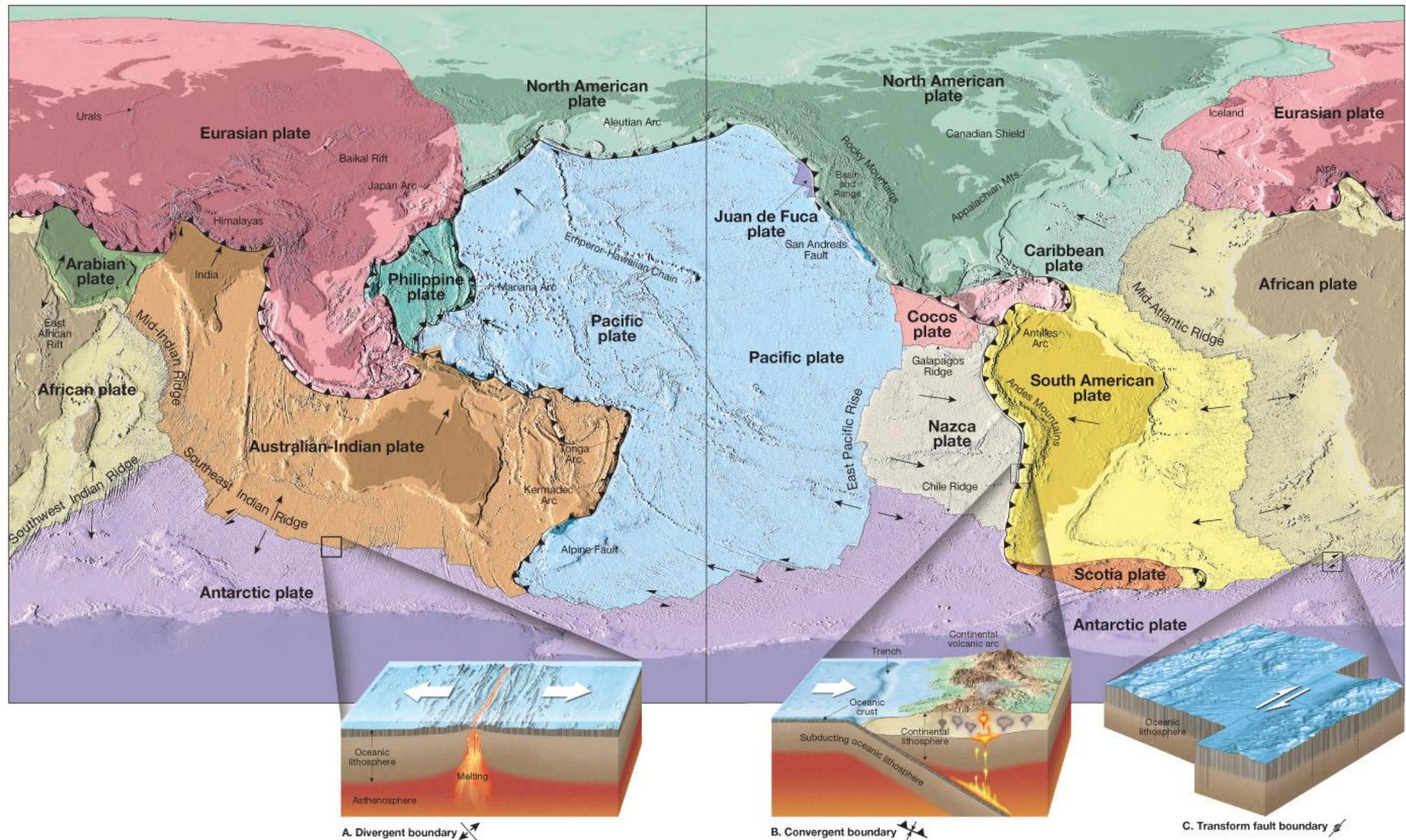


A wide-angle photograph of a fjord at sunset. The sky is filled with soft, warm orange and yellow hues, transitioning into cooler blues and purples. The fjord's water reflects these colors. On either side of the narrow inlet are steep, rugged mountains covered in dense green forests. In the foreground, a winding road cuts through the greenery, leading towards the town at the base of the fjord. The overall atmosphere is serene and majestic.

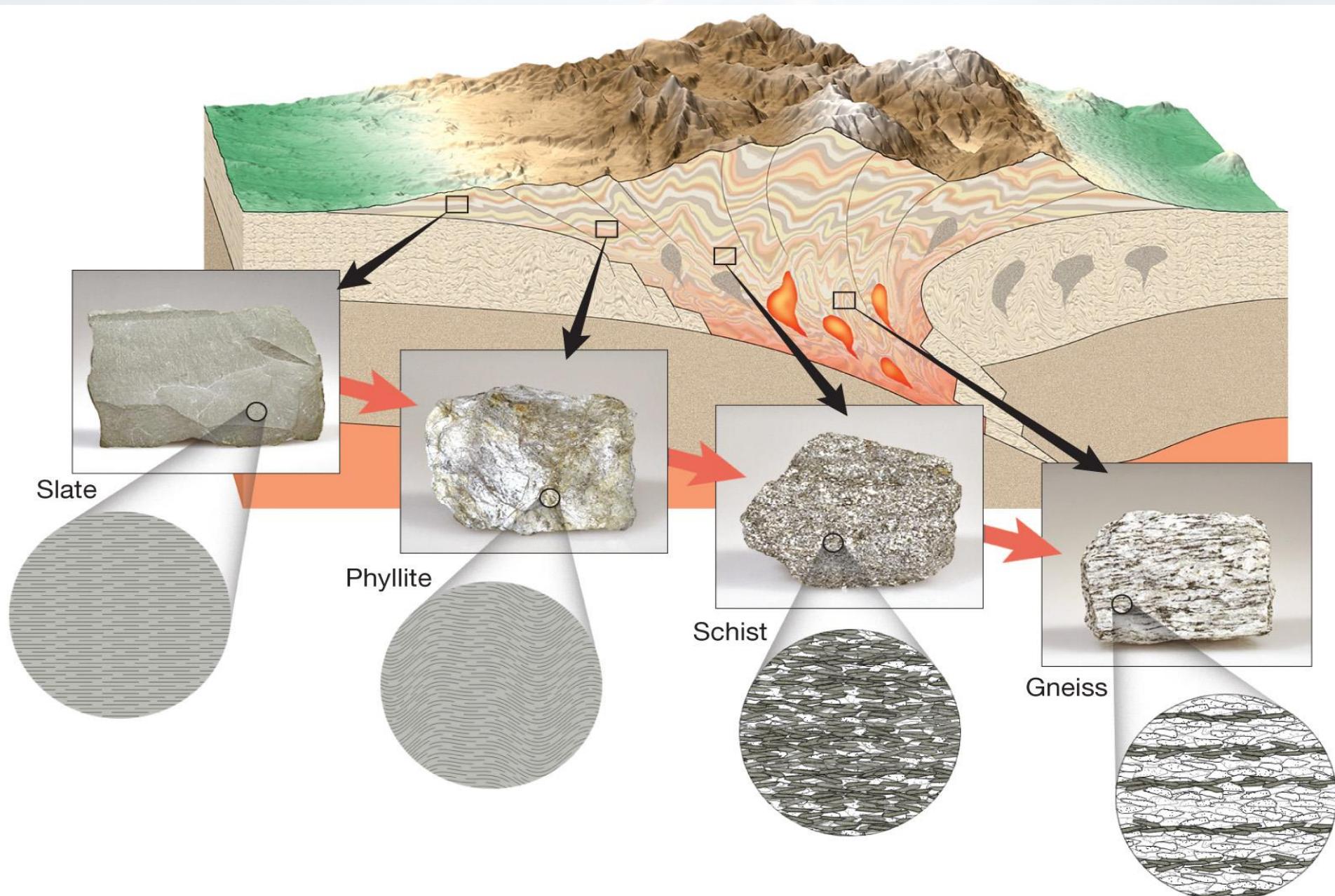
# GY4051 Earth Science and Society

*The Rise and Fall of the Caledonian Mountains*













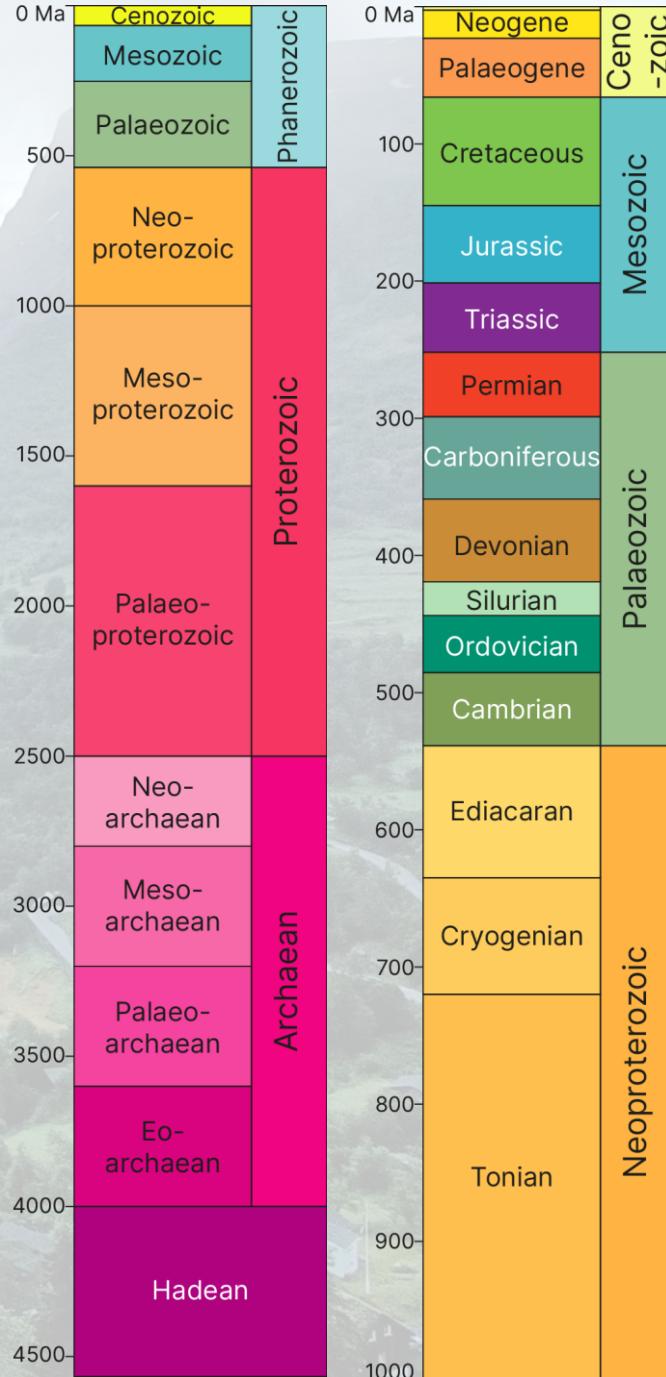
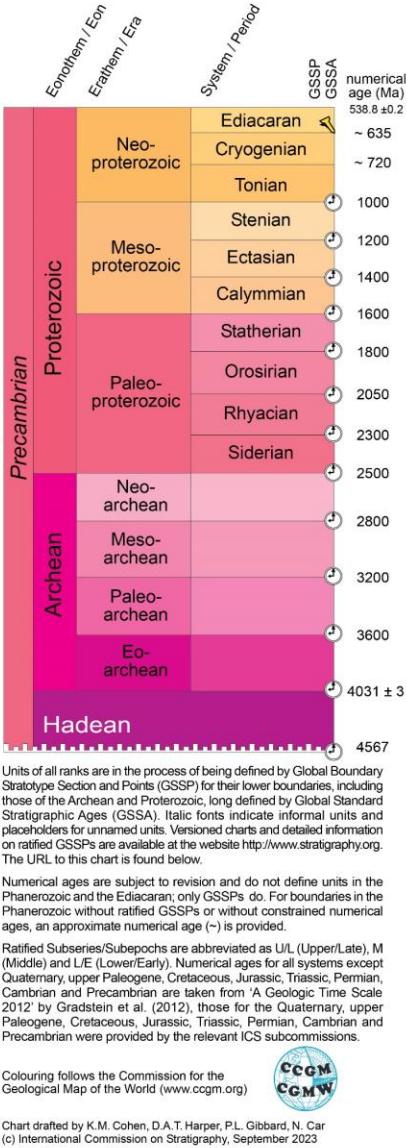
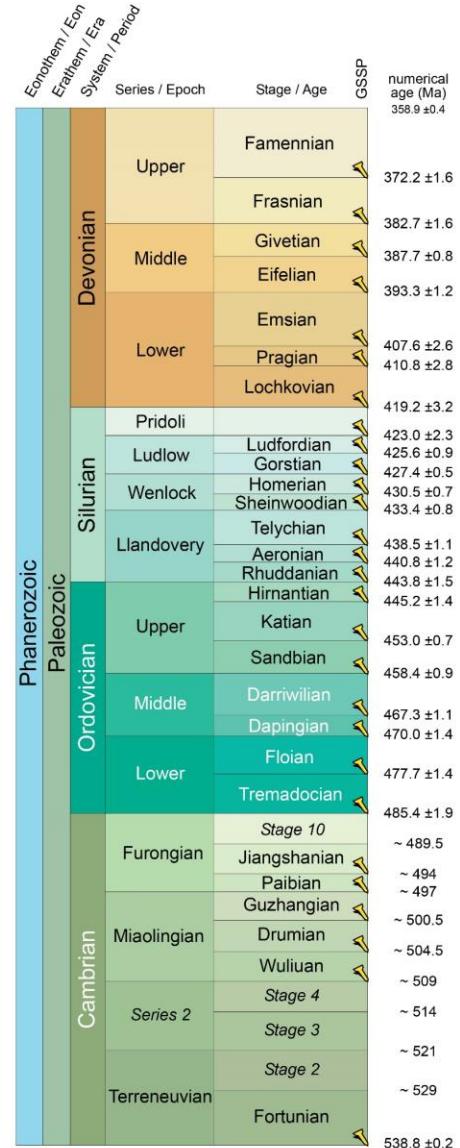
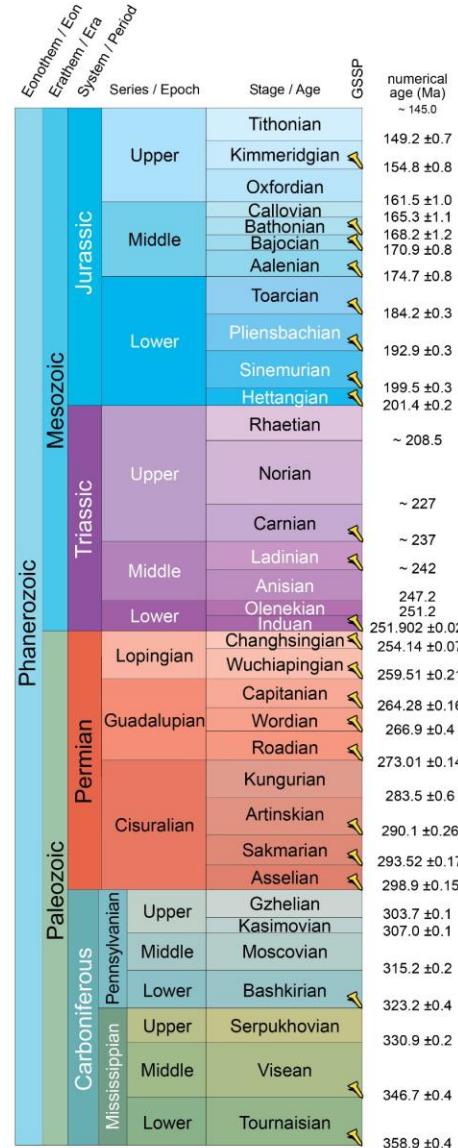
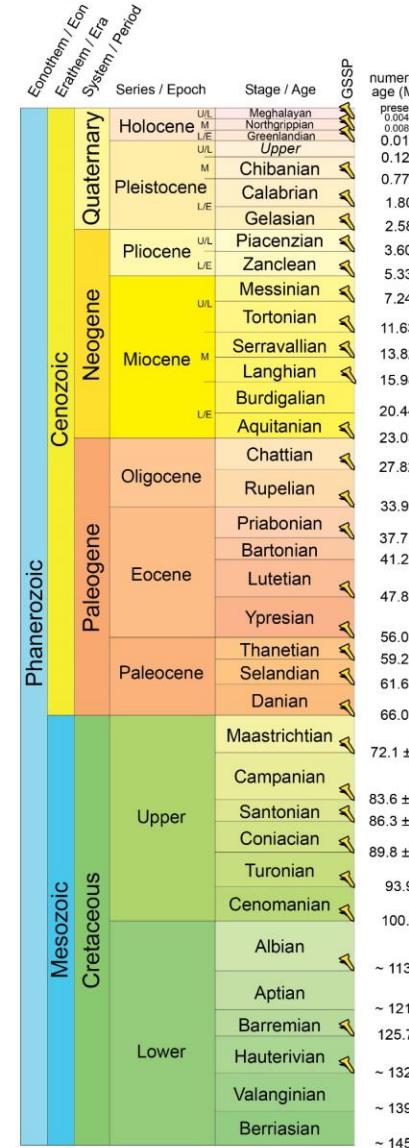


## INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

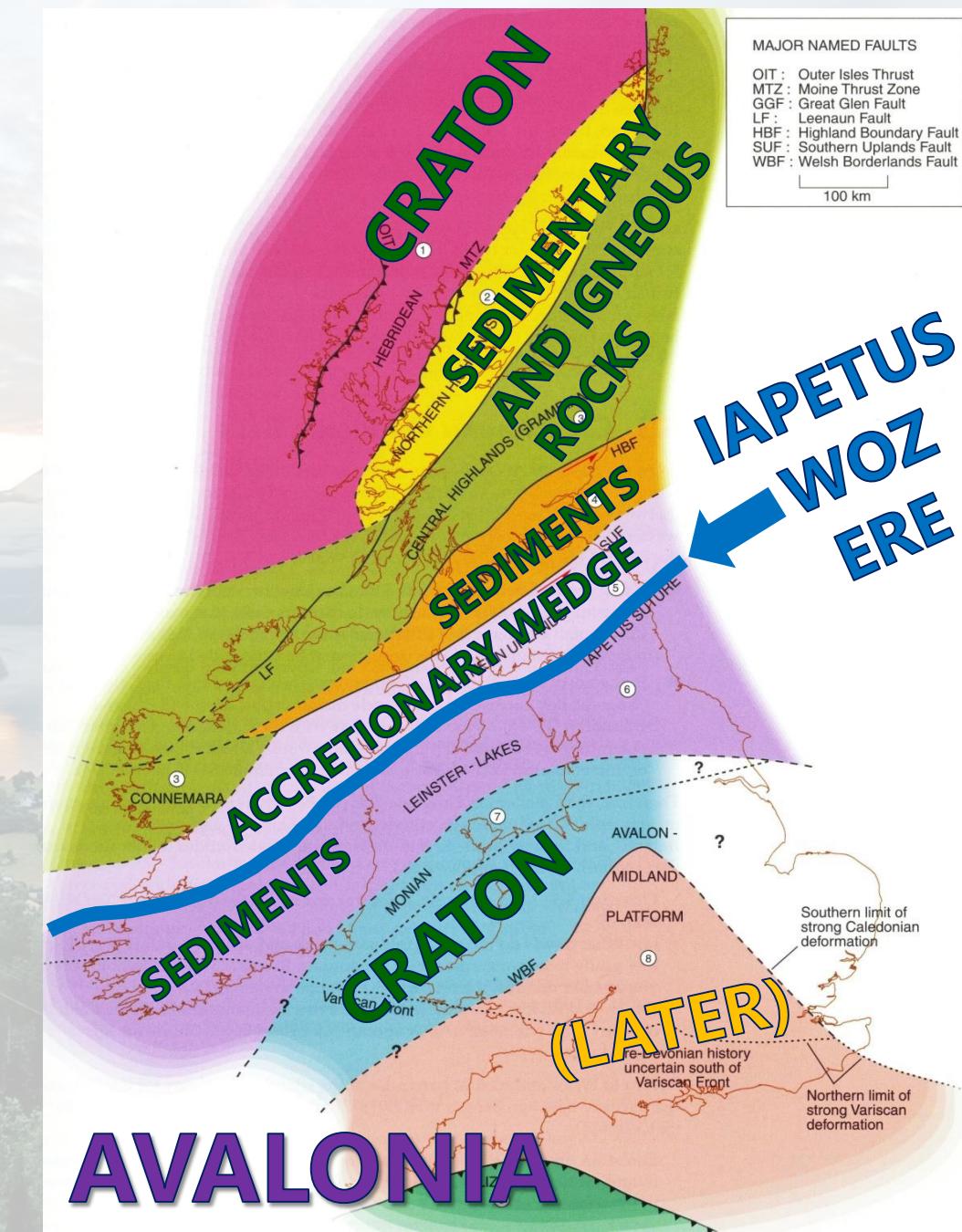
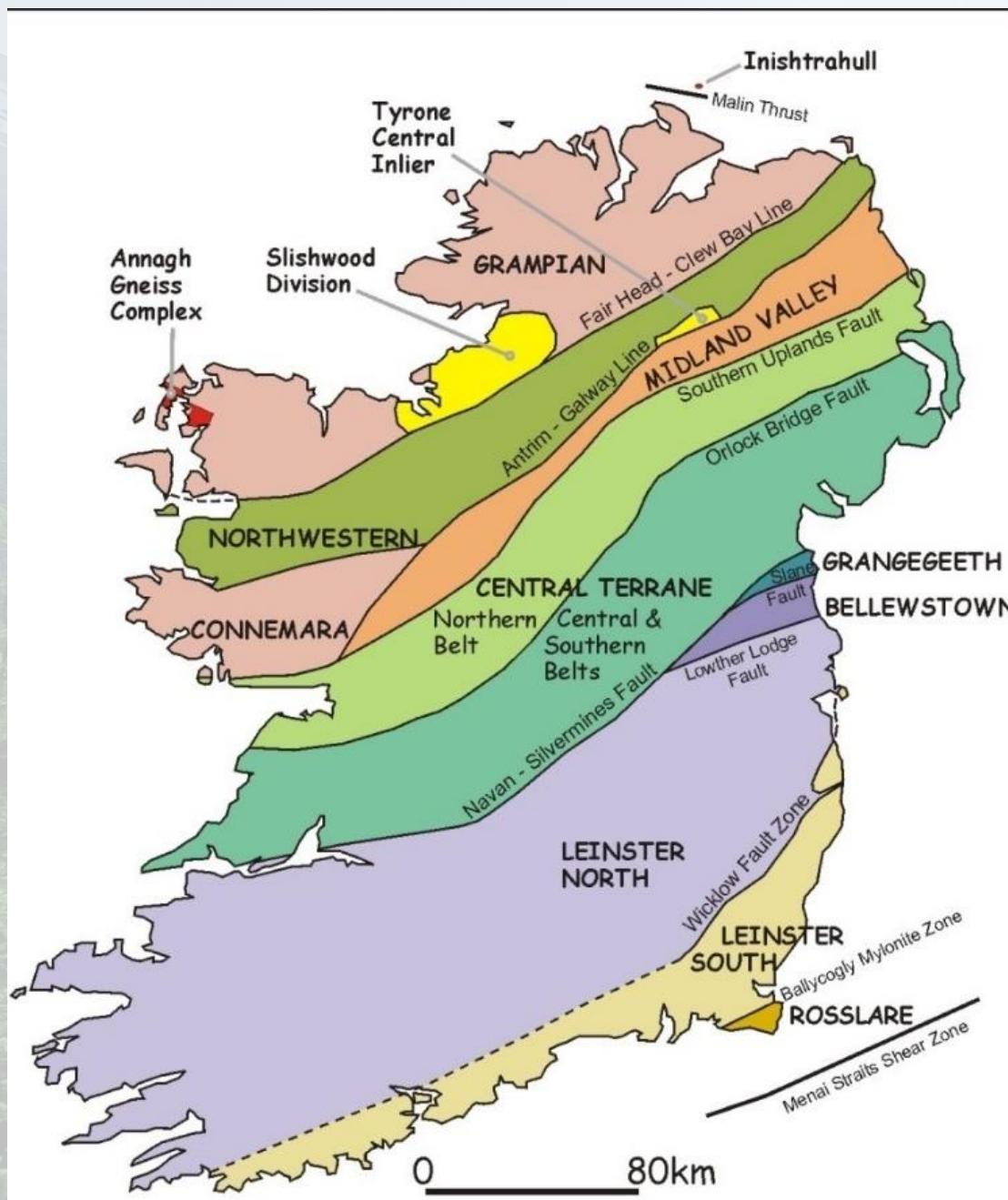
[www.stratigraphy.org](http://www.stratigraphy.org)

International Commission on Stratigraphy

v 2023/09



GY4051





## AVALONIA

SUBDUCTION ZONE

VOLCANIC ISLAND ARC

HOT SPOT VOLCANO-SEAMOUNT

OCEANIC SPREADING RIDGE

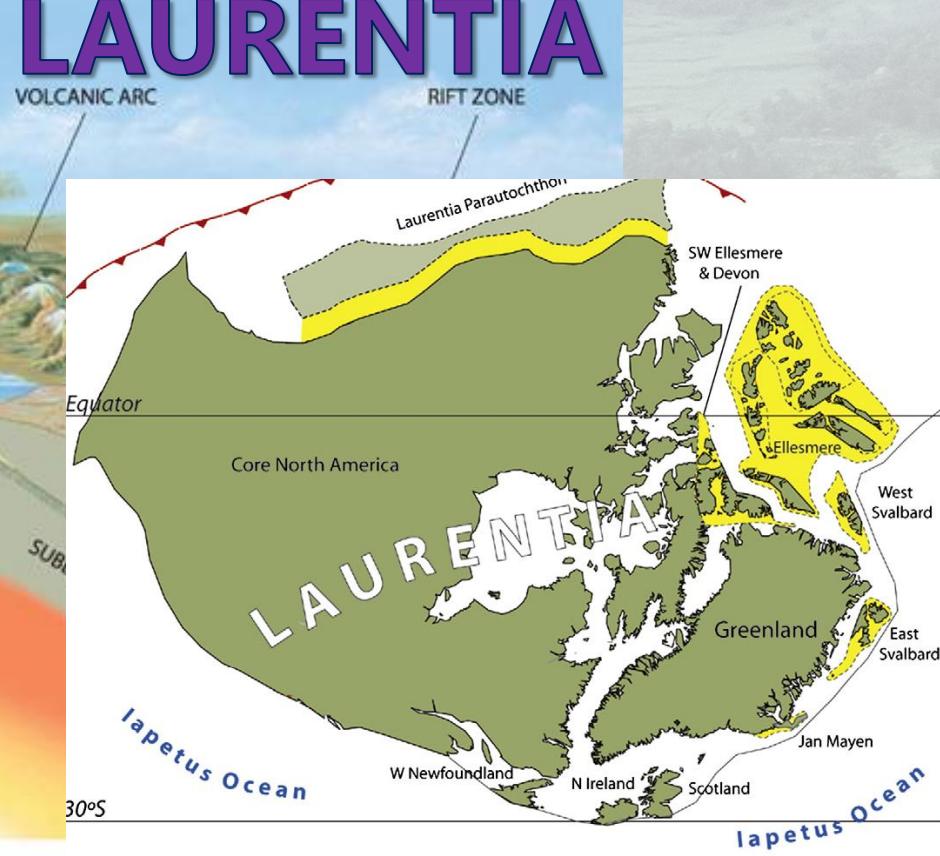
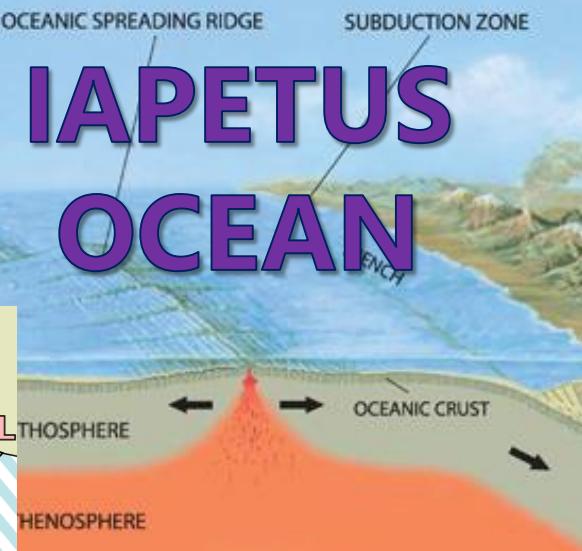
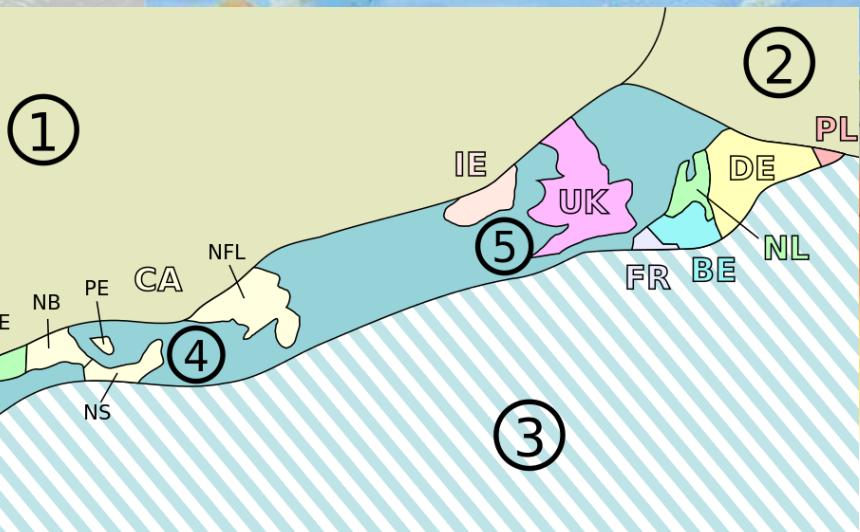
SUBDUCTION ZONE

