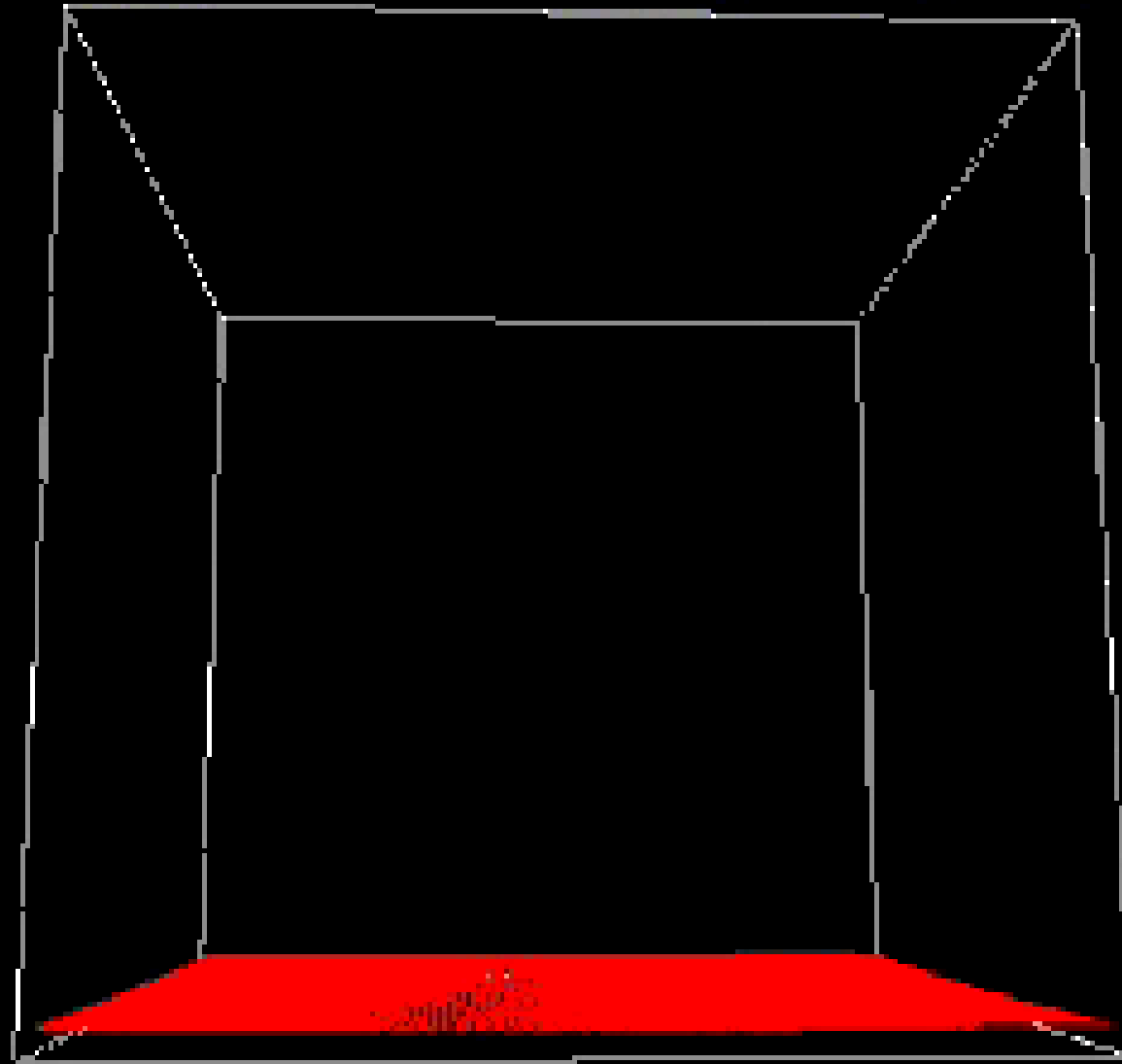
Rayleigh Number

Measures convective vigour

$$Ra = \frac{g \rho \alpha T a^3}{\kappa \eta} = \frac{\tau_c}{\tau_a} \pi^2$$

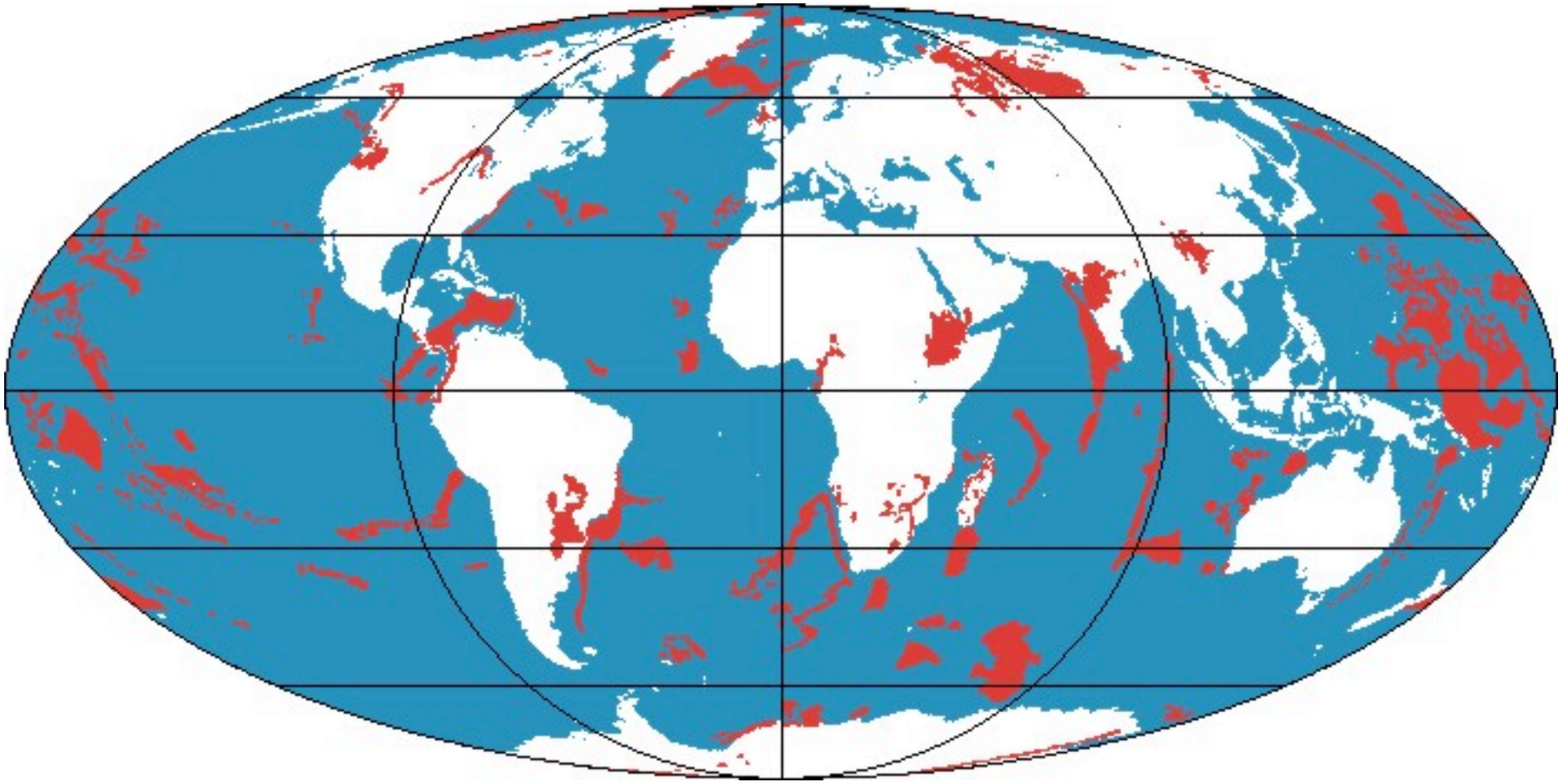
Lord Rayleigh (1842 - 1919)





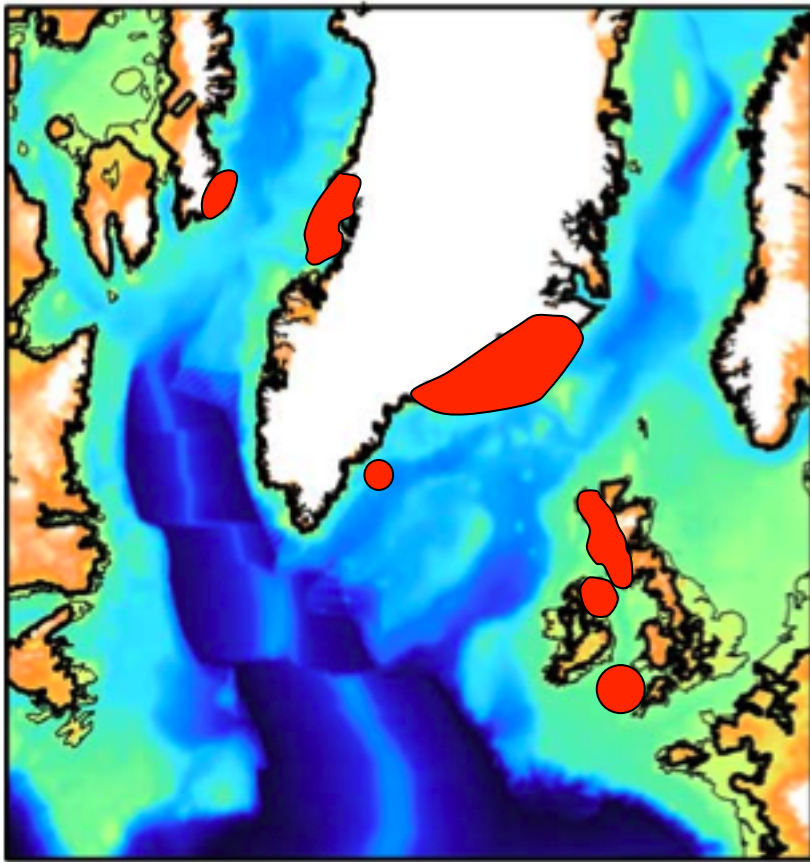
Time-Dependent (Blobby) Convection

Large Igneous Provinces



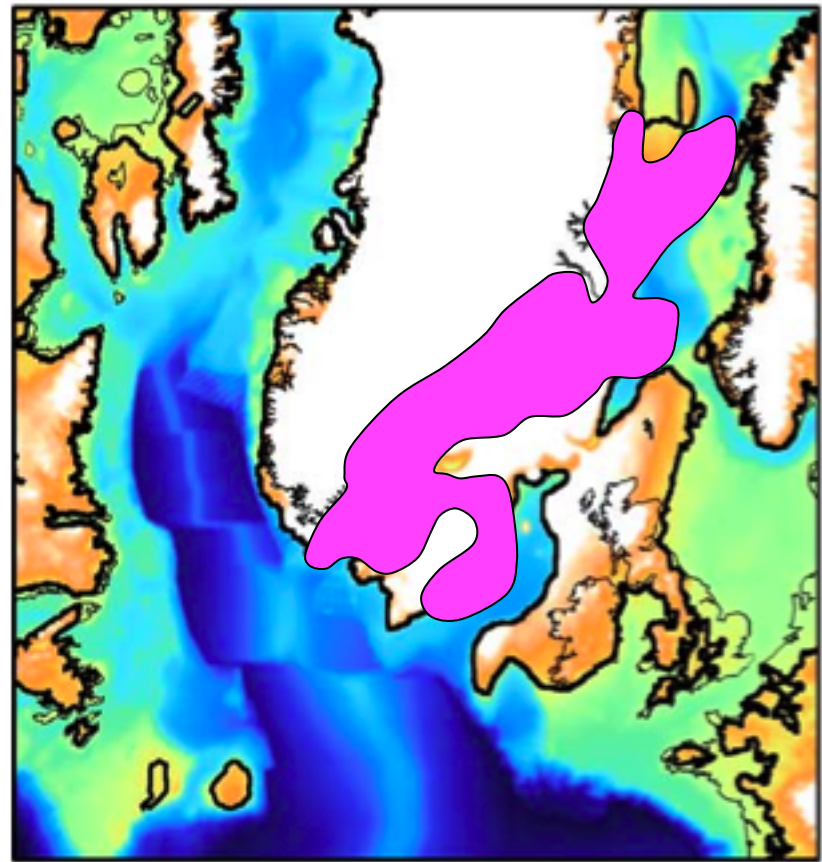
= “Starting Plume Heads”

Birth of the North Atlantic Igneous Province

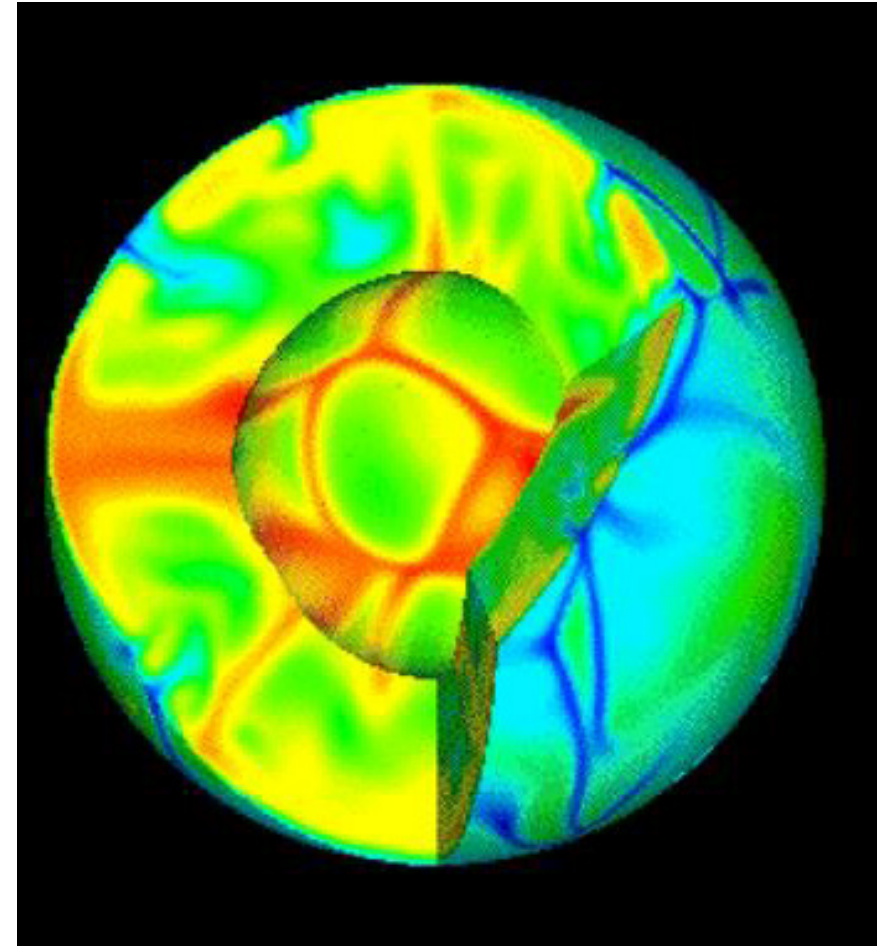
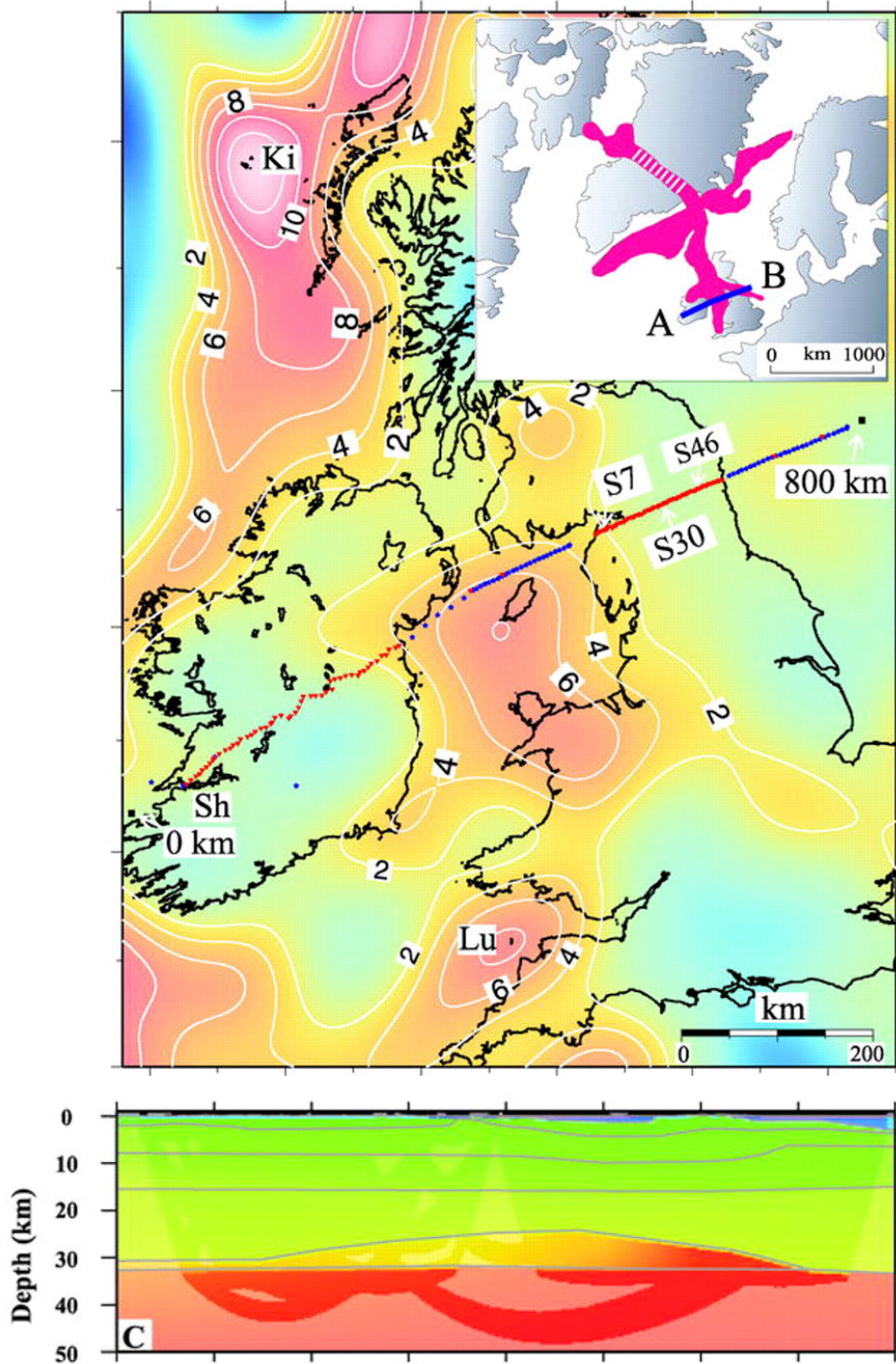


MacLennan & Jones, EPSL, 2006

~ 60 million years ago



~ 55 million years ago

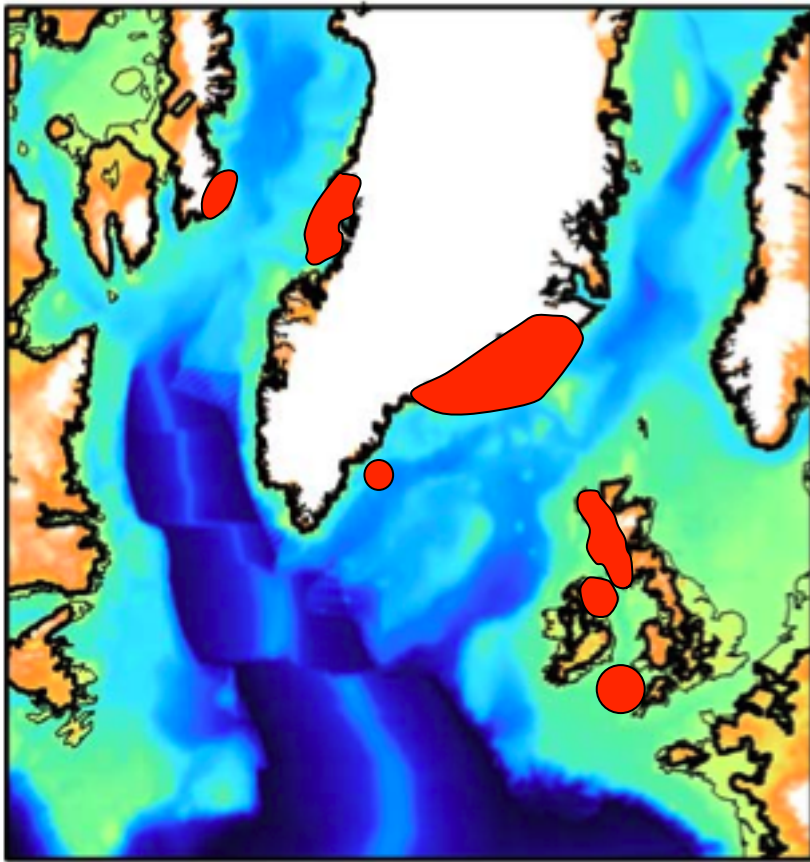


Lundy: South end of mantle convective spoke?