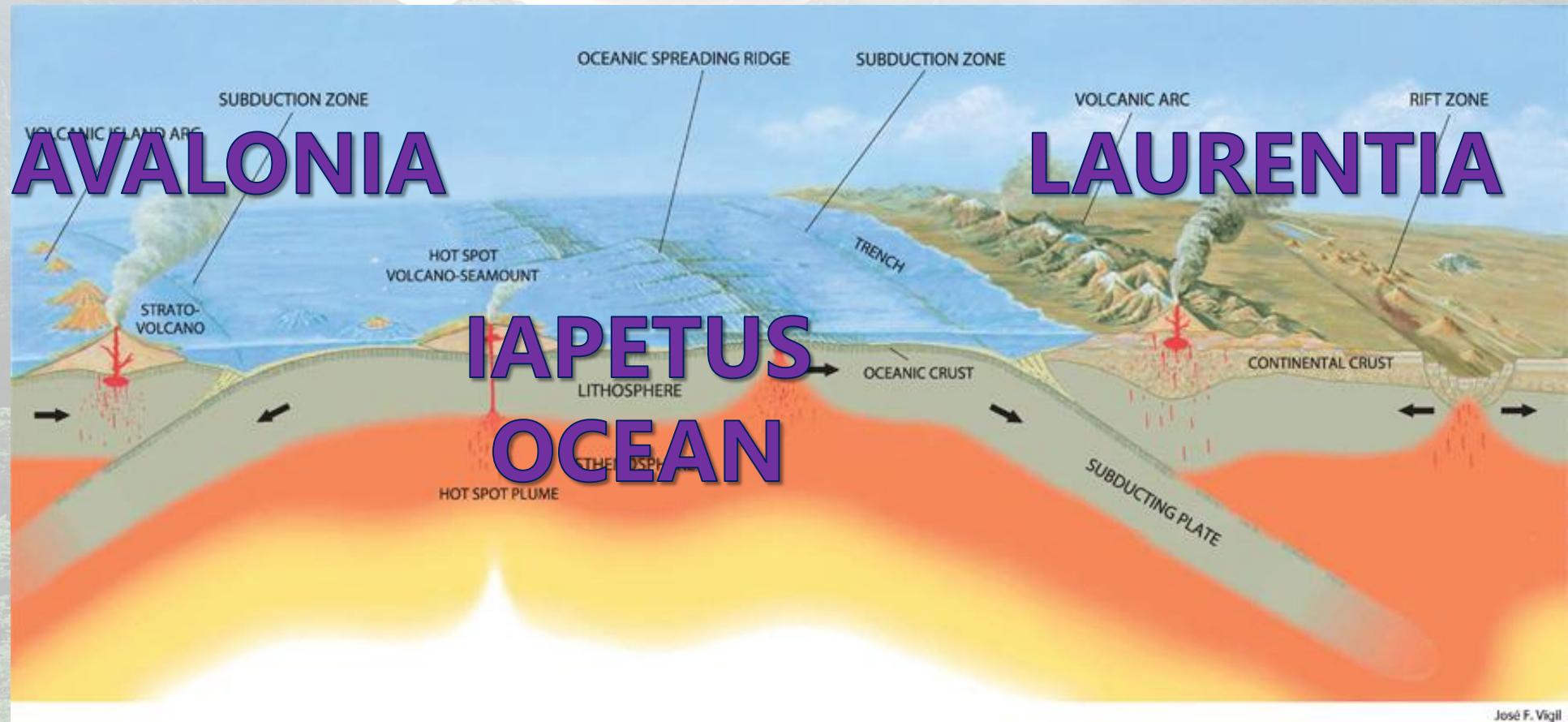
## IAPETUS OCEAN

## LAURENTIA

VOLCANIC ARC

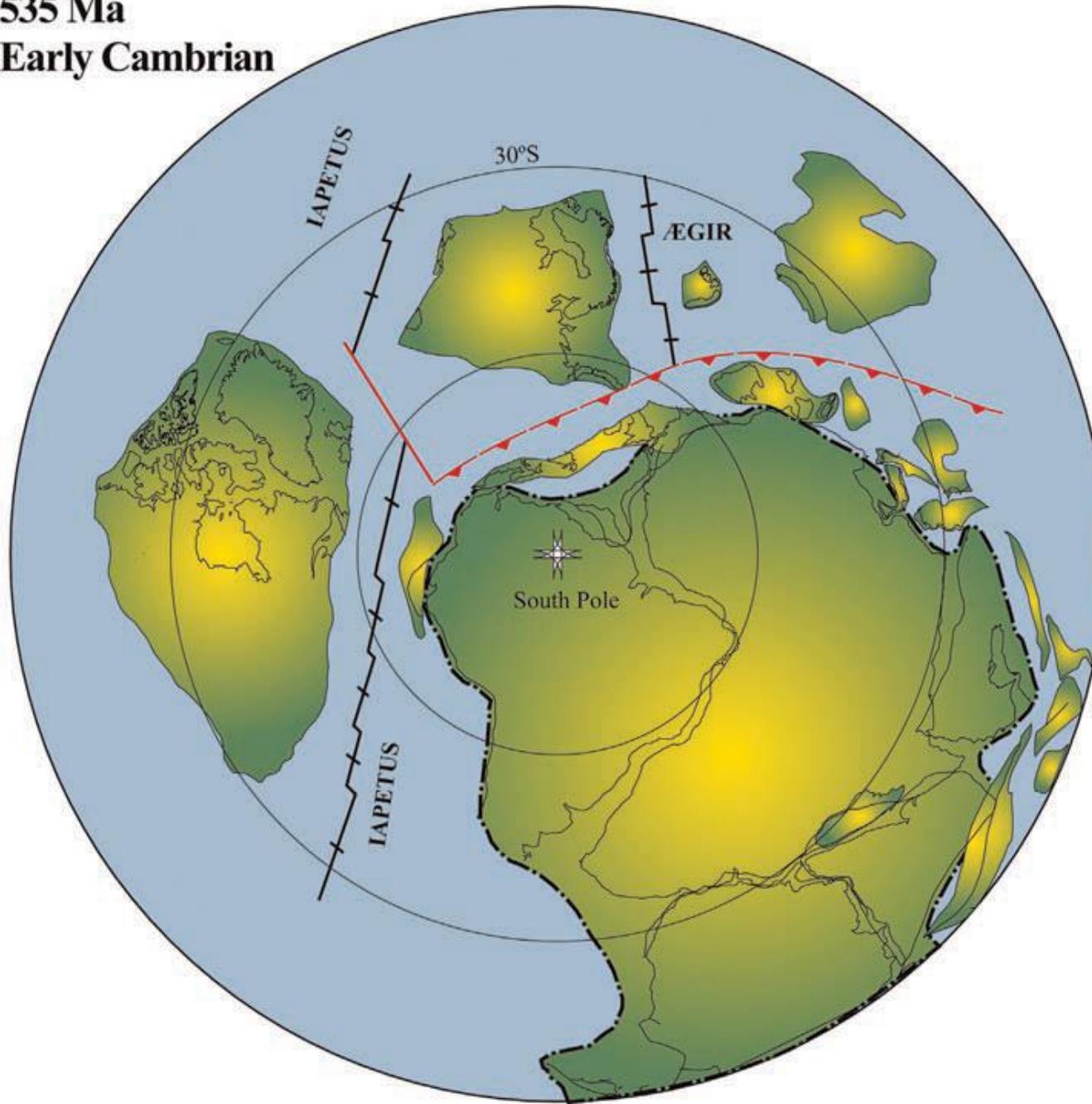
RIFT ZONE





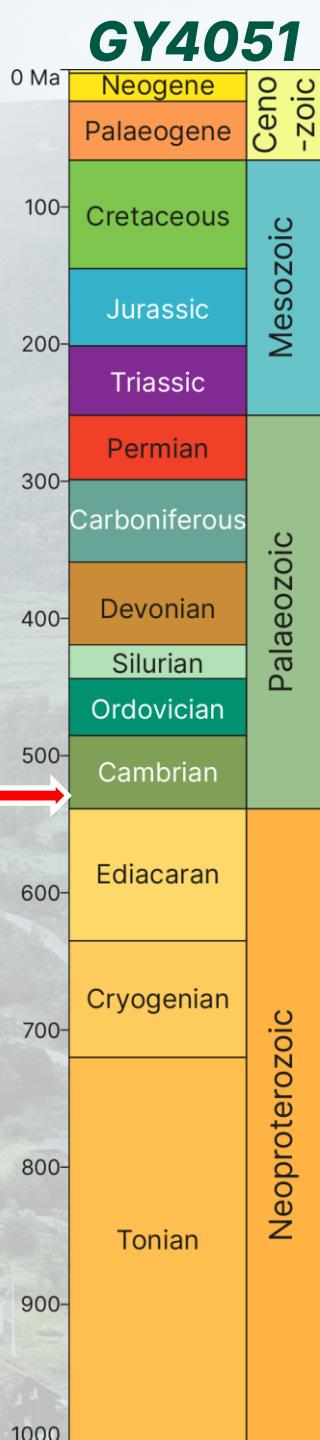
535 Ma

Early Cambrian



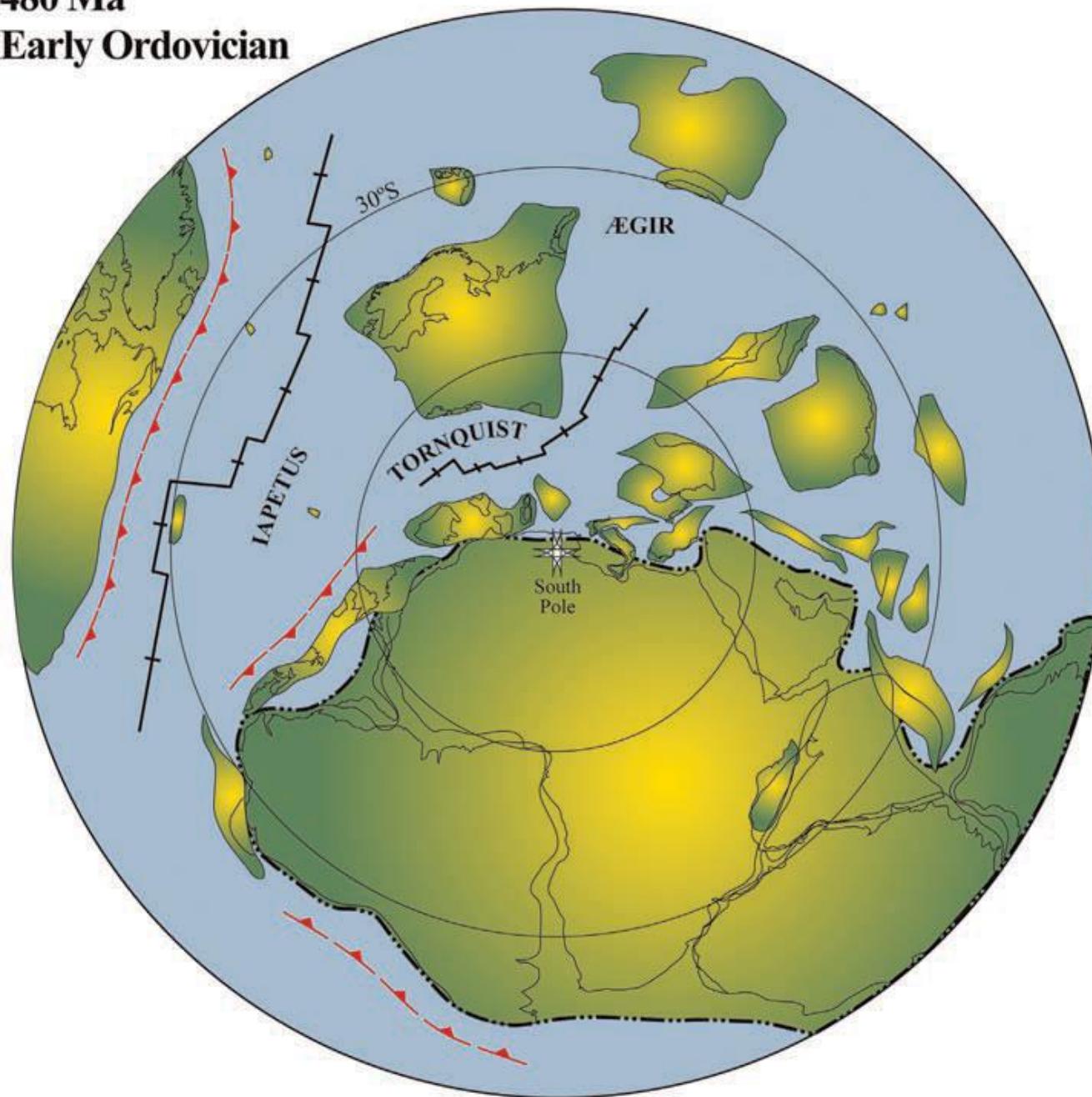
## Rifting of Rodinia

- Iapetus Ocean opening
- Northern Britain and Ireland part of Laurentia
- Southern Britain and Ireland still part of Gondwana



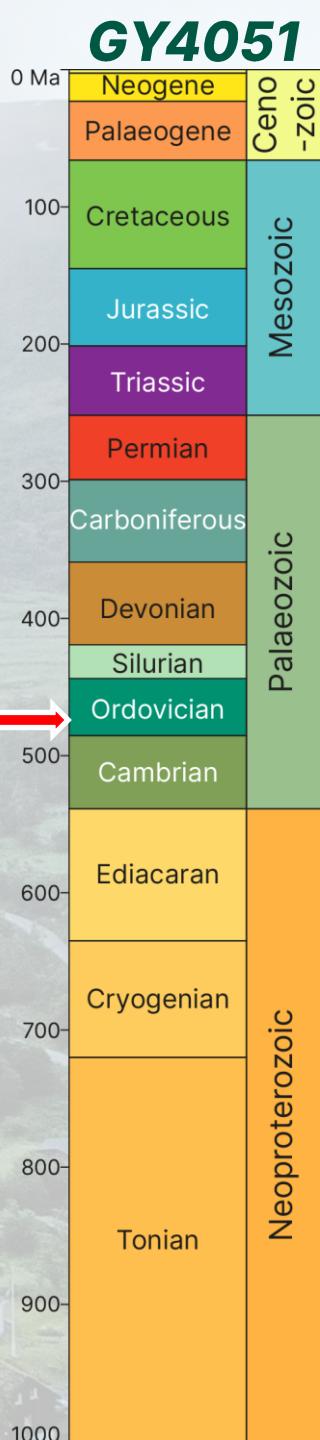
480 Ma

Early Ordovician



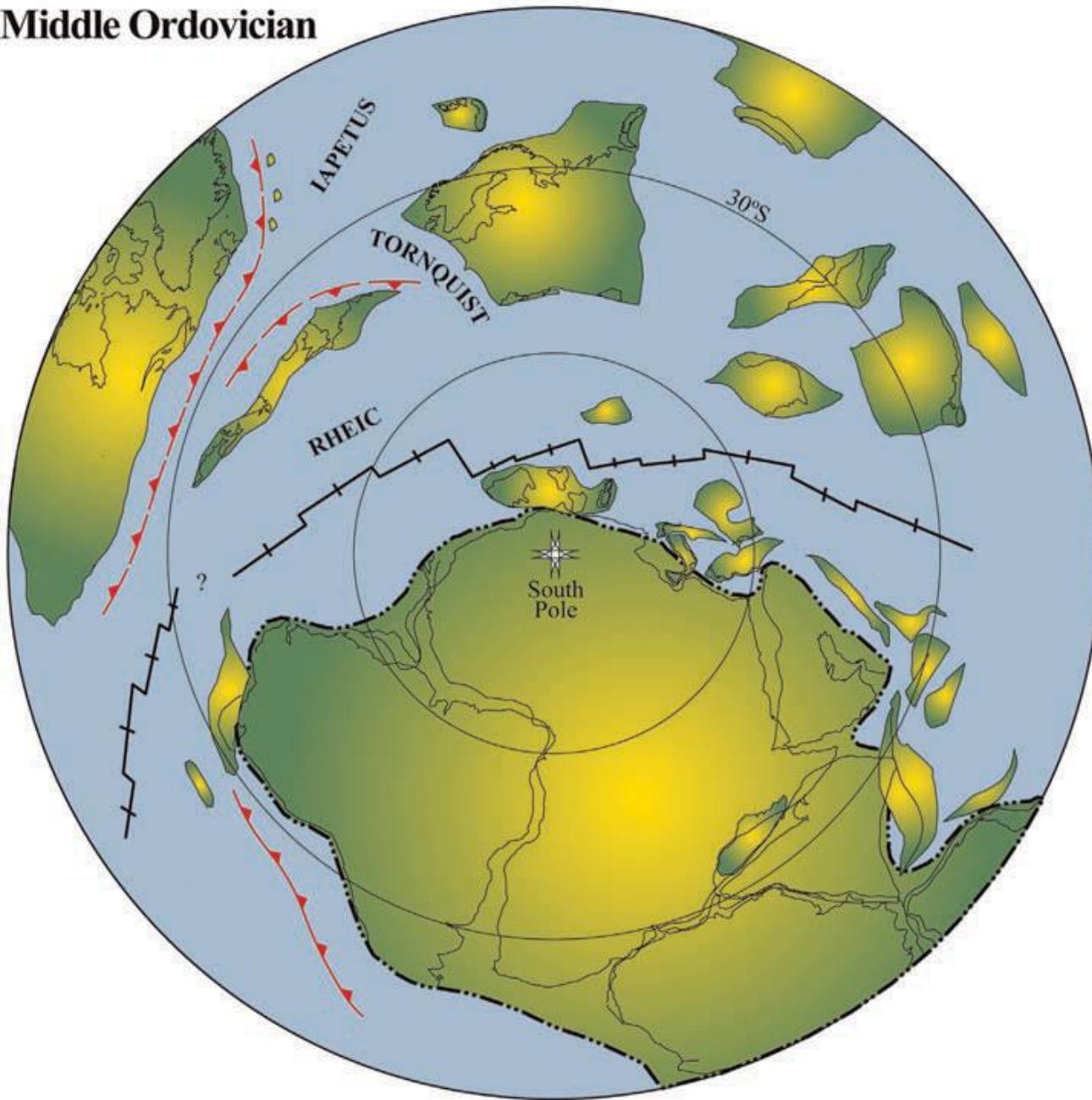
## Iapetus Ocean starts to close

- Southern Britain and Ireland starts to rift from Gondwana
- Becomes microcontinent of Avalonia



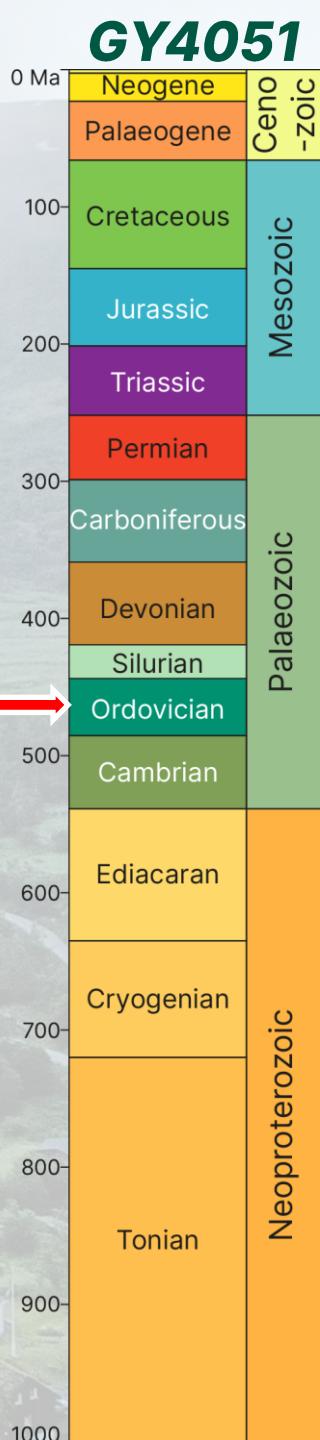
460 Ma

Middle Ordovician



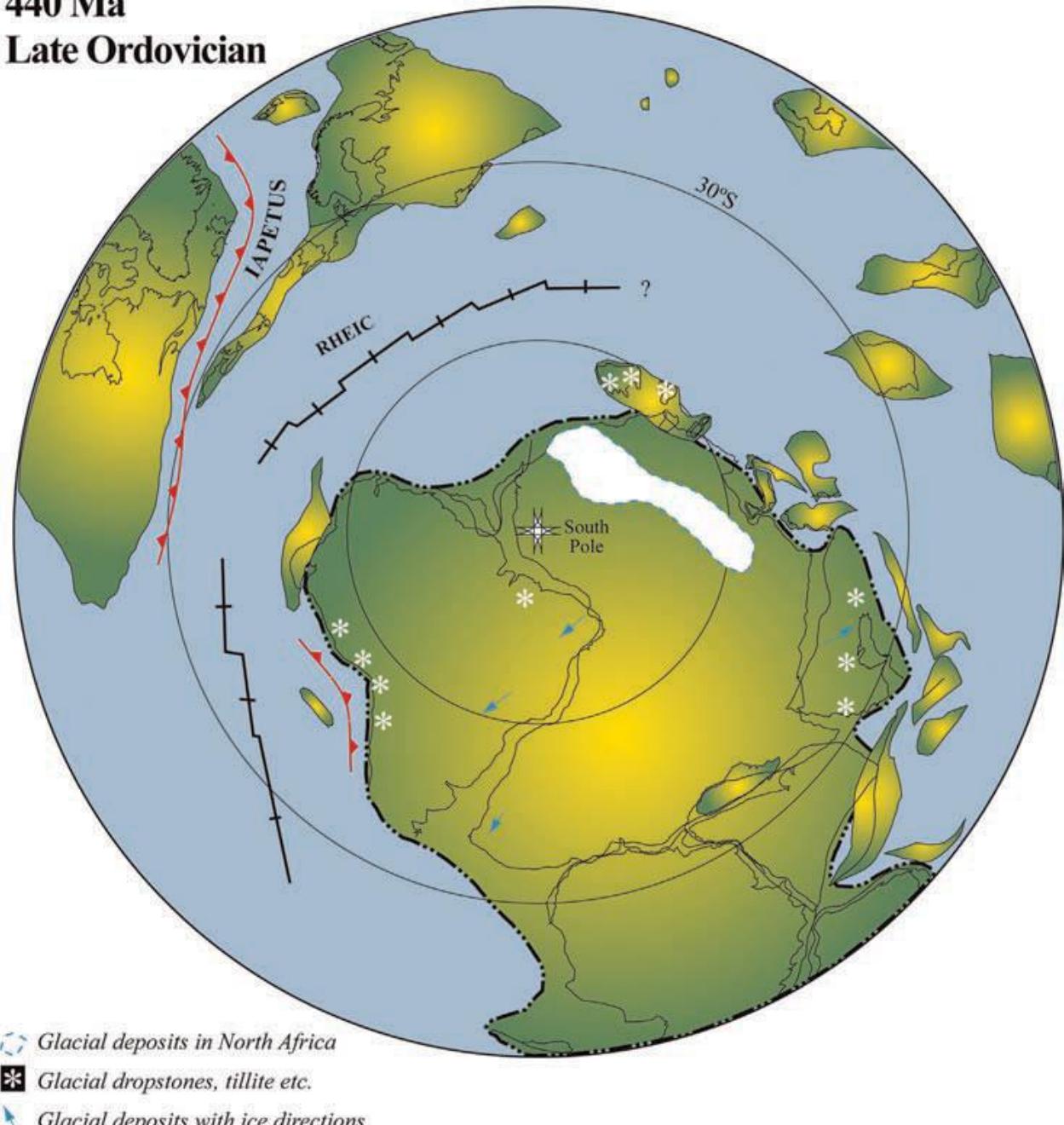
## Iapetus Ocean continues to close

- Rheic Ocean opening between Avalonia and Gondwana
- Avalonia moving north towards Laurentia as Iapetus narrows