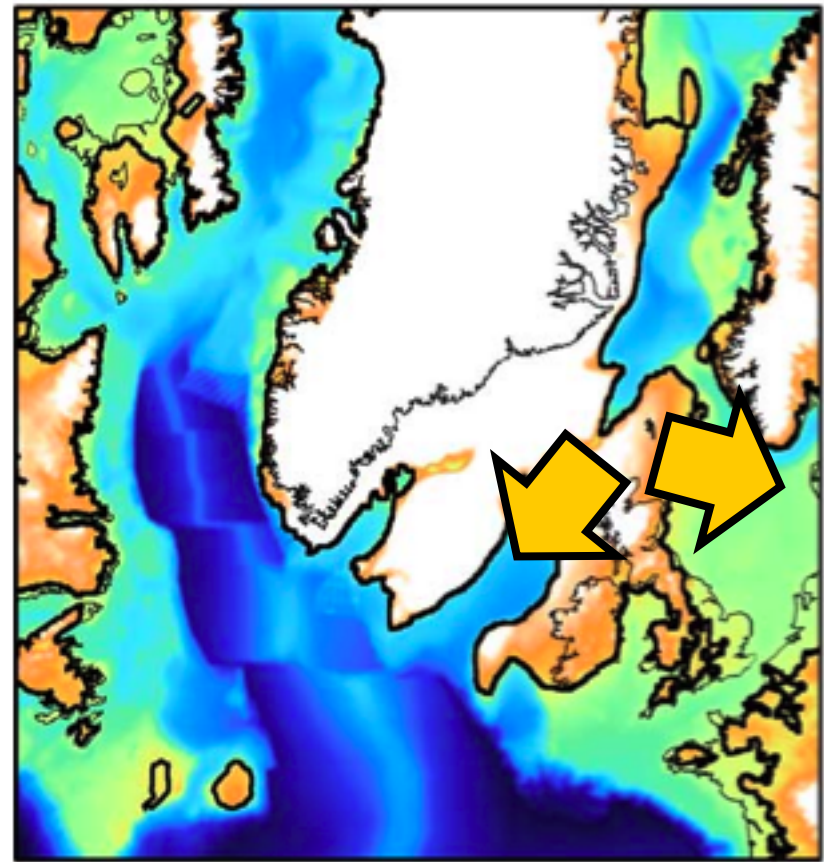


Uplift Increases Erosion



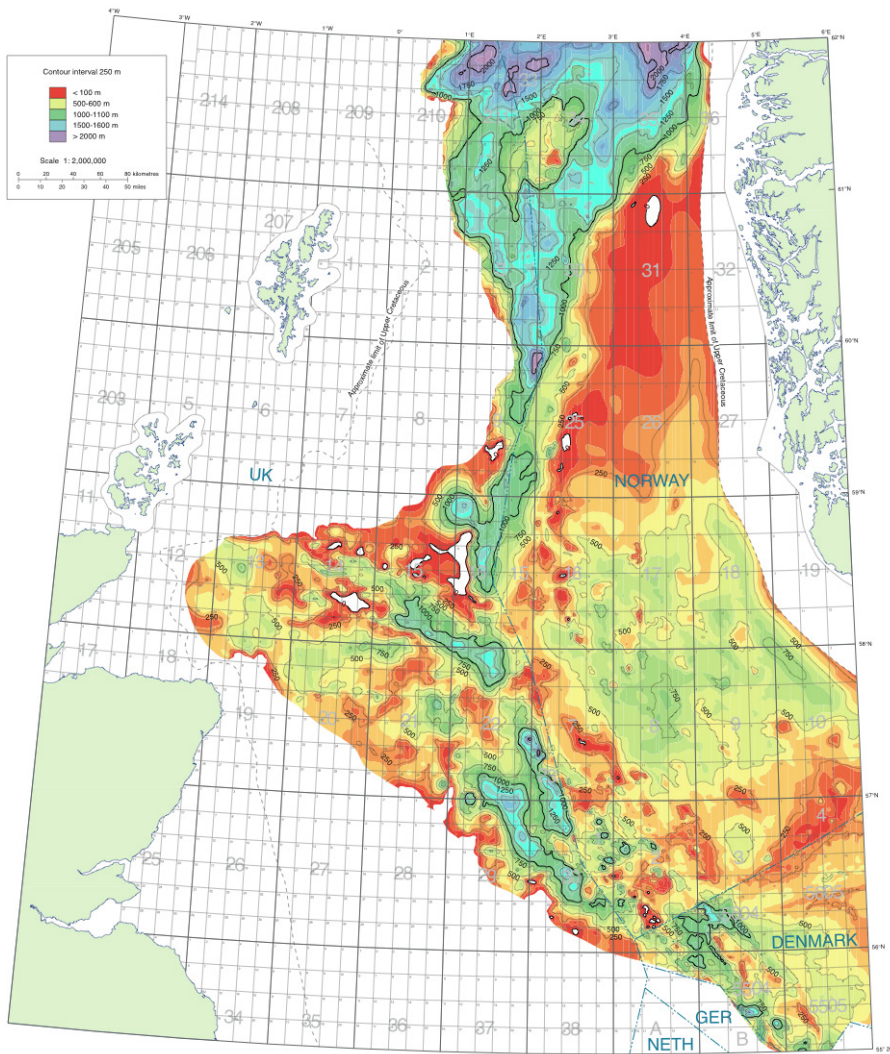
60 million years

Lundy
volcano
active

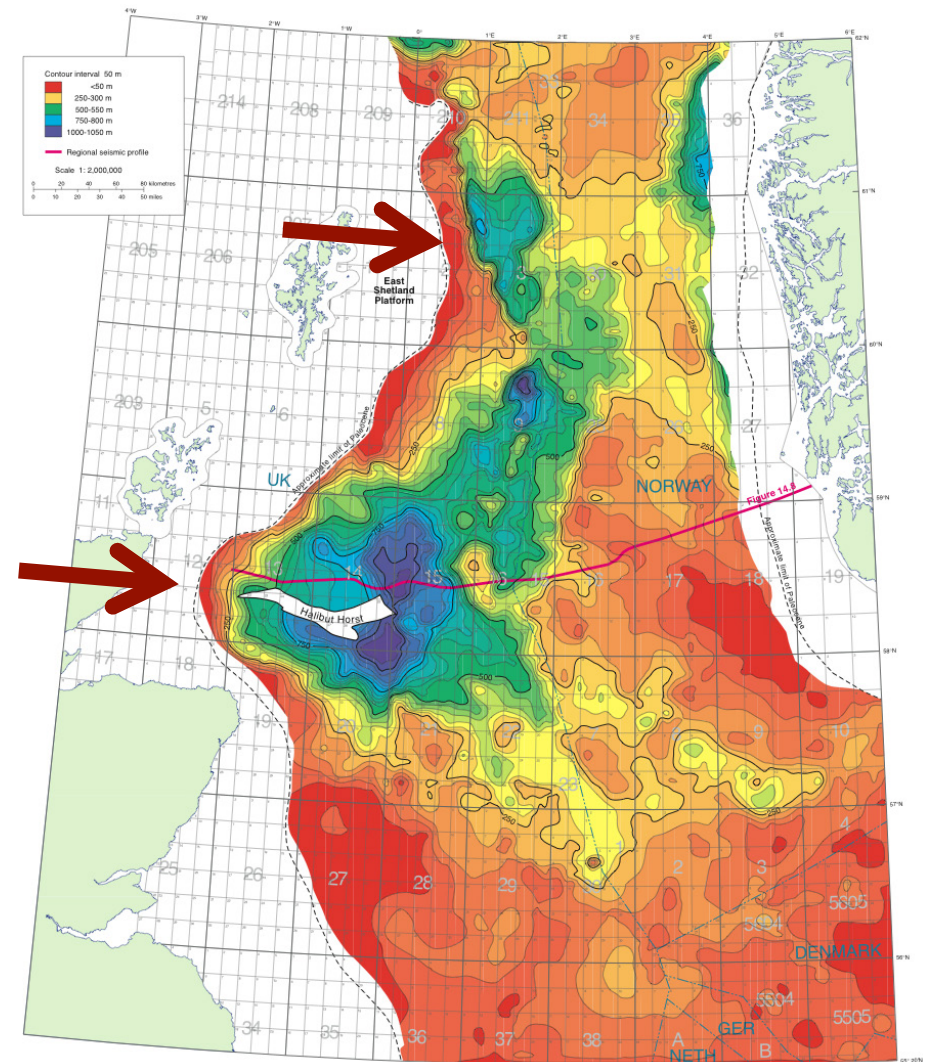


55 million years

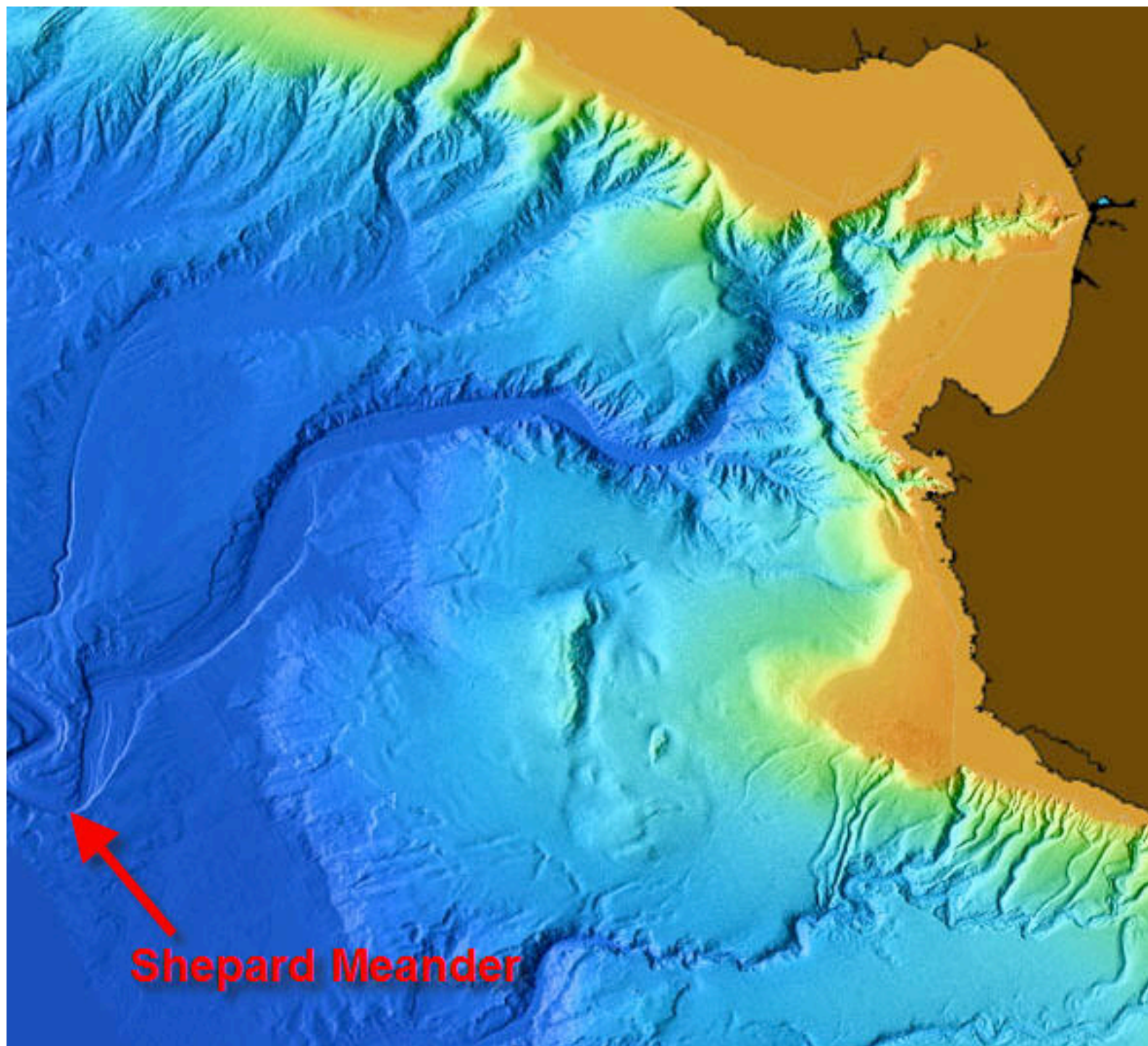
Uplift Increases Sediment Accumulation



Upper Cretaceous: ~ 50 million years



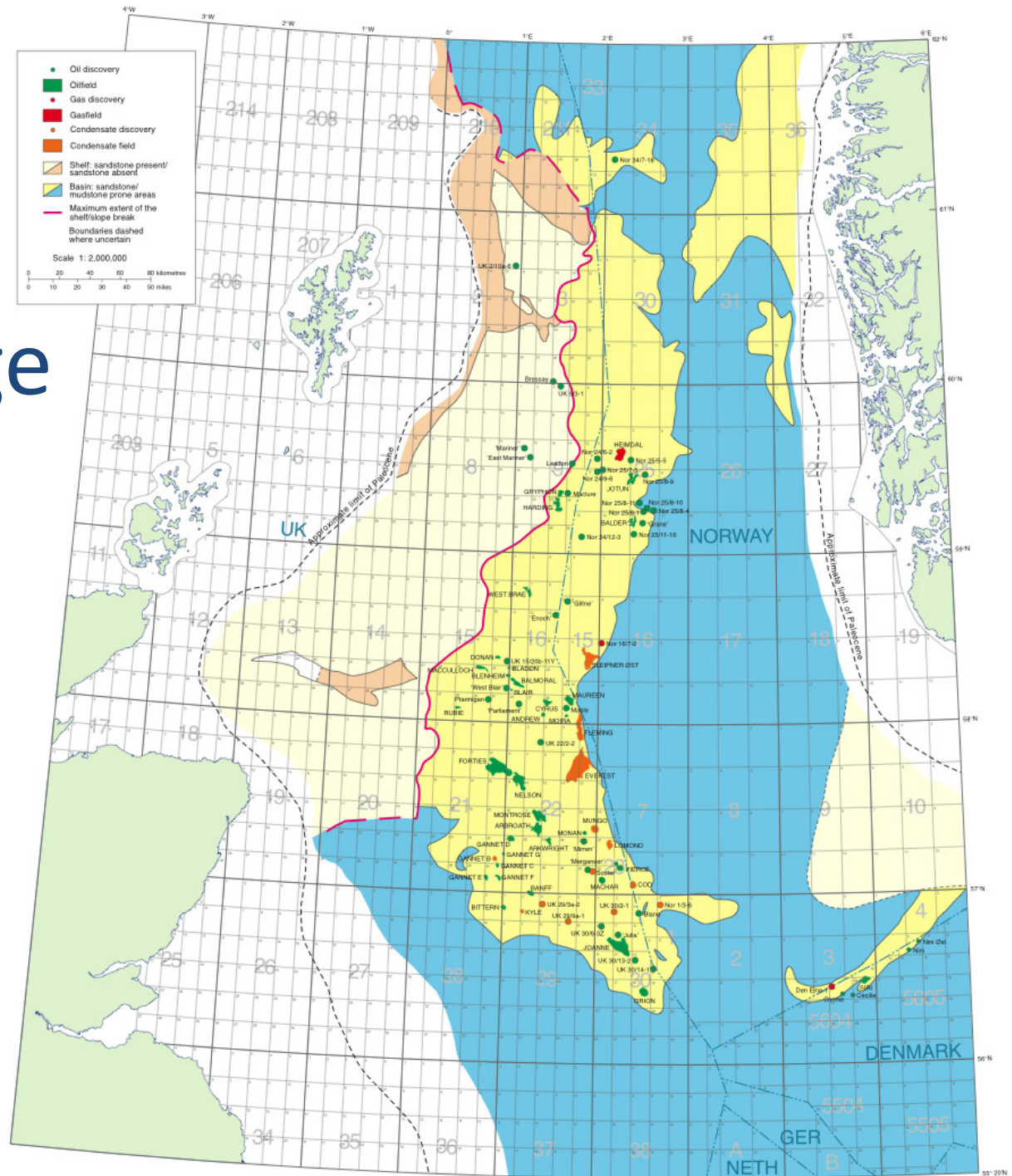
Paleocene: ~ 10 million years



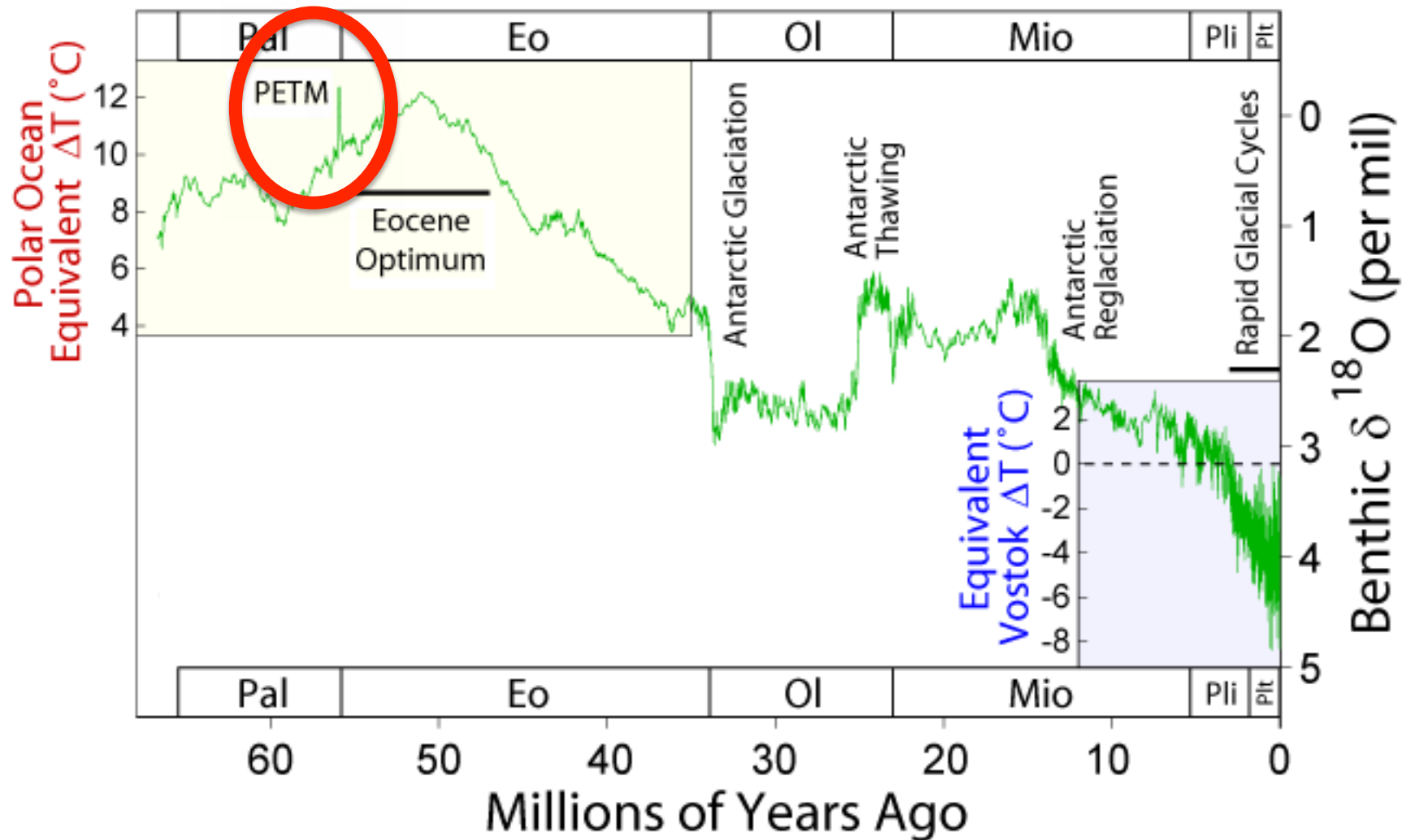
North Sea Oil Fields of Lundy's Age

Oil: 5859 million barrels

Gas: 7764 trillion cu feet



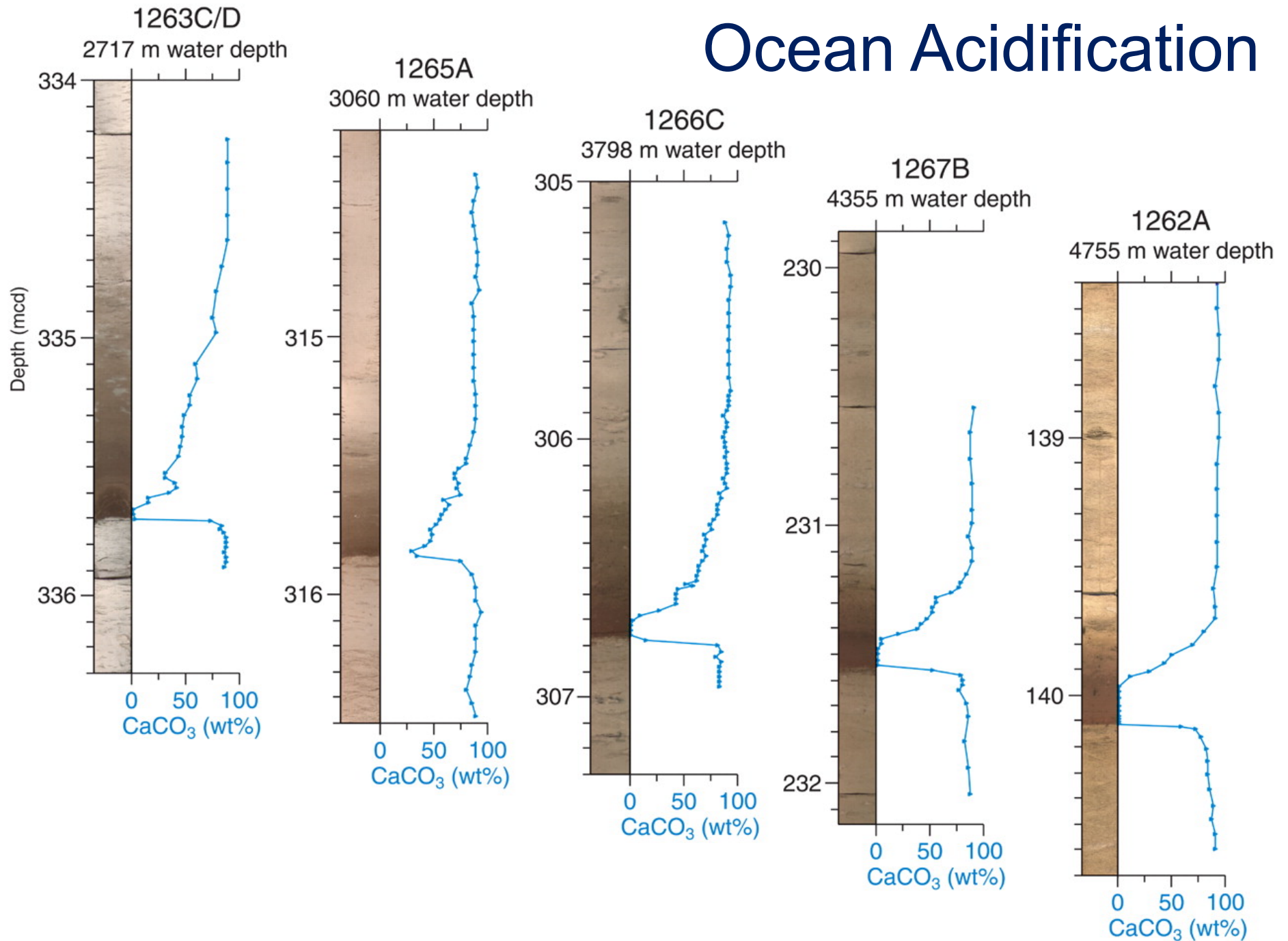
65 Million Years of Climate Change



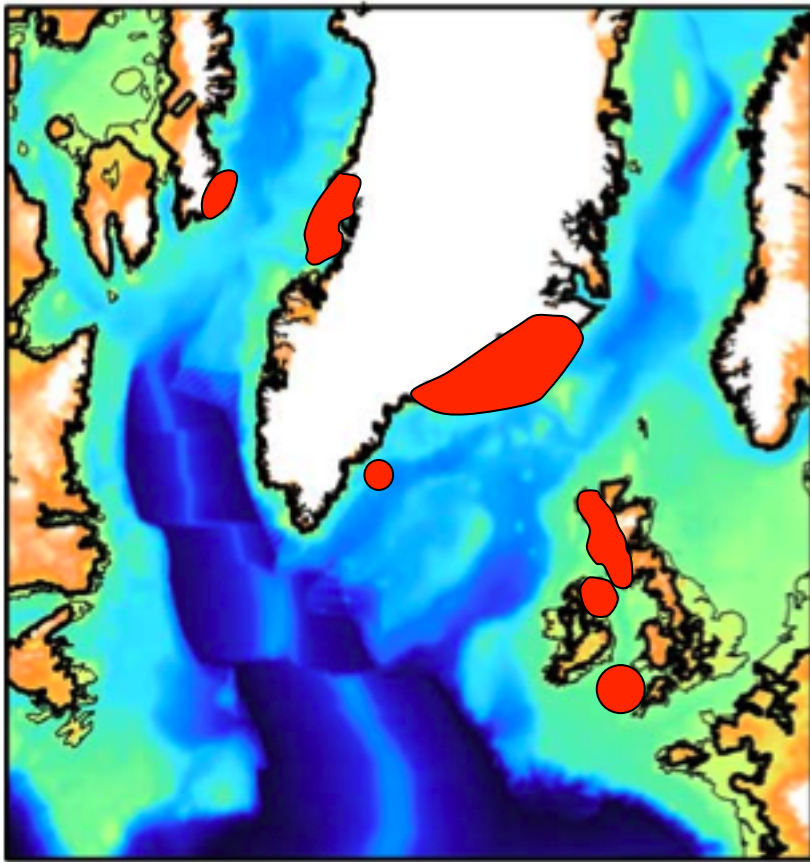