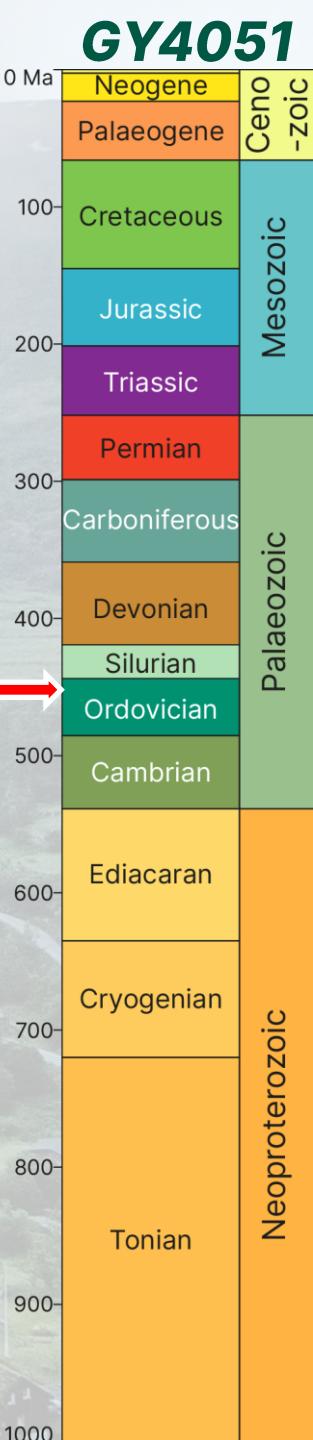
440 Ma

Late Ordovician



## Iapetus Ocean nears the end

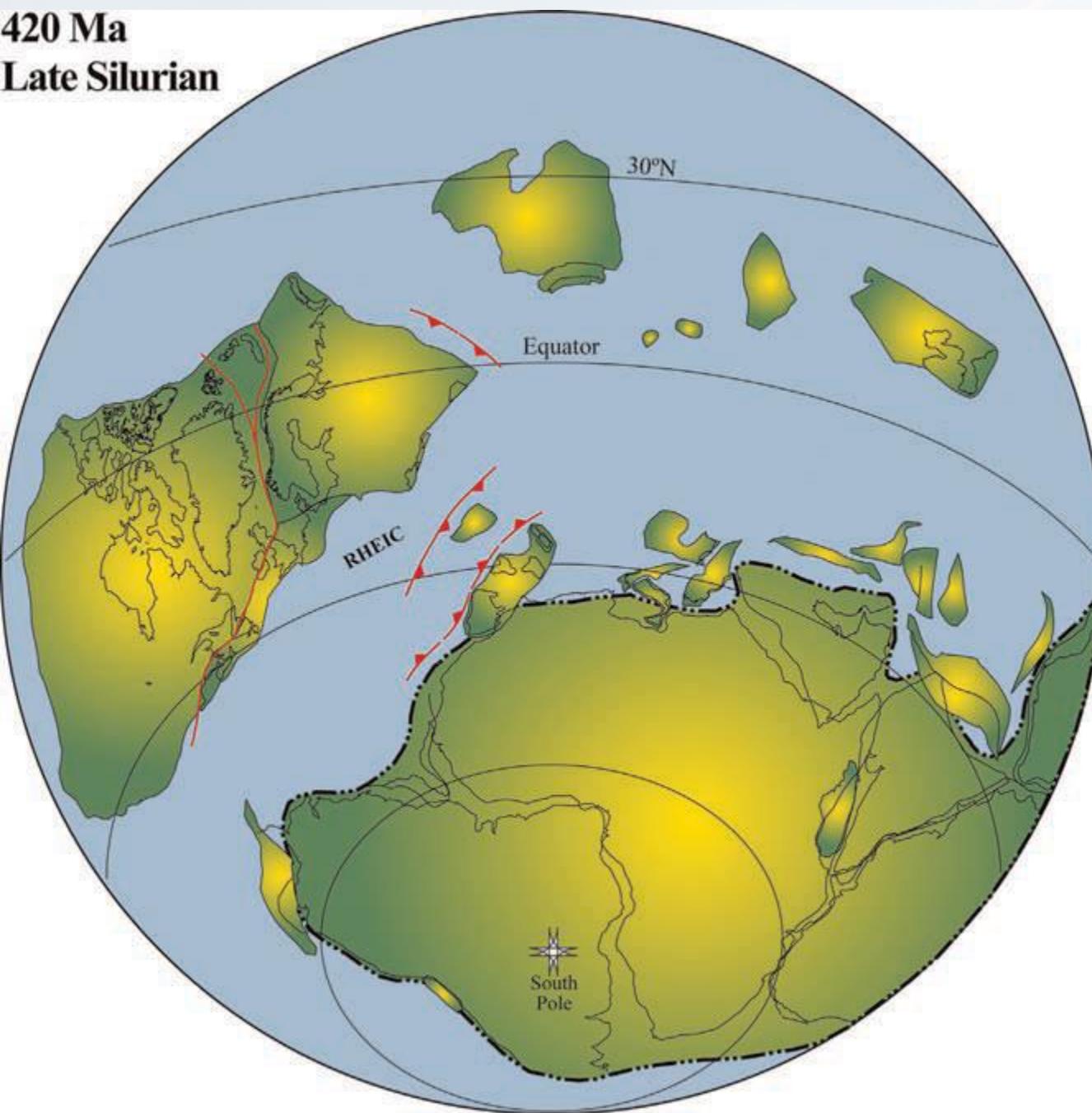
- Two halves of Britain and Ireland very close
- Baltica starts to collide with Eastern Avalonia
- Rheic Ocean widening



# Rise and Fall of The Caledonian Mountains | Late Silurian

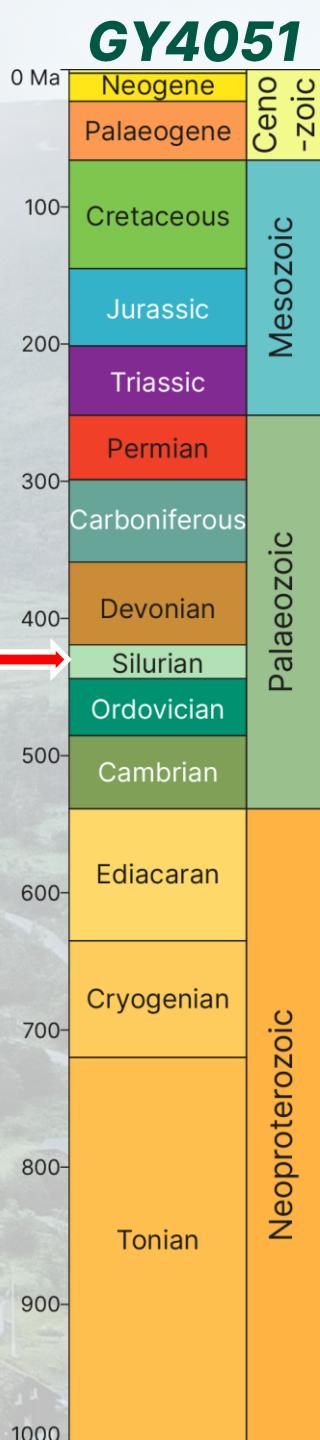
420 Ma

Late Silurian



## Iapetus Ocean is gone

- Avalonia has collided with Laurentia and Baltica in the Caledonian Orogeny
- Continent of Laurussia
- Britain and Ireland joined, separated from Gondwana by the Rheic Ocean