McInroy, D © ECORD/IODP



Ocean Acidification

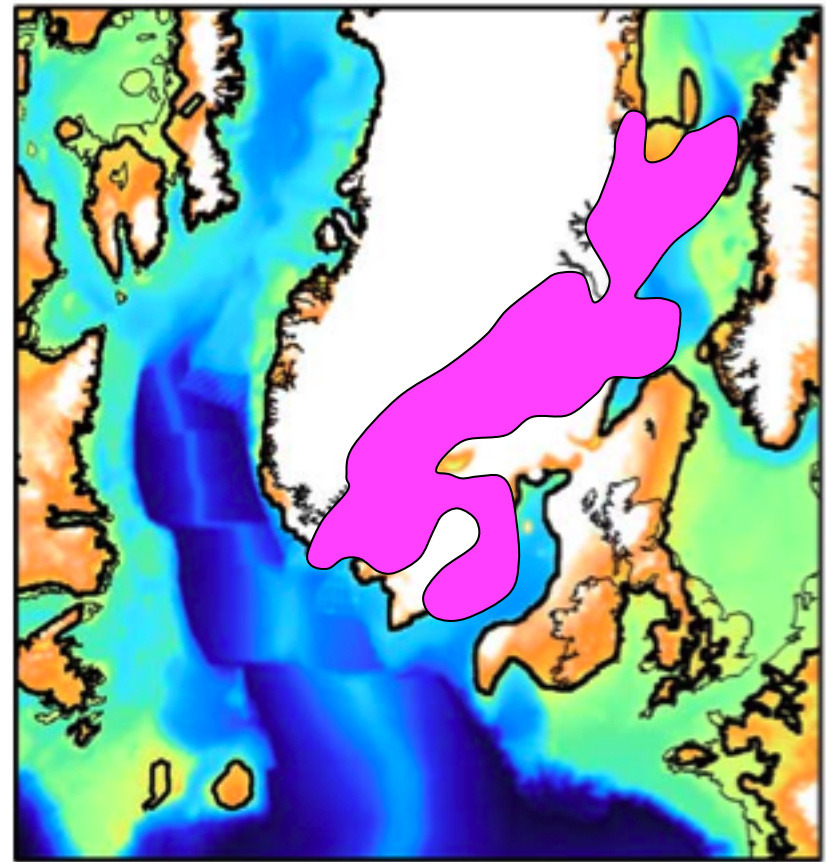


Birth of the North Atlantic Igneous Province



60 million years

Lundy
volcano
active



55 million years

− 40 °C

− 18 °C

− 61 °C



+ 510 °C

+ 33 °C

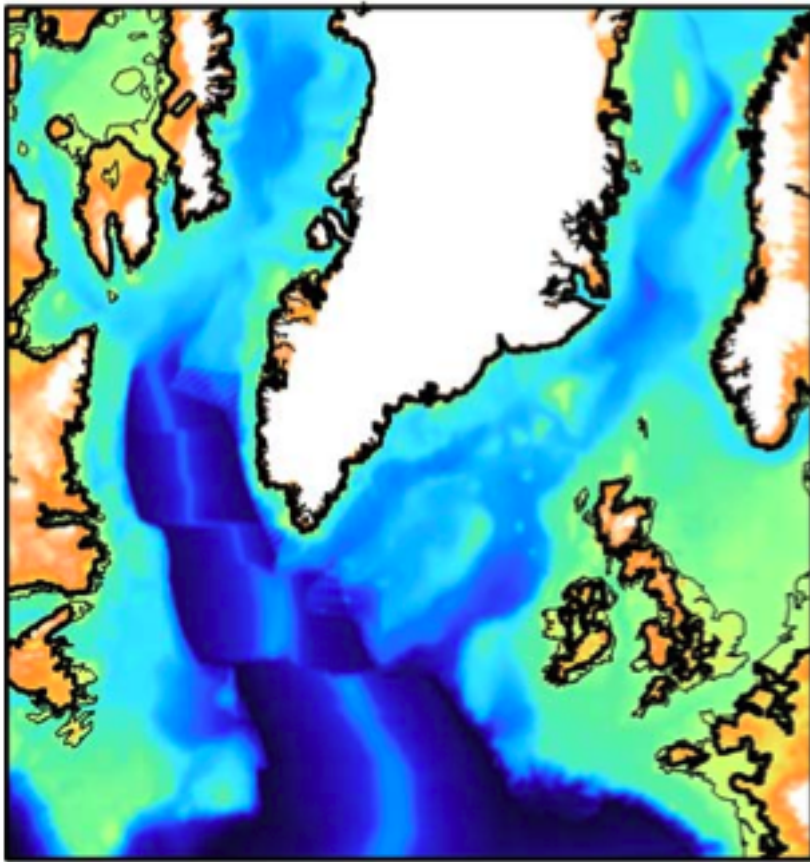
+ 6 °C