# Rise and Fall of The Caledonian Mountains | Evolution of Ireland

GY4051

0 Ma  
Neogene

Palaeogene

Ceno -zoic

100  
Cretaceous

200  
Jurassic

300  
Triassic

400  
Permian

500  
Carboniferous

600  
Devonian

700  
Silurian

800  
Ordovician

900  
Cambrian

1000  
Ediacaran

1100  
Cryogenian

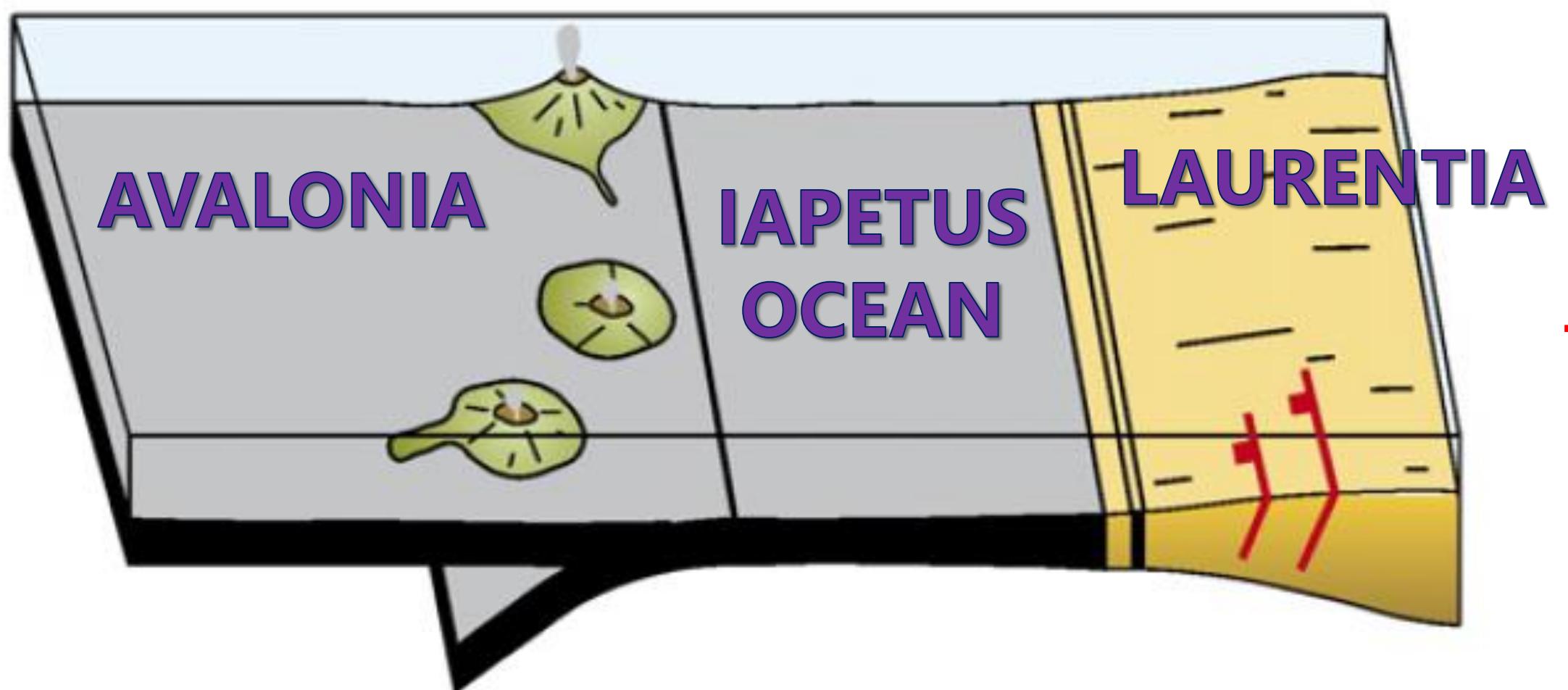
1200  
Tonian

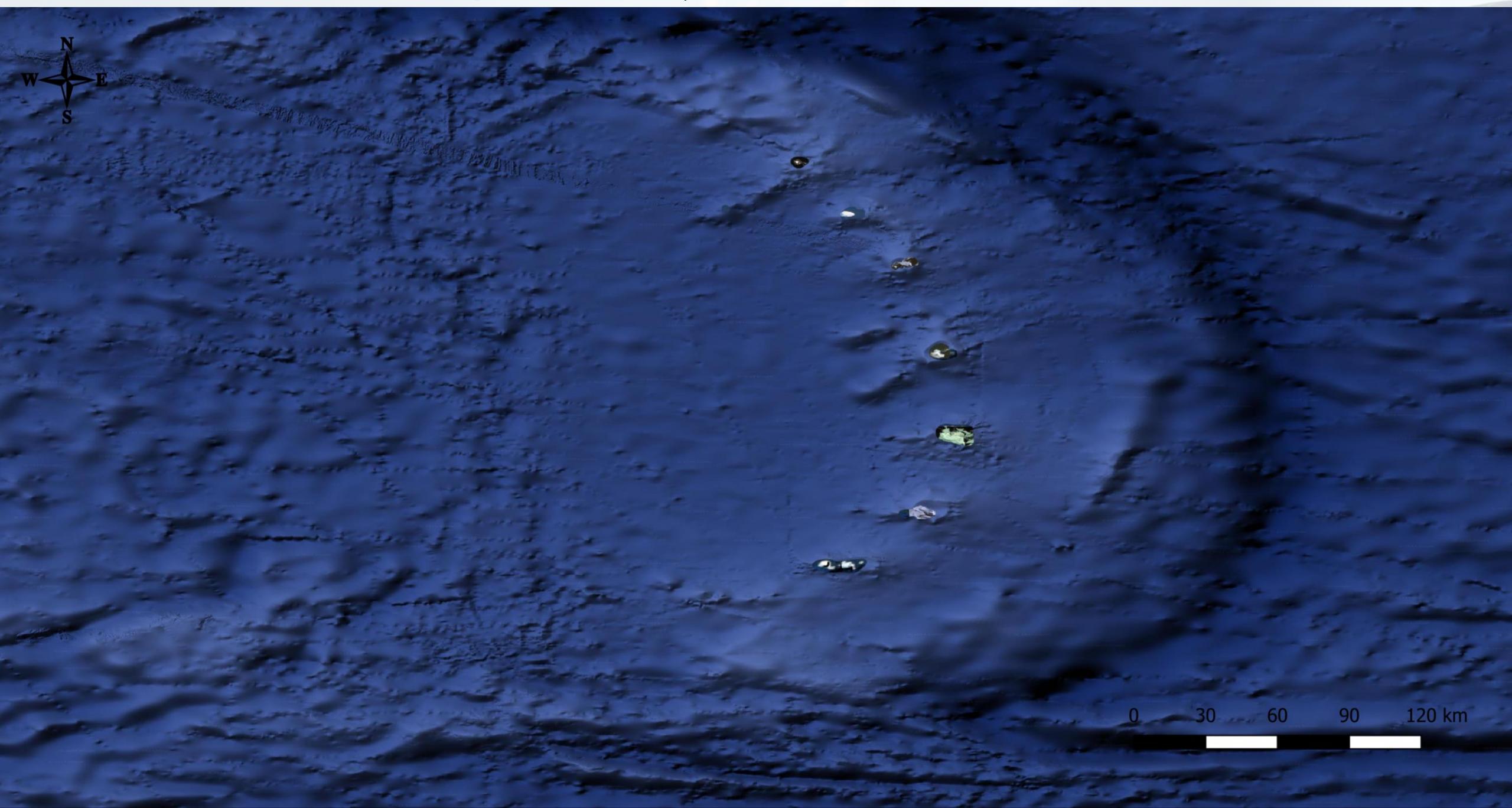
1300  
Neoproterozoic

1400  
Palaeozoic

1500  
Mesozoic

1600  
Cenozoic





# Rise and Fall of The Caledonian Mountains | Evolution of Ireland

GY4051

0 Ma  
Neogene

Palaeogene

Ceno -zoic

100  
Cretaceous

200  
Jurassic

300  
Triassic

400  
Permian

500  
Carboniferous

600  
Devonian

700  
Silurian

800  
Ordovician

900  
Cambrian

1000  
Ediacaran

1100  
Cryogenian

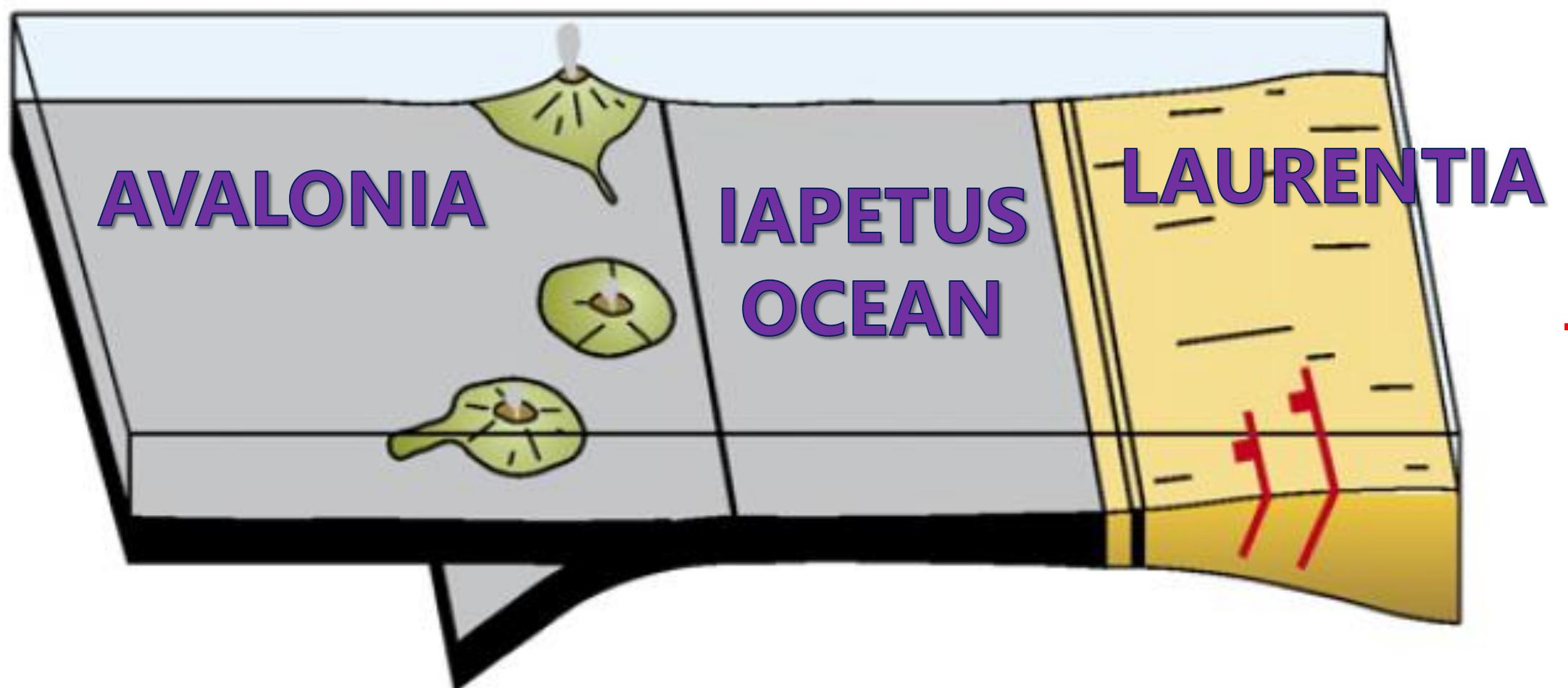
1200  
Tonian

1300  
Neoproterozoic

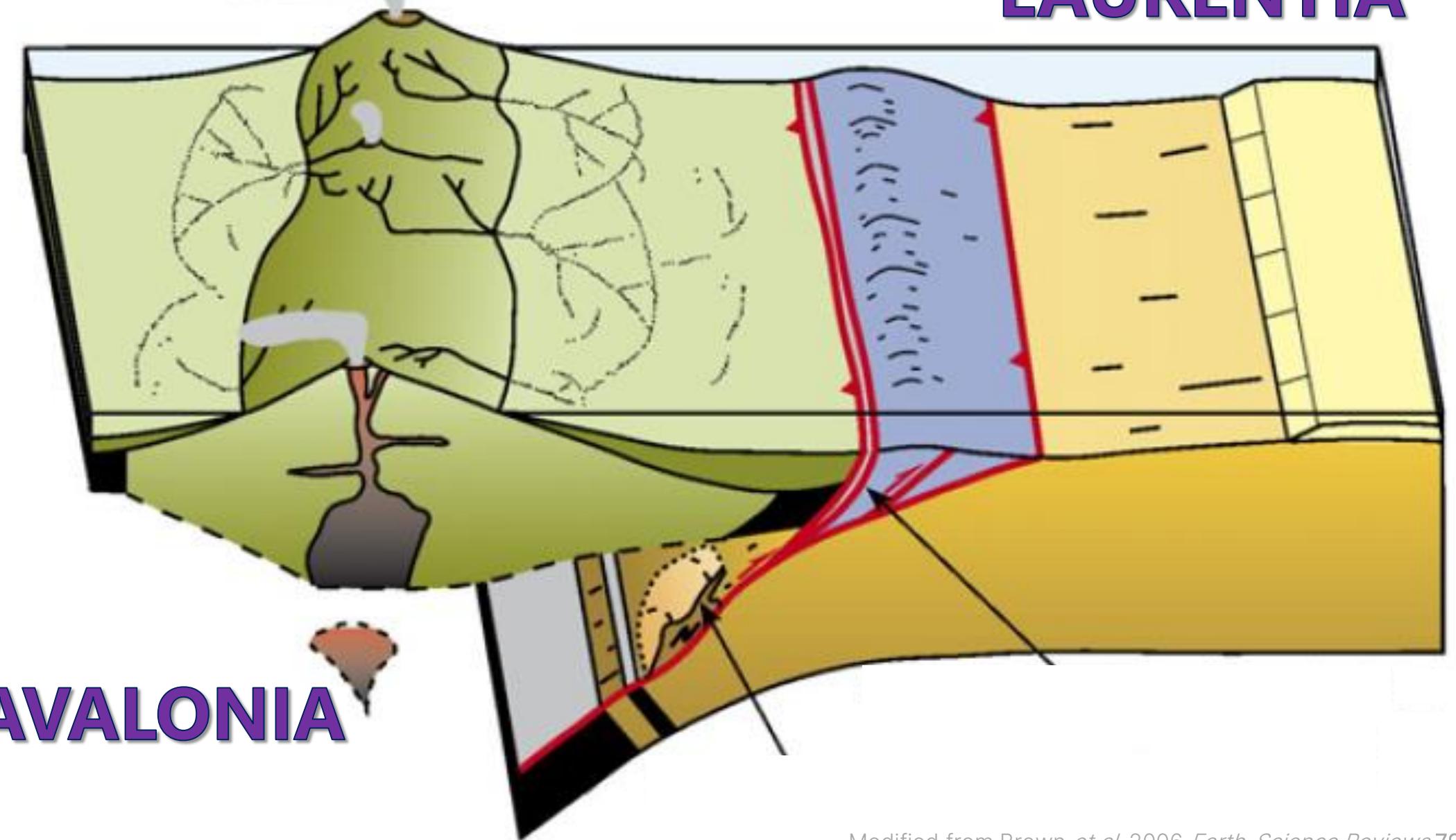
1400  
Palaeozoic

1500  
Mesozoic

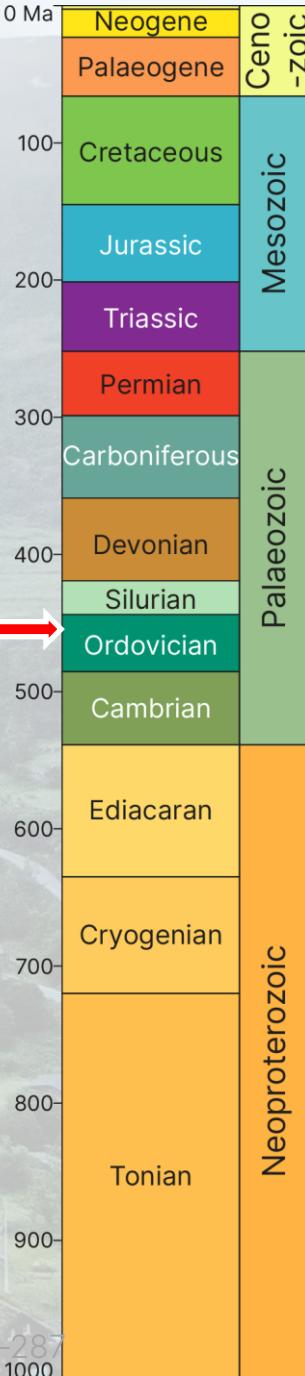
1600  
Cenozoic



**LAURENTIA**



Modified from Brown *et al.* 2006 *Earth-Science Reviews* 79, 261–287



# Rise and Fall of The Caledonian Mountains | The Dalradian Supergroup

**GY4051**

0 Ma  
Ceno -zoic

Neogene

Palaeogene

100 Cretaceous

200 Jurassic

300 Triassic

300 Permian

400 Carboniferous

400 Devonian

500 Silurian

500 Ordovician

600 Cambrian

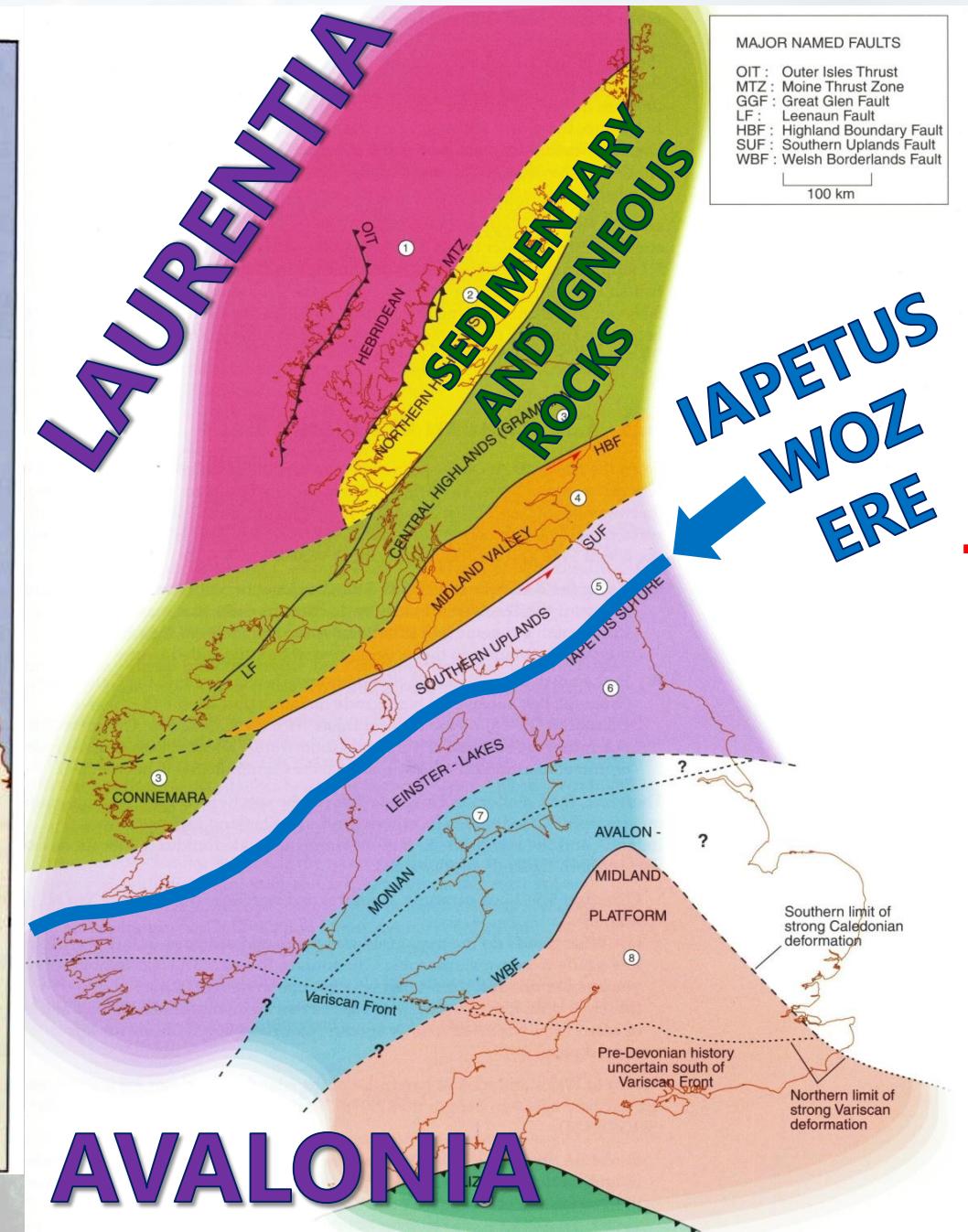
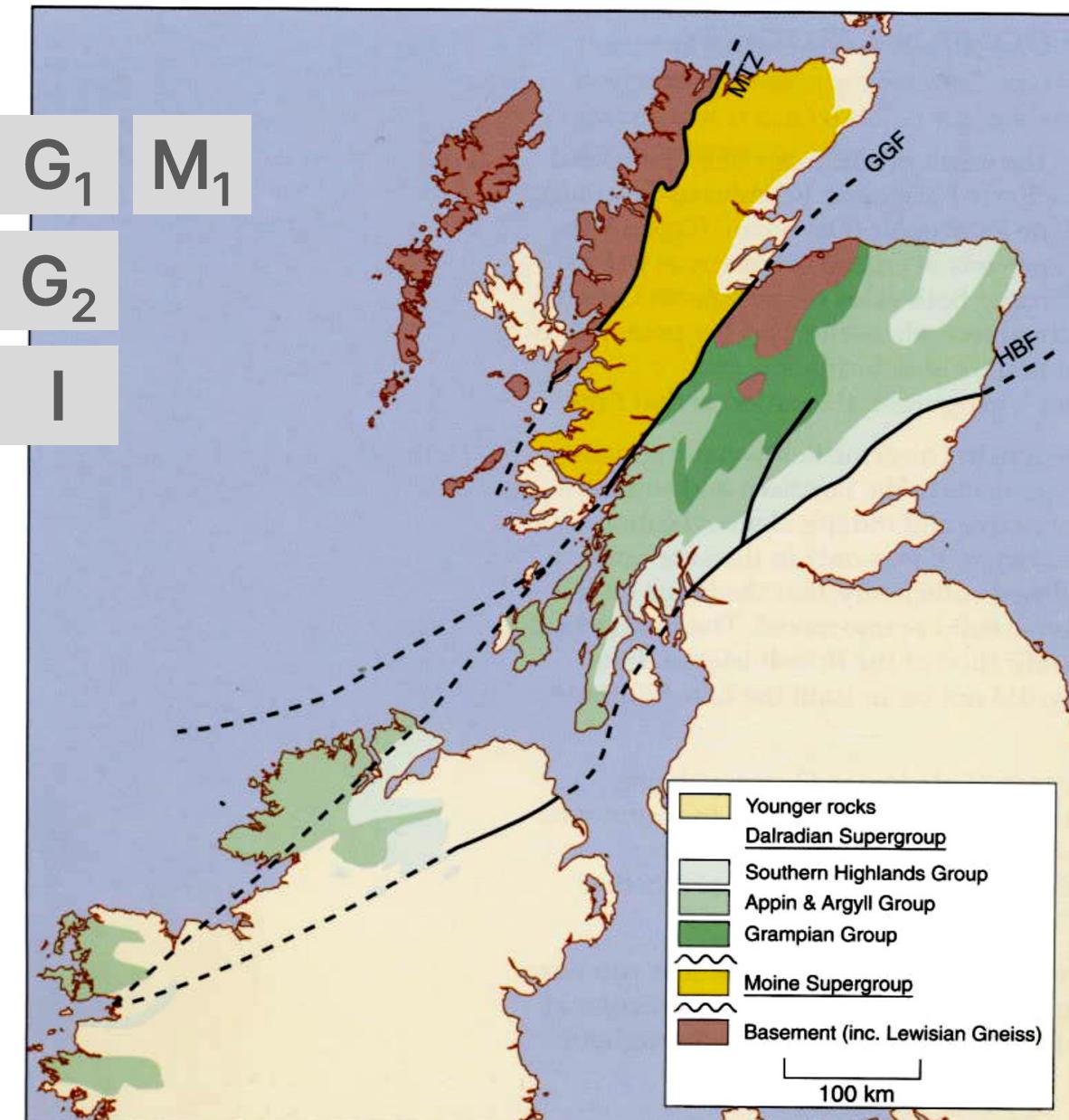
600 Ediacaran

700 Cryogenian

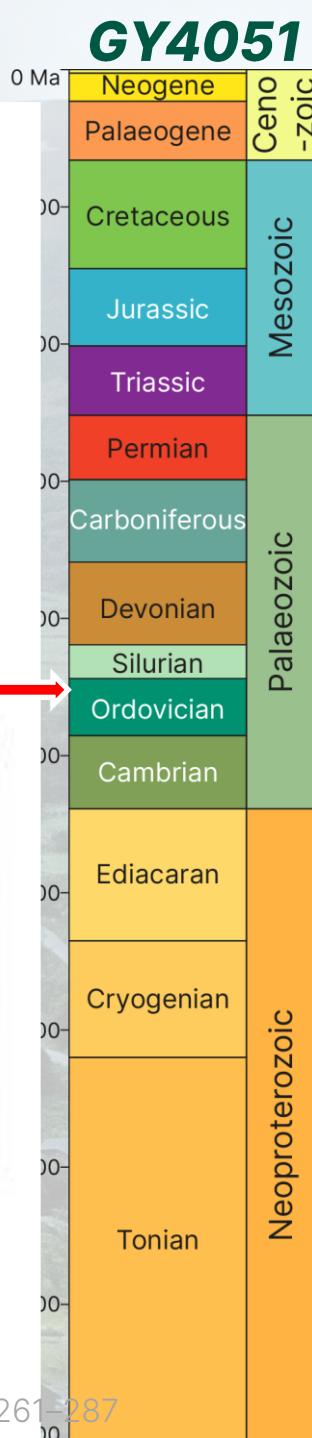
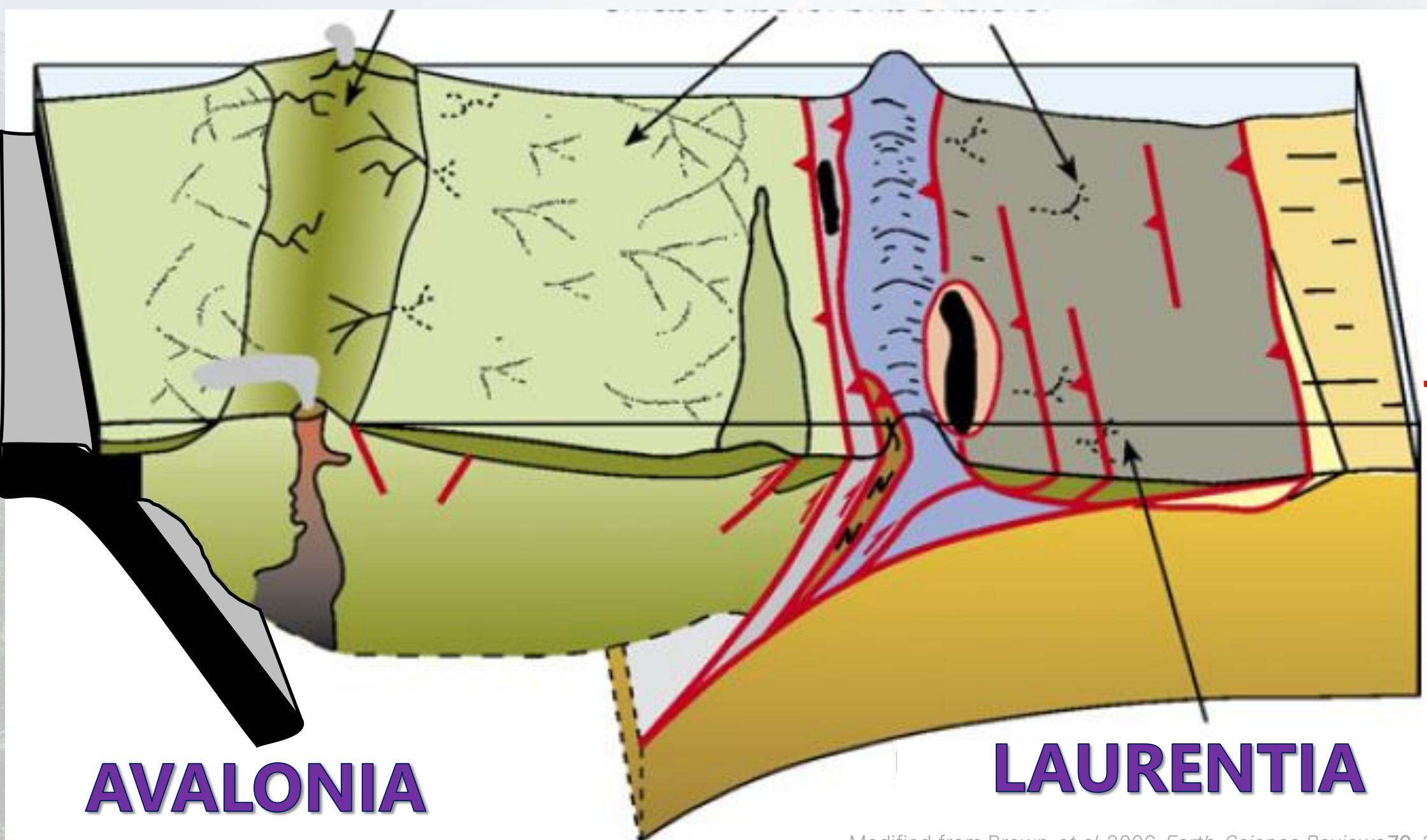
800 Tonian

900 Neoproterozoic

1000



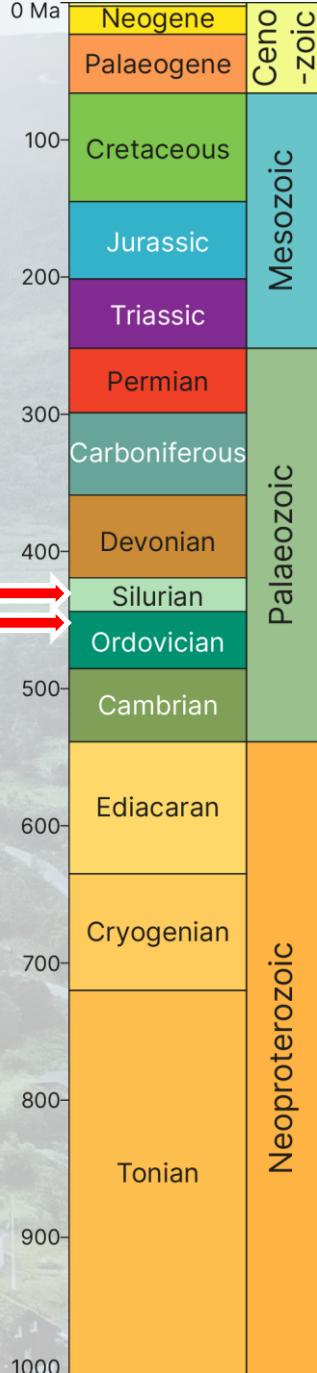
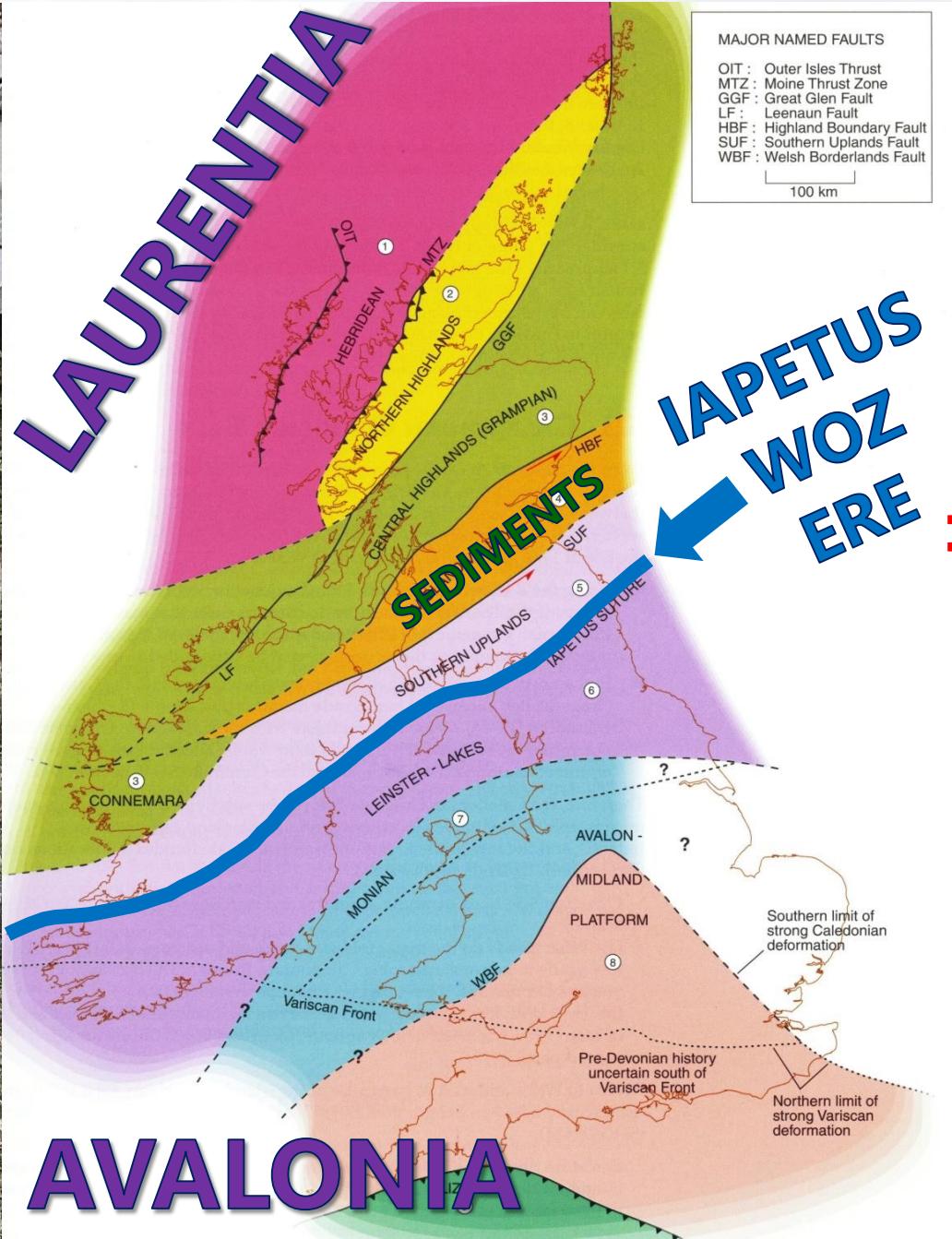
# Rise and Fall of The Caledonian Mountains | Evolution of Ireland



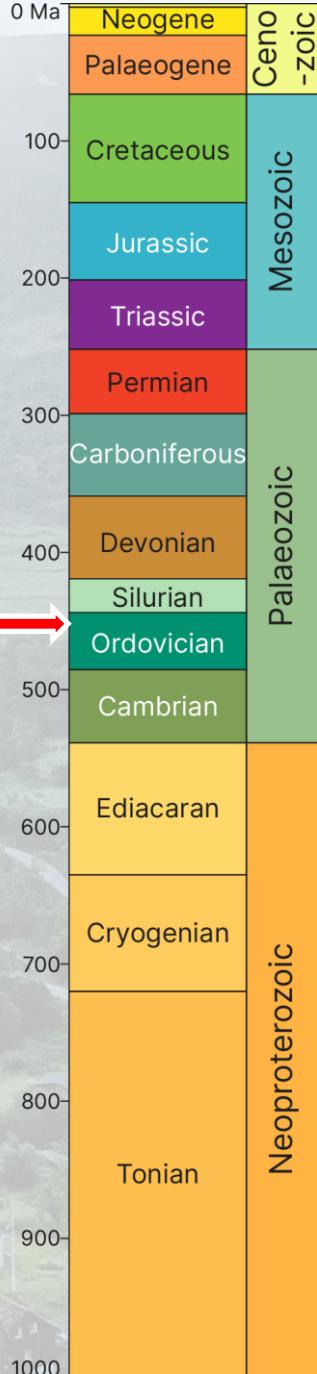
Modified from Brown *et al.* 2006 *Earth-Science Reviews* 79, 261–287

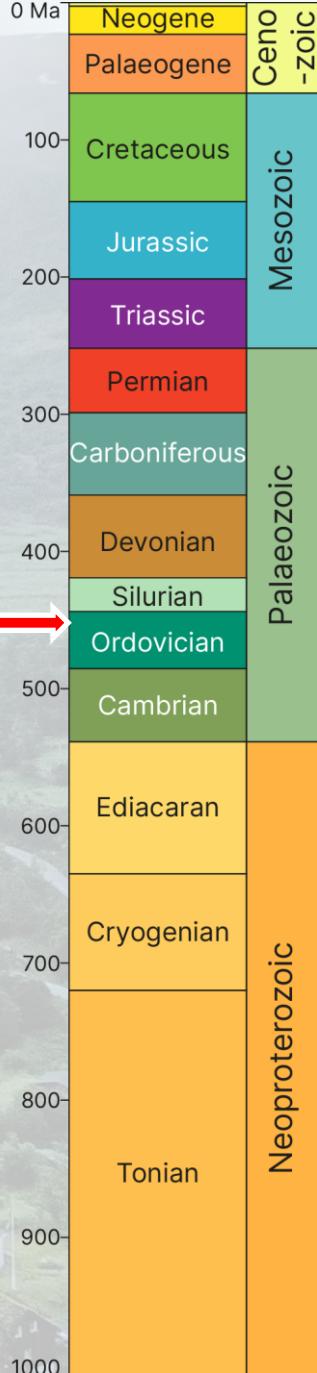


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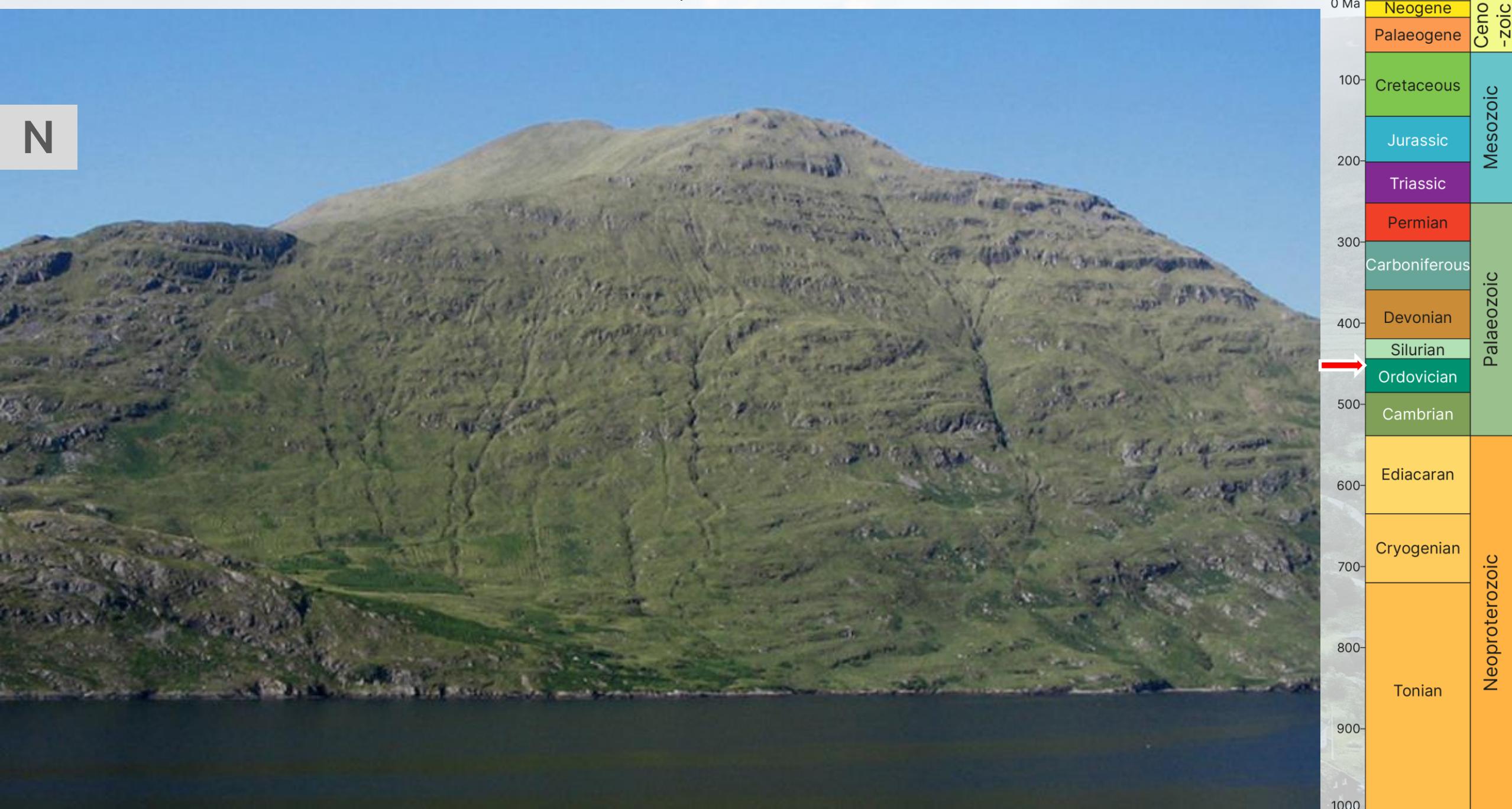
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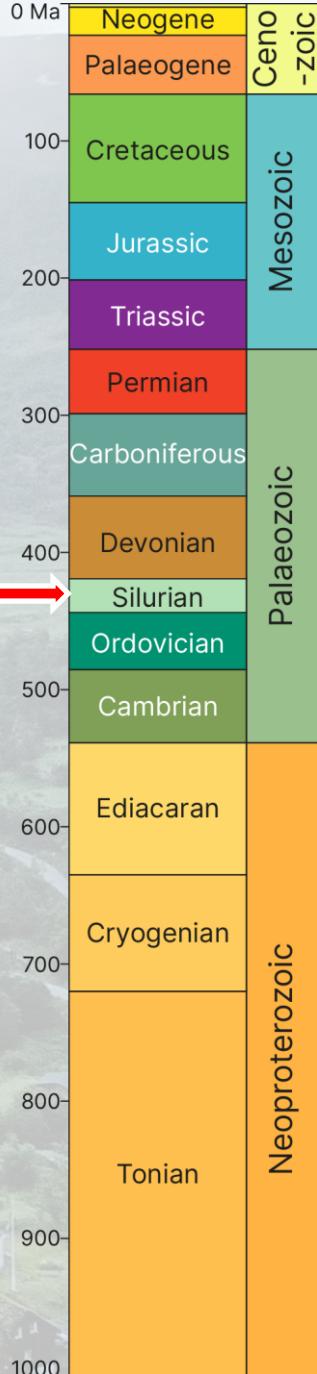


# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051

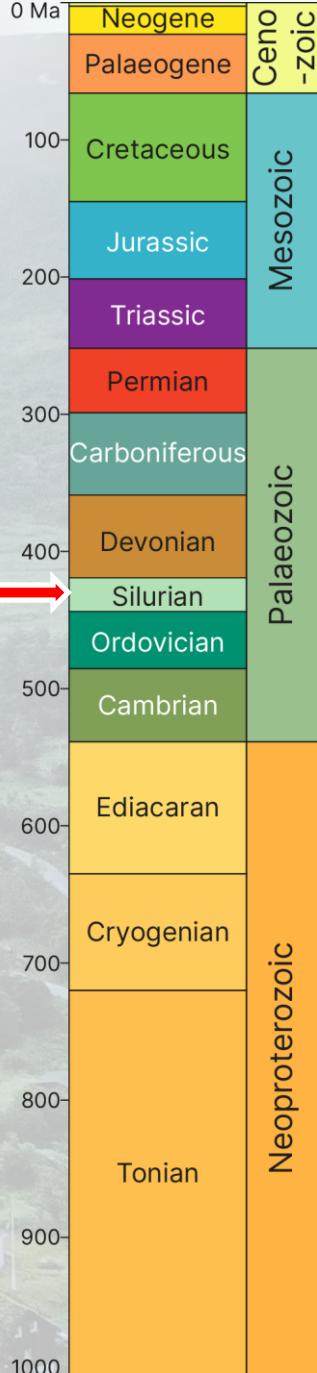
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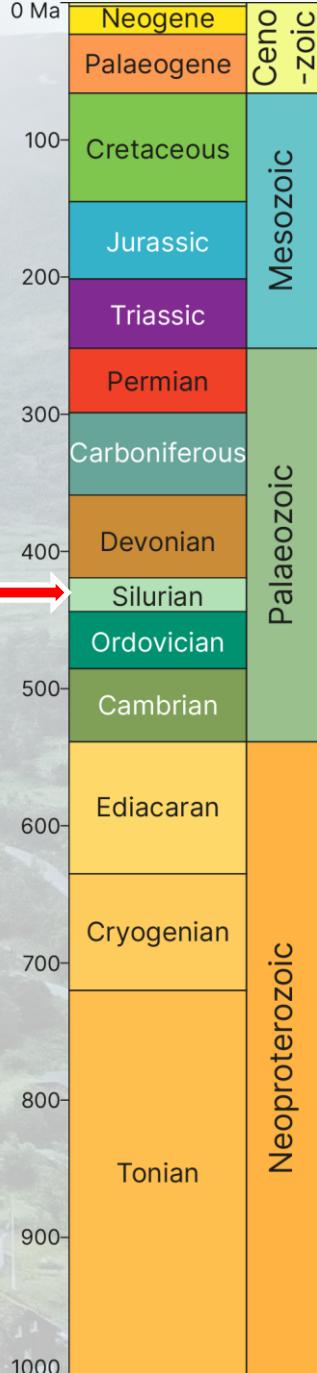
# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051



# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051



# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051



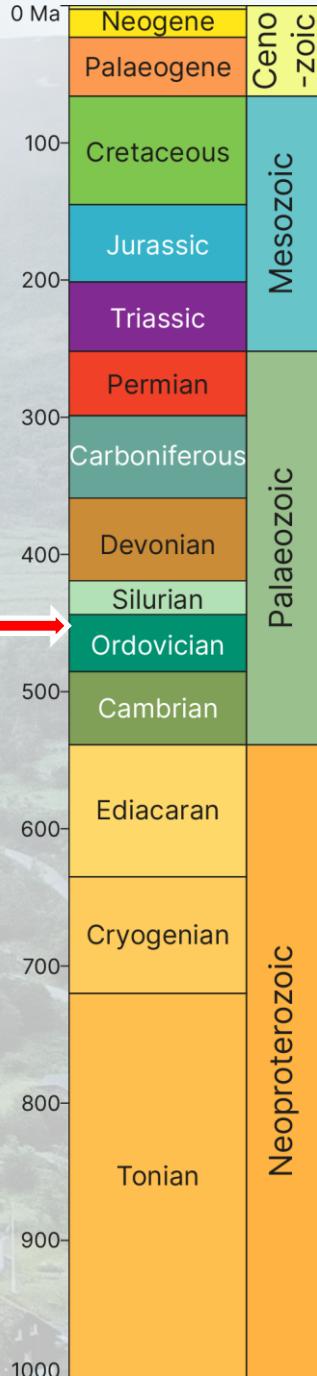
# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051