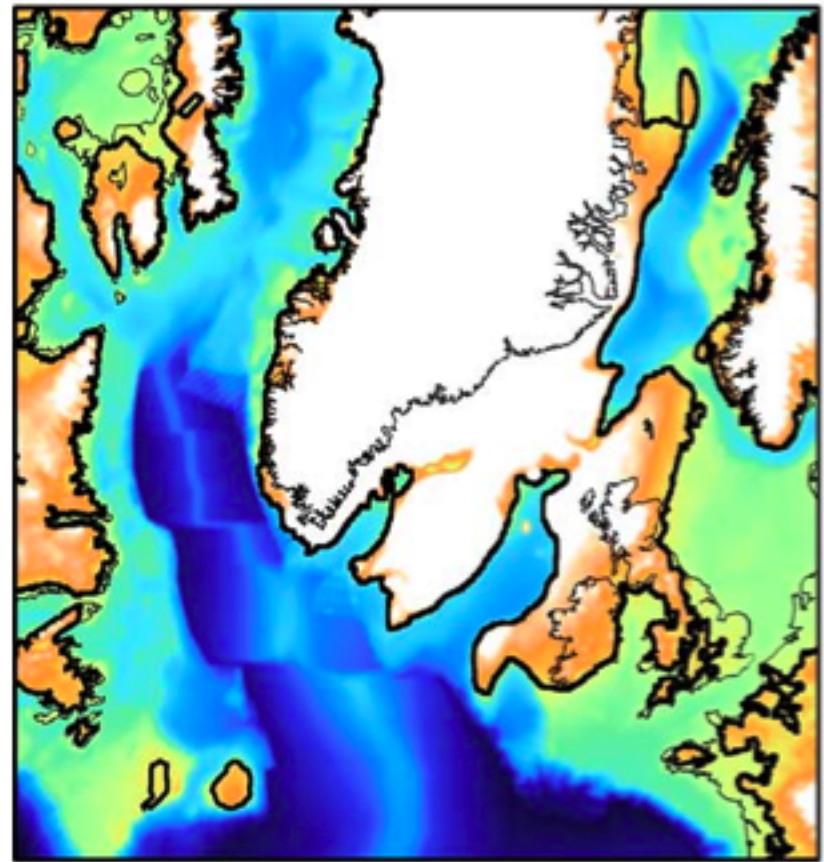
Methane
Hydrate



Methane Hydrate Released by Uplift?



60 million years

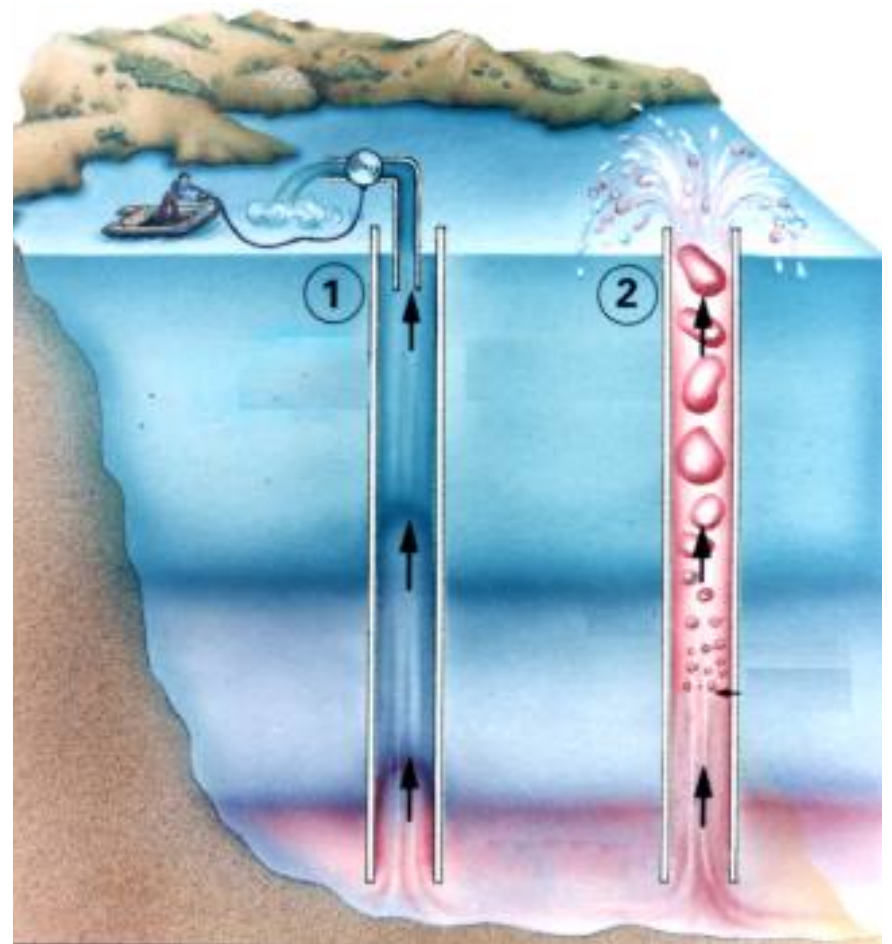


55 million years

Lundy
volcano
active

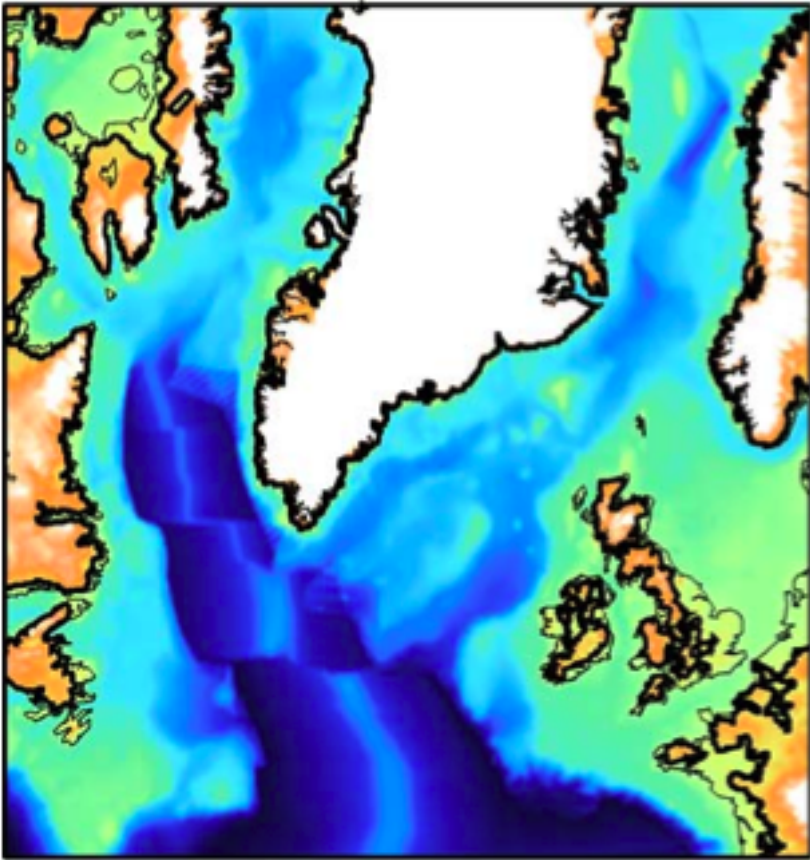


Lake Nyos

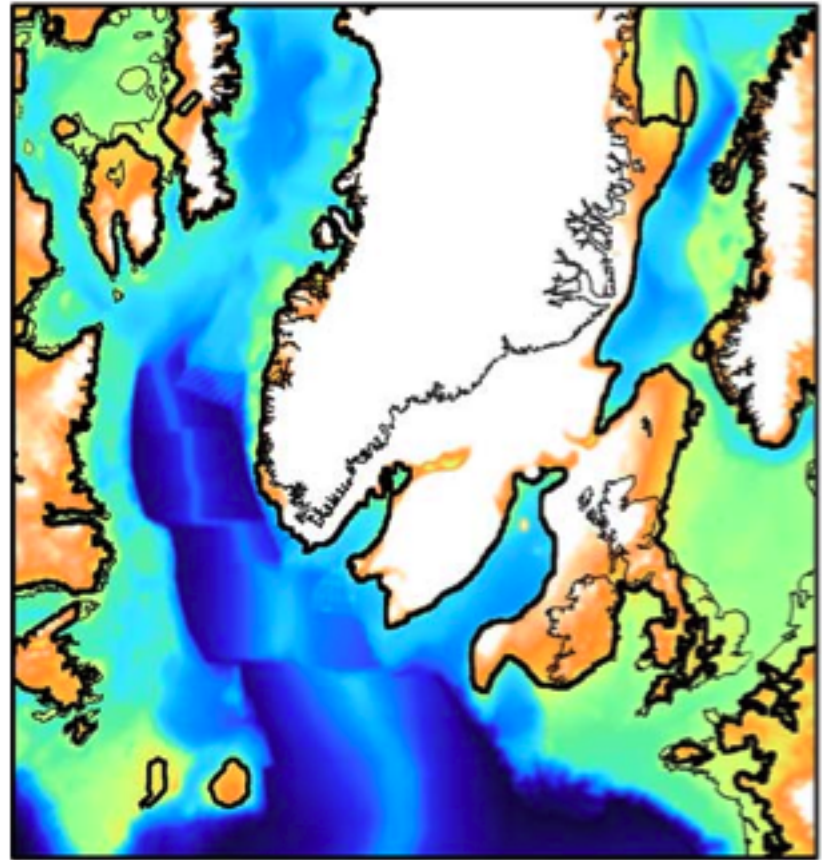


Stores CH_4 and CO_2

An Ancient Lake Nyos?