N

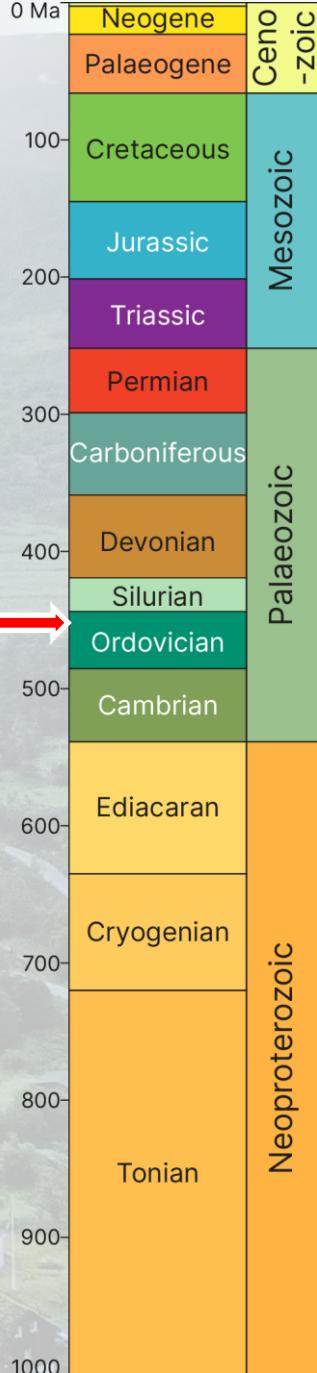
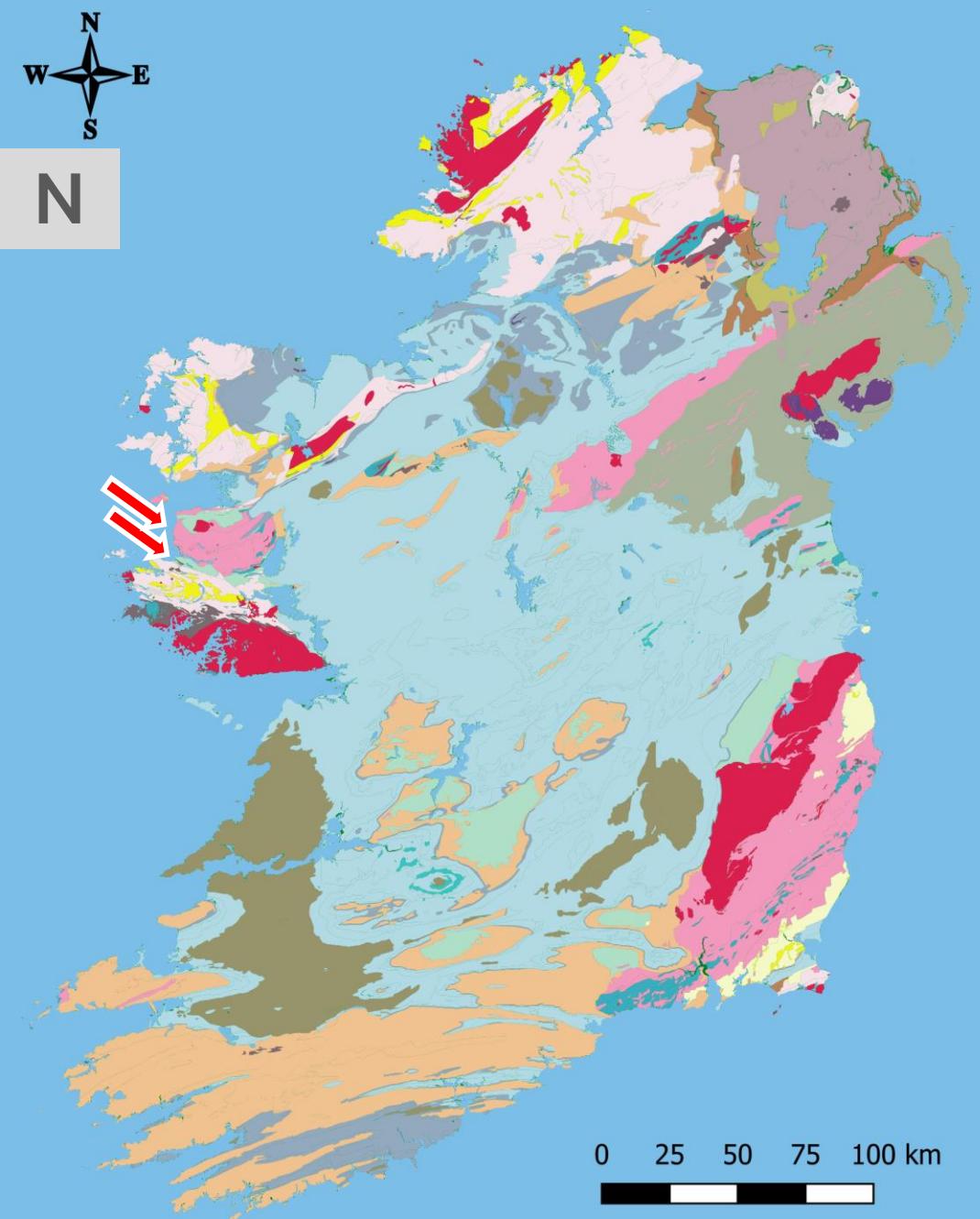


# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051

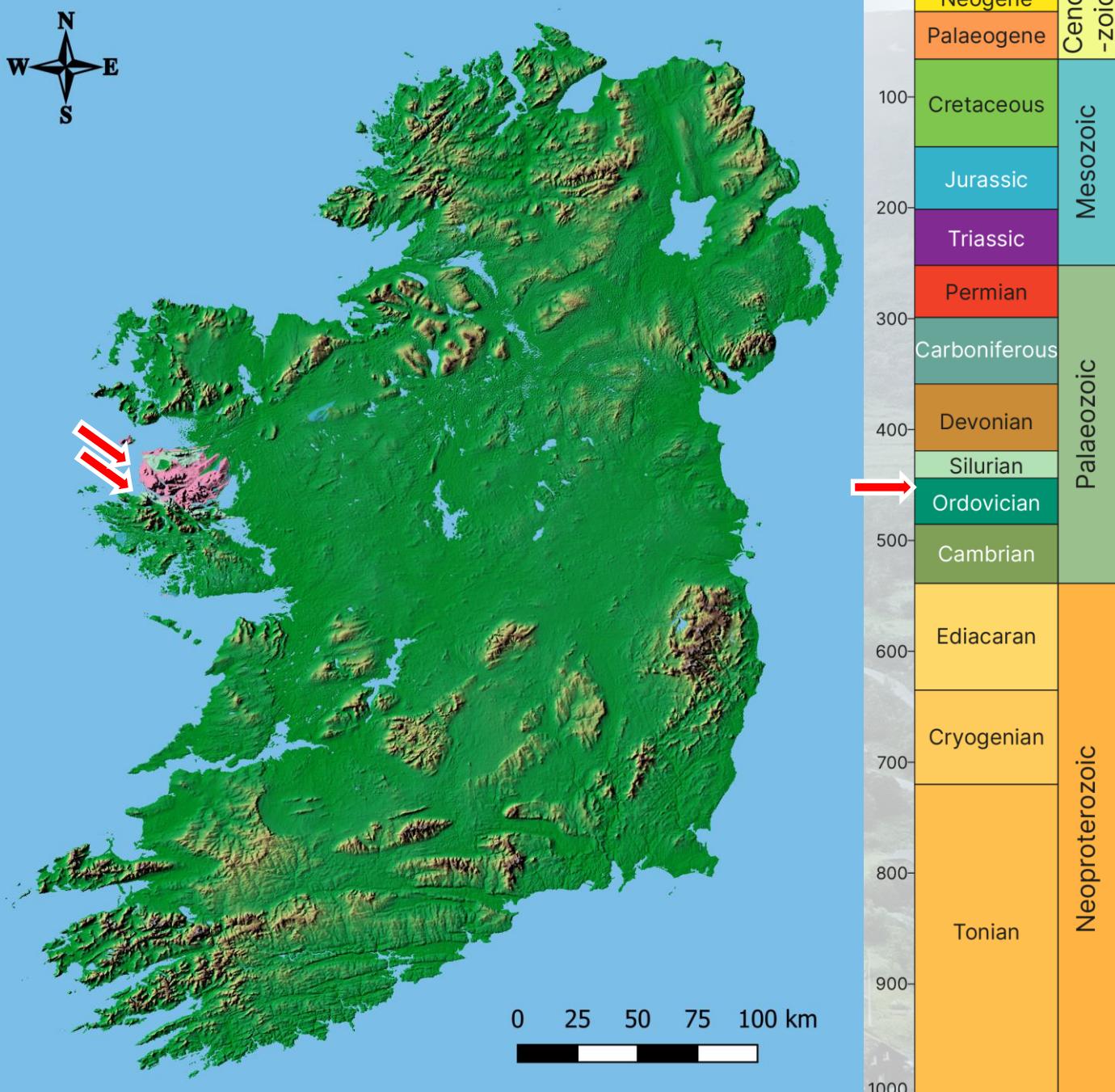
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# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051



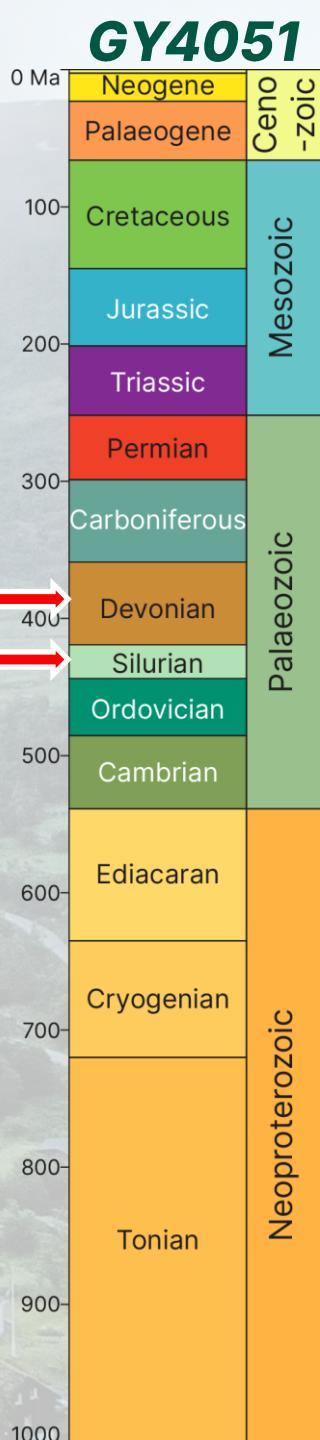
# Rise and Fall of The Caledonian Mountains | Subduction volcanics and clastics in Laurentia GY4051



0 Ma	Neogene	Ceno-zoic
100	Palaeogene	
200	Cretaceous	Mesozoic
300	Jurassic	
400	Triassic	
500	Permian	
600	Carboniferous	Palaeozoic
700	Devonian	
800	Silurian	
900	Ordovician	
1000	Cambrian	
1100	Ediacaran	
1200	Cryogenian	
1300	Tonian	Neoproterozoic

# Rise and Fall of The Caledonian Mountains | Caledonian Granites

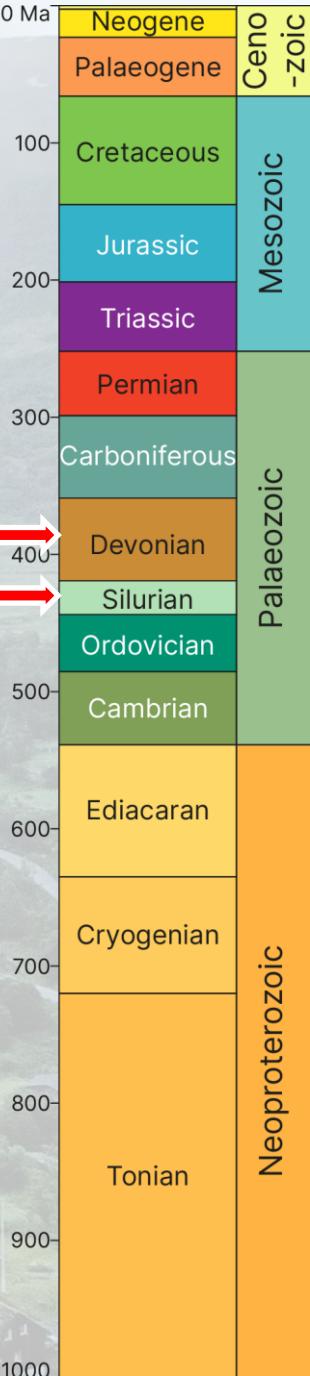
C<sub>1</sub>



# Rise and Fall of The Caledonian Mountains | Caledonian Granites

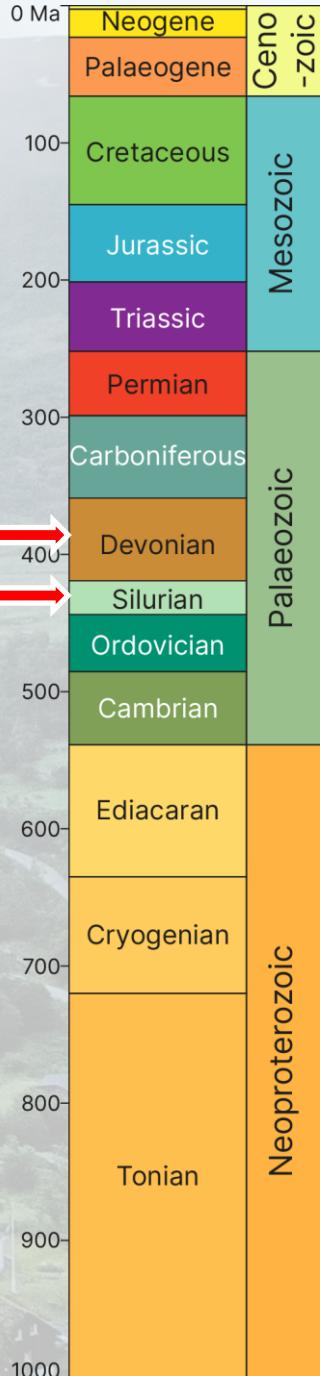
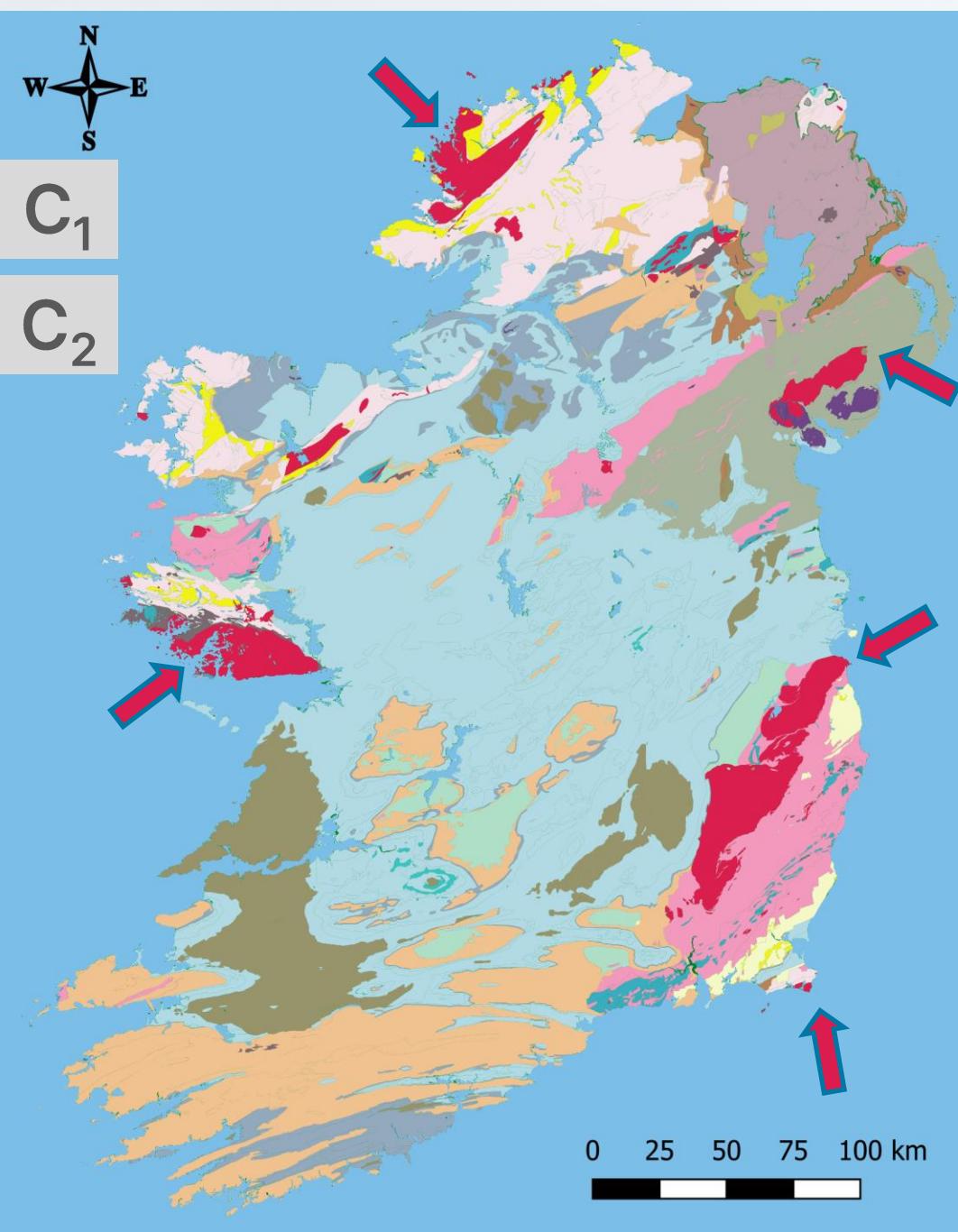
GY4051