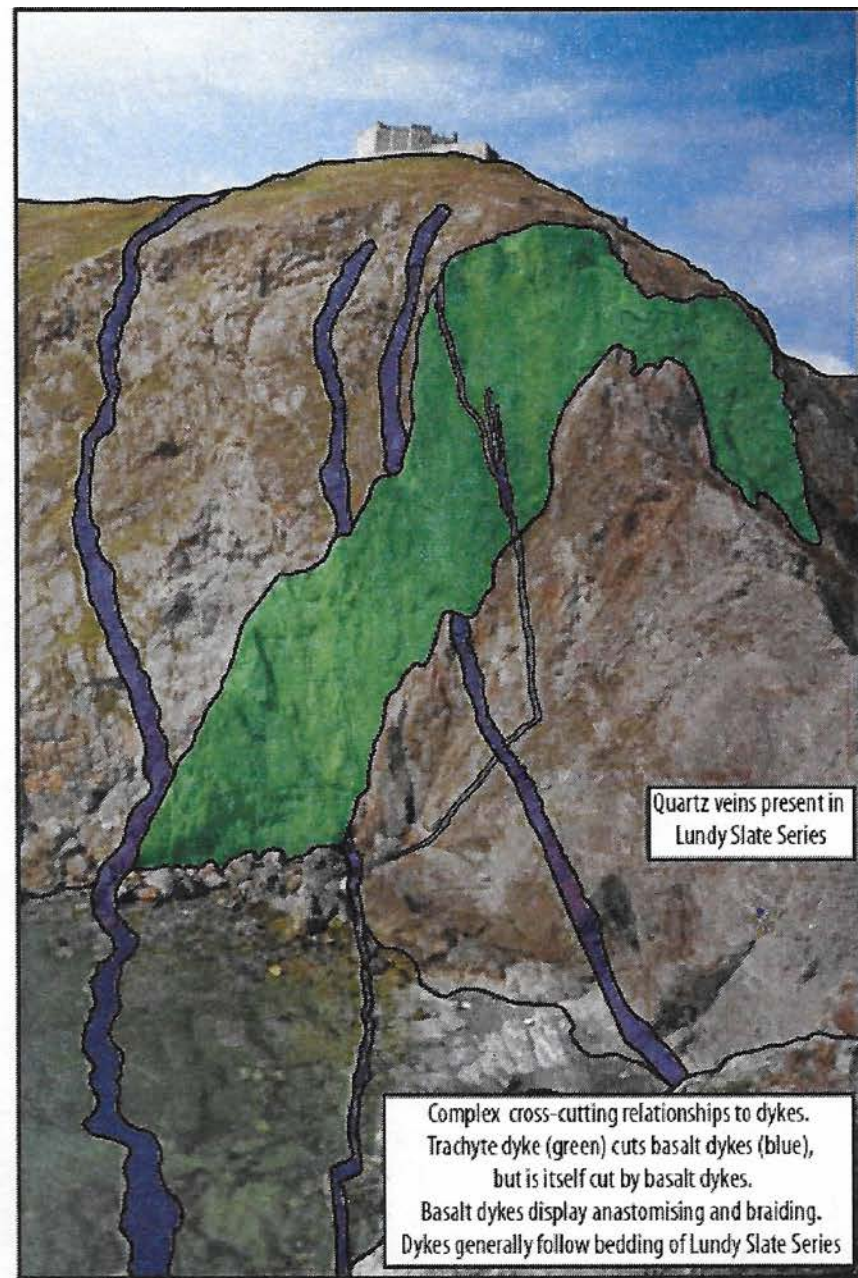
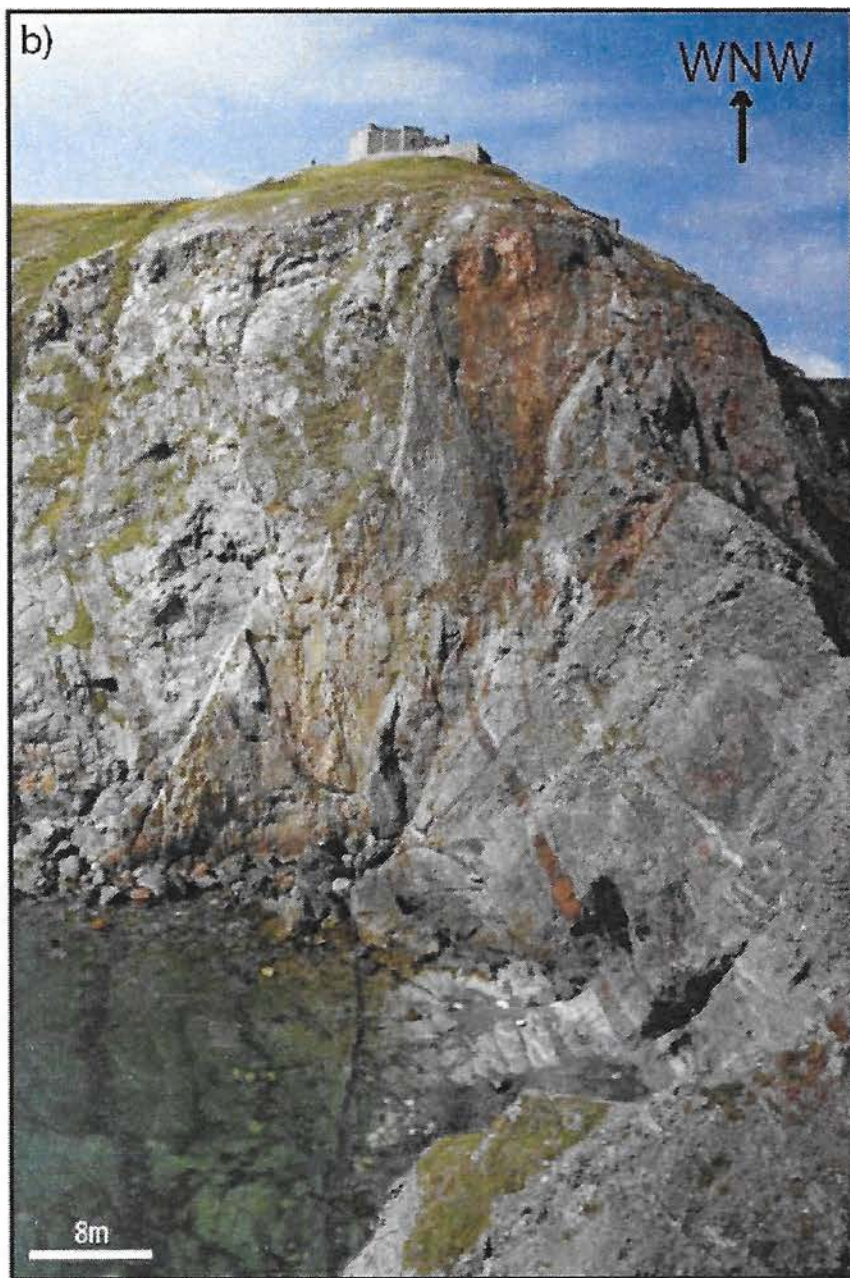


60 million years

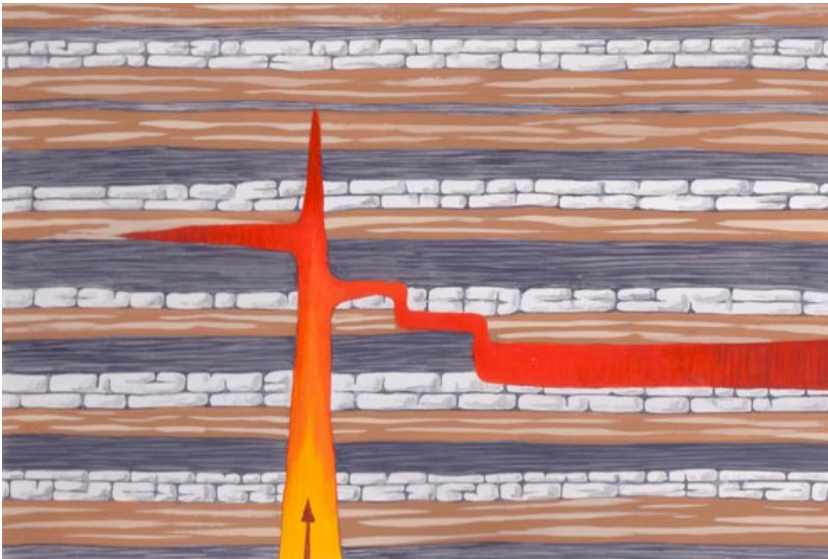


Lundy
volcano
active

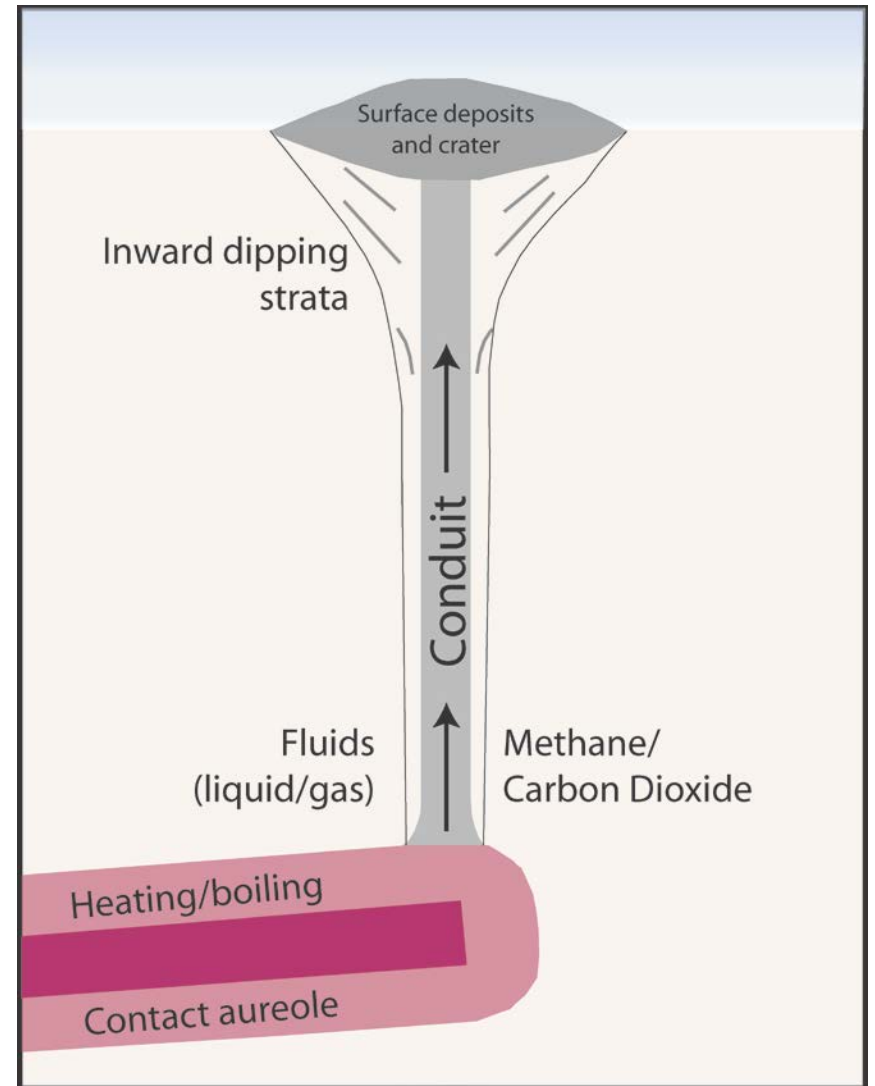
55 million years



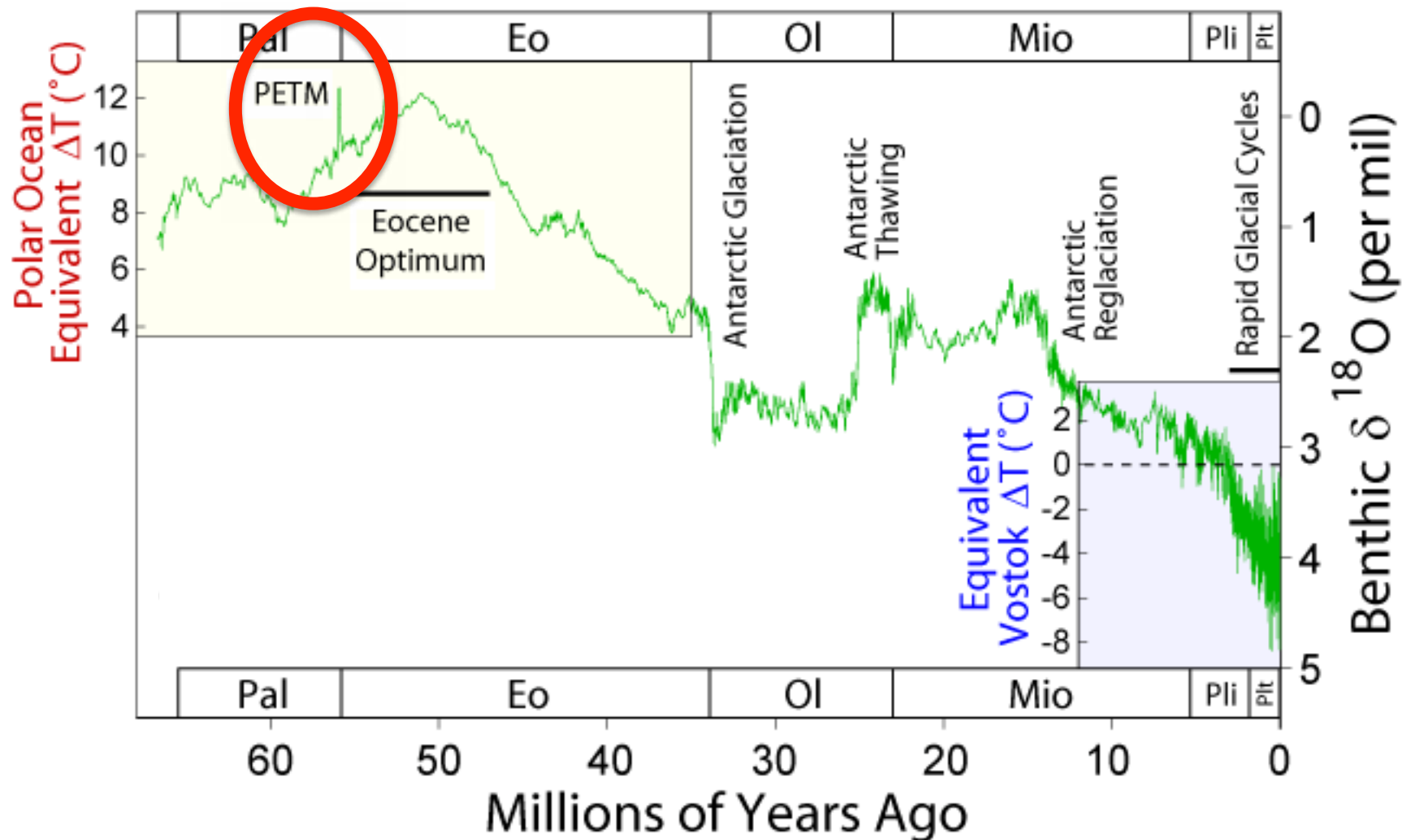
Magma Cooks Rock

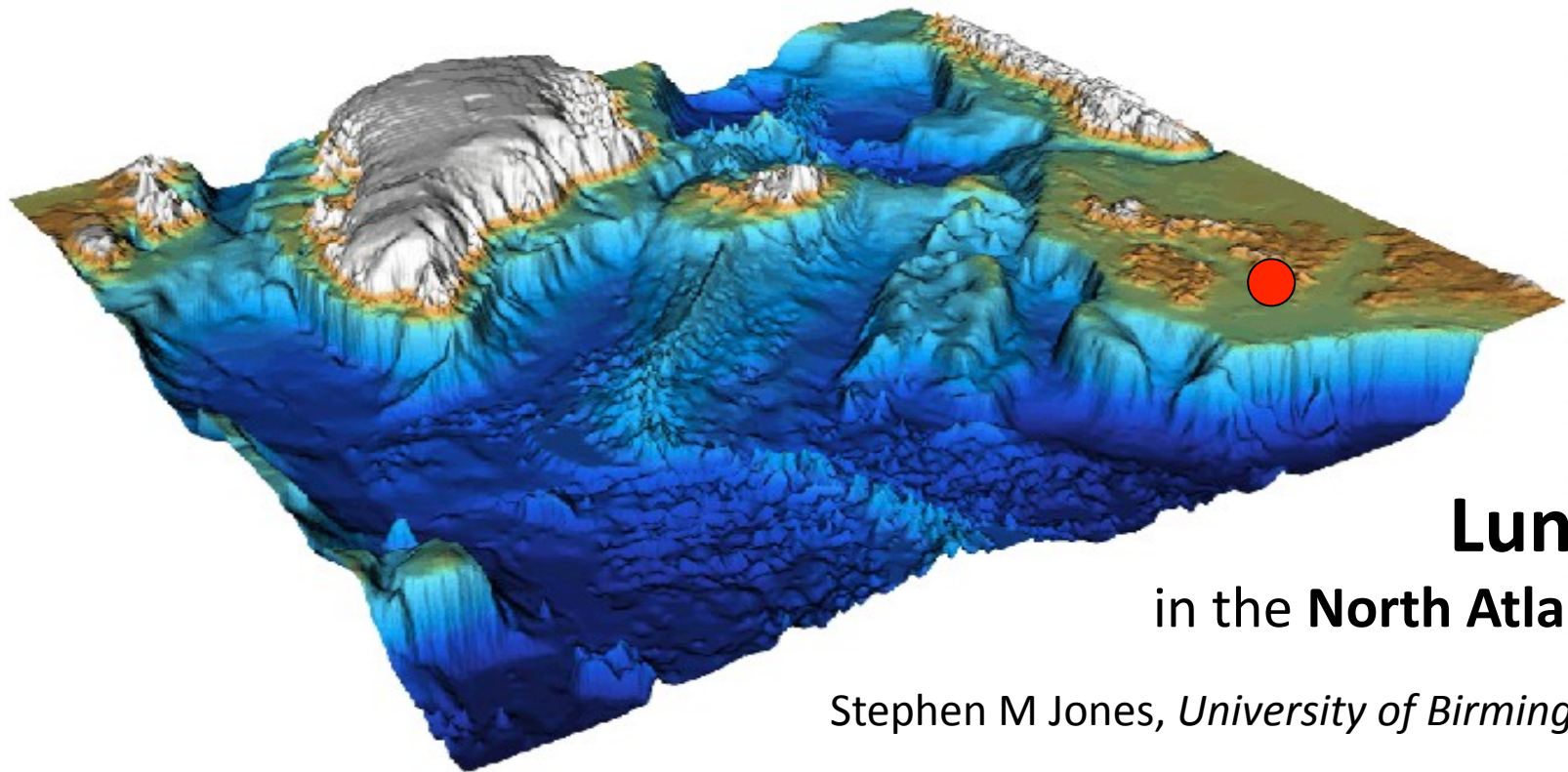


Generates Methane



North Atlantic Igneous Province & Climate Change





Lundy in the **North Atlantic**

Stephen M Jones, *University of Birmingham*