C<sub>1</sub>



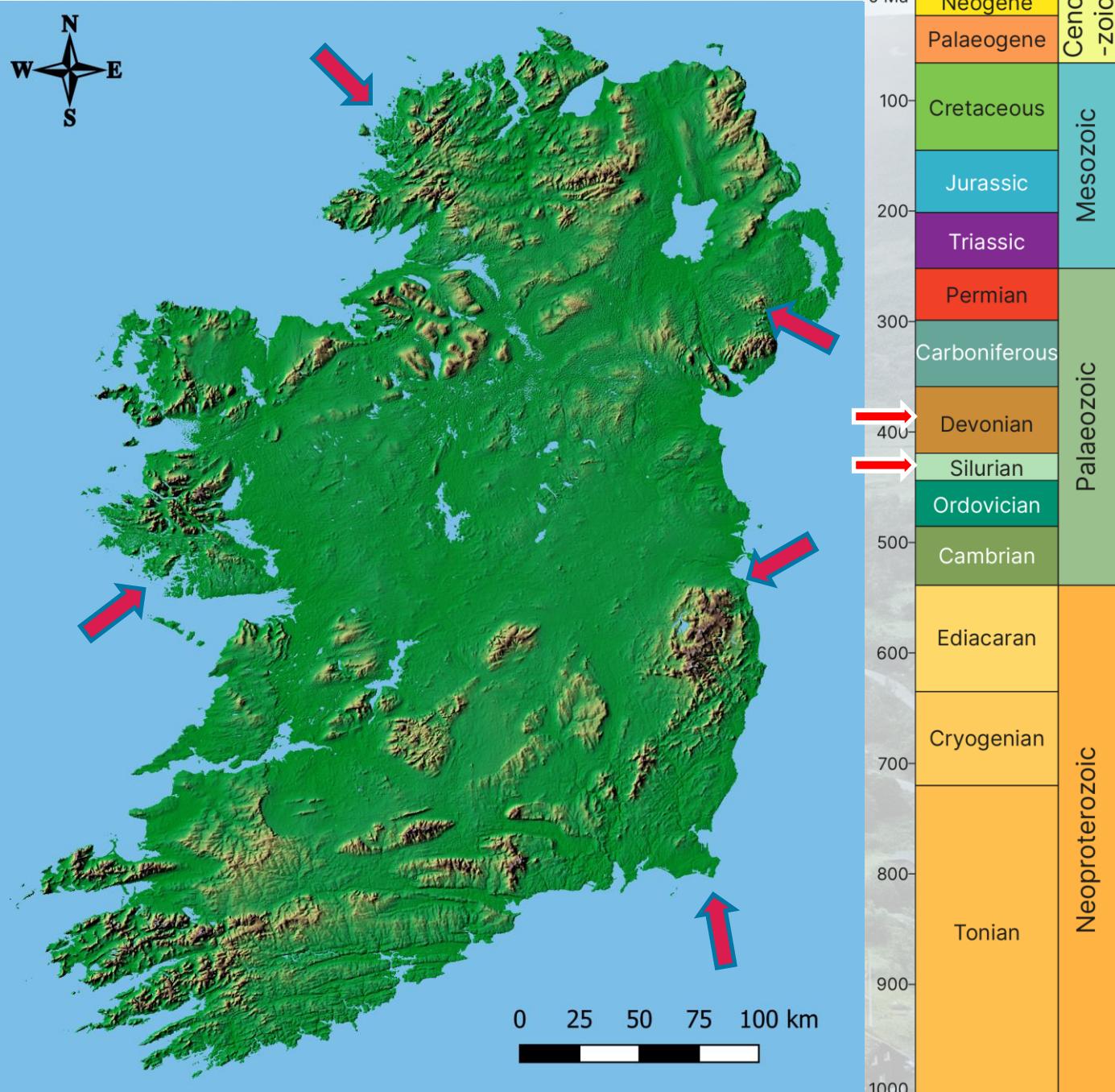
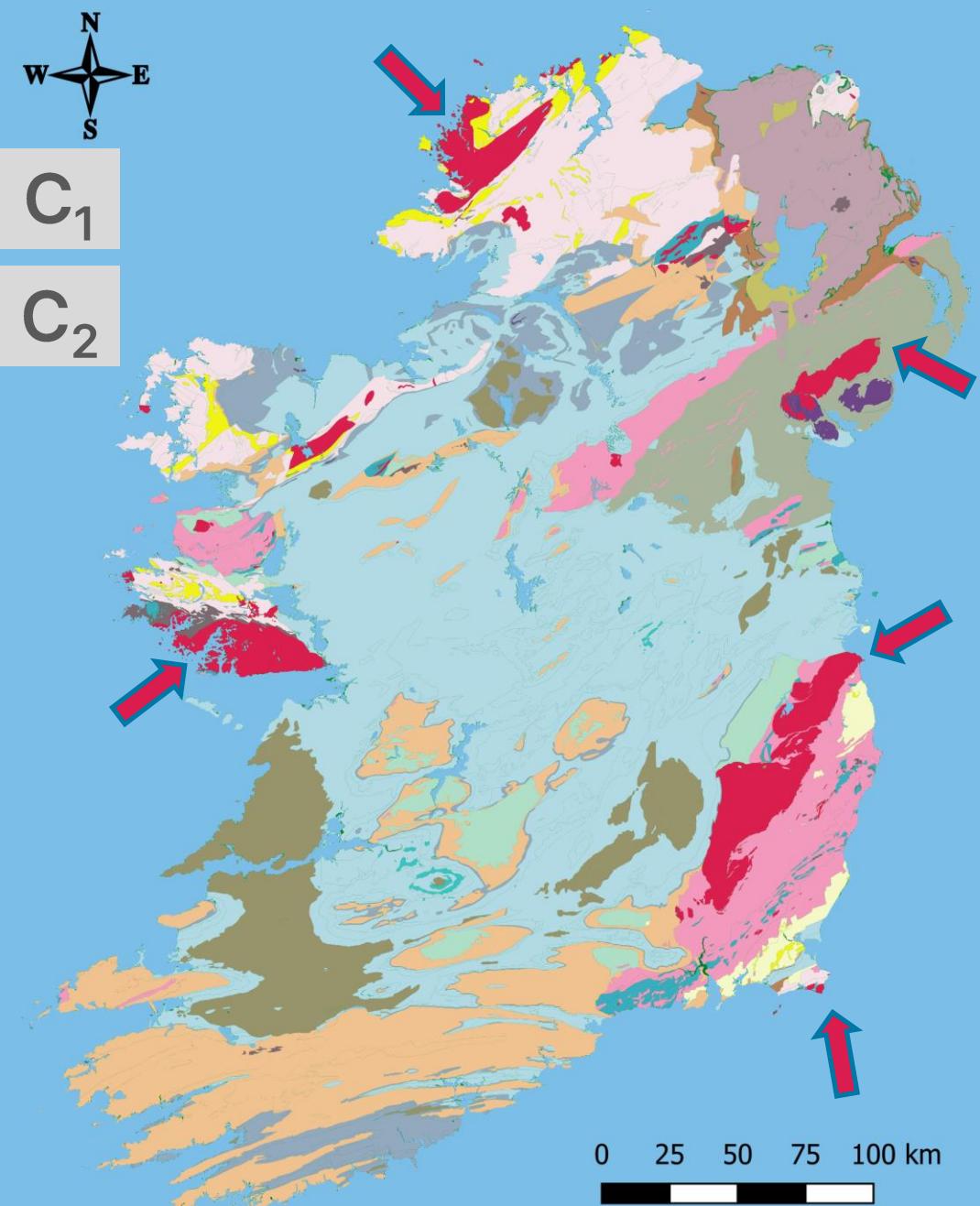
# Rise and Fall of The Caledonian Mountains | Caledonian Granites

GY4051



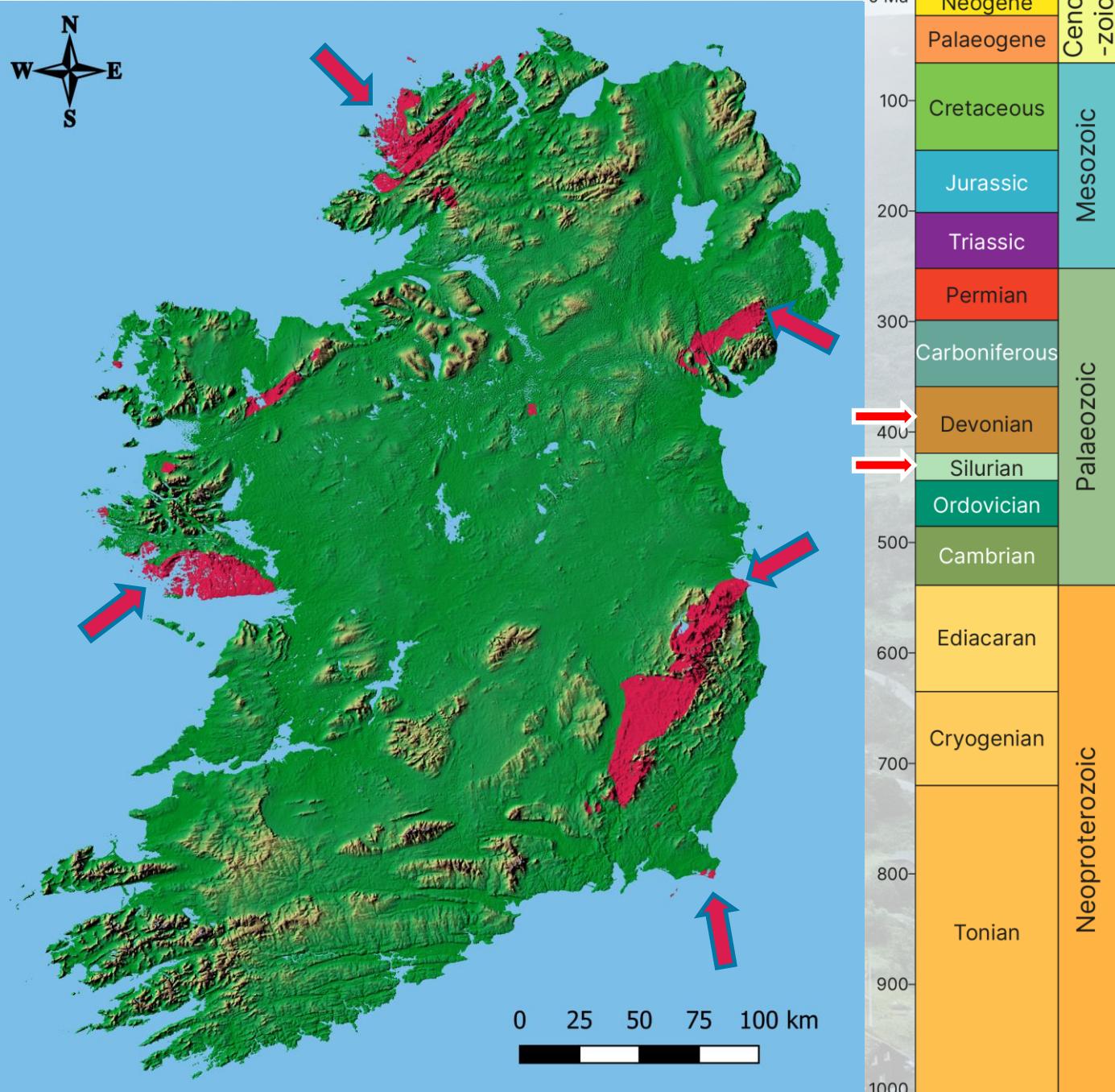
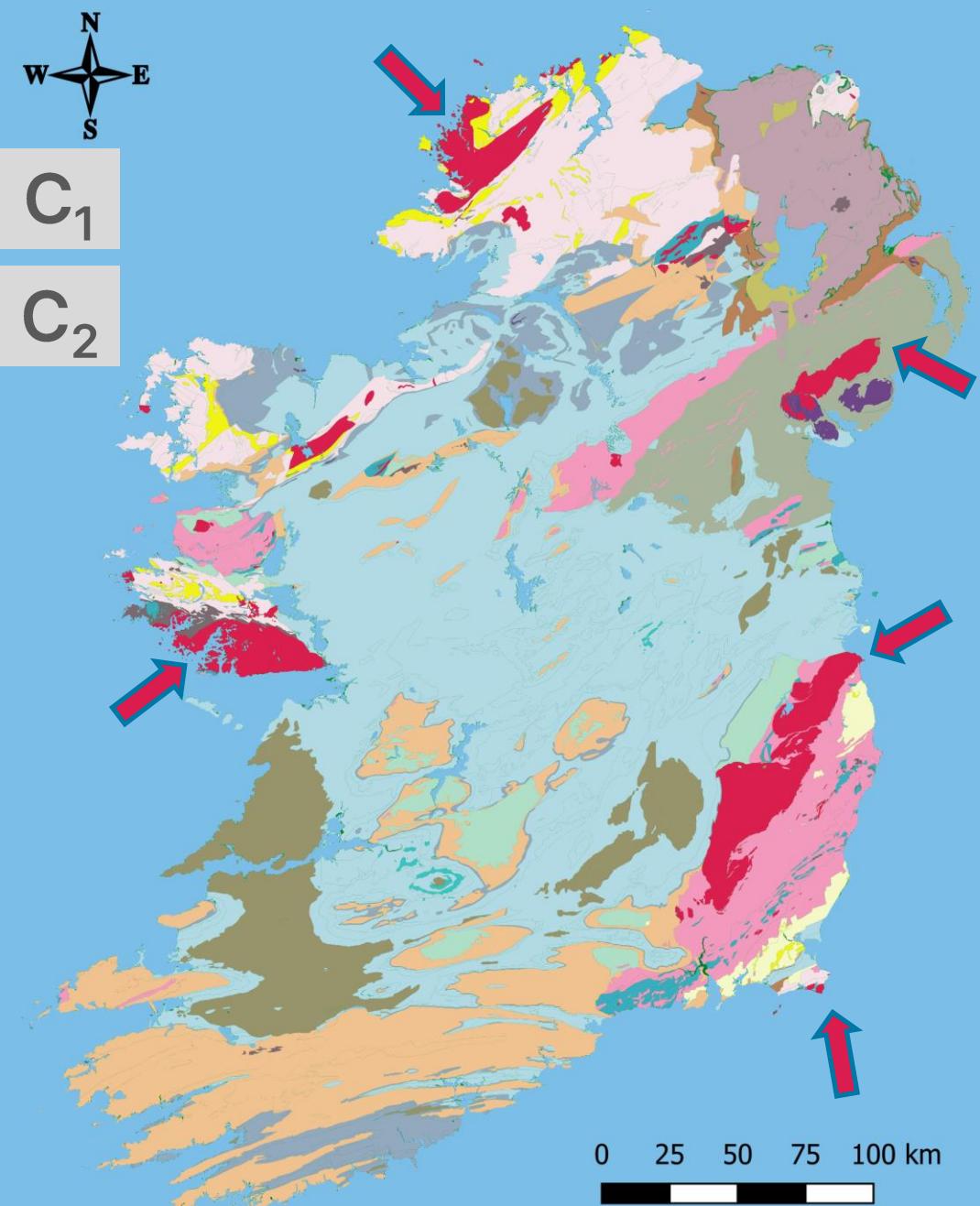
# Rise and Fall of The Caledonian Mountains | Caledonian Granites

GY4051



# Rise and Fall of The Caledonian Mountains | Caledonian Granites

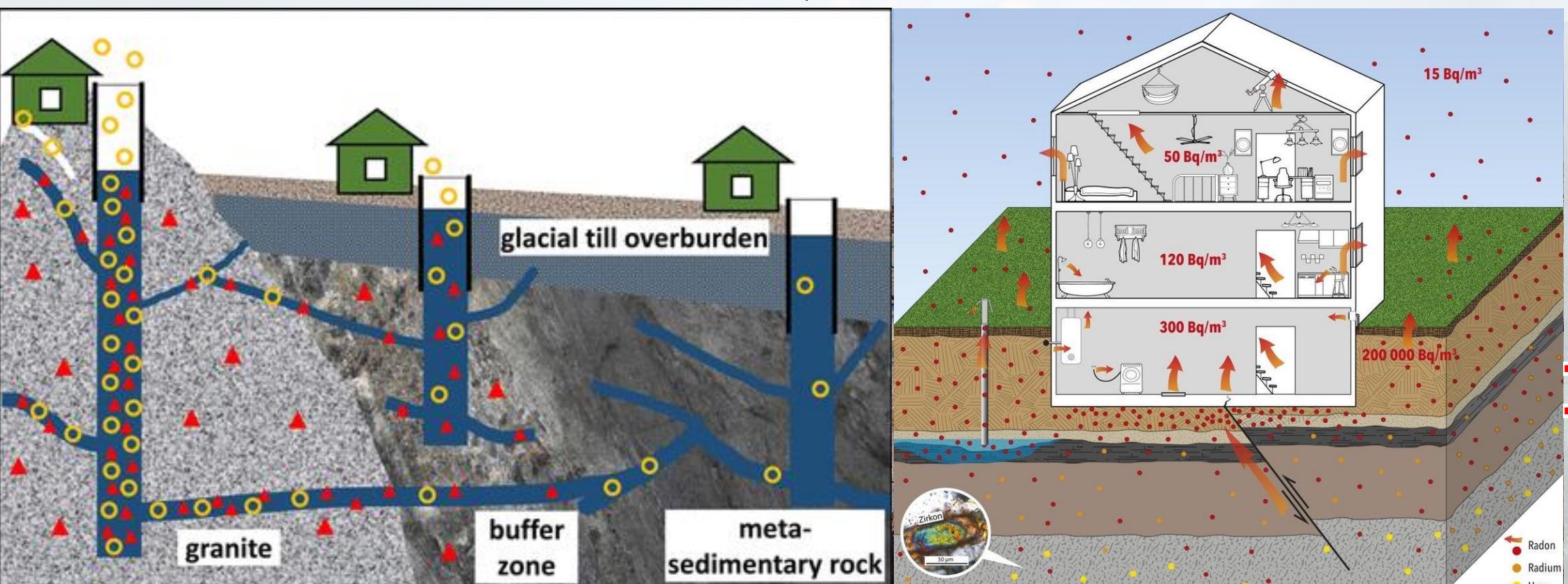
GY4051



	0 Ma	Neogene	Ceno-zoic
	100	Palaeogene	
	200	Cretaceous	Mesozoic
	300	Jurassic	
	400	Triassic	
	500	Permian	
	600	Carboniferous	
	700	Devonian	Palaeozoic
	800	Silurian	
	900	Ordovician	
	1000	Cambrian	
	1100	Ediacaran	
	1200	Cryogenian	
	1300	Tonian	Neoproterozoic

# Rise and Fall of The Caledonian Mountains | Caledonian Granites - Radon

**GY4051**



0 Ma  
Neogene  
Palaeogene

Ceno-zoic

100  
Cretaceous

Mesozoic

200  
Jurassic

Triassic

300  
Permian

Carboniferous

400  
Devonian

Silurian

500  
Ordovician

Cambrian

600  
Ediacaran

Palaeozoic

700  
Cryogenian

Neoproterozoic

800  
Tonian

Neoproterozoic

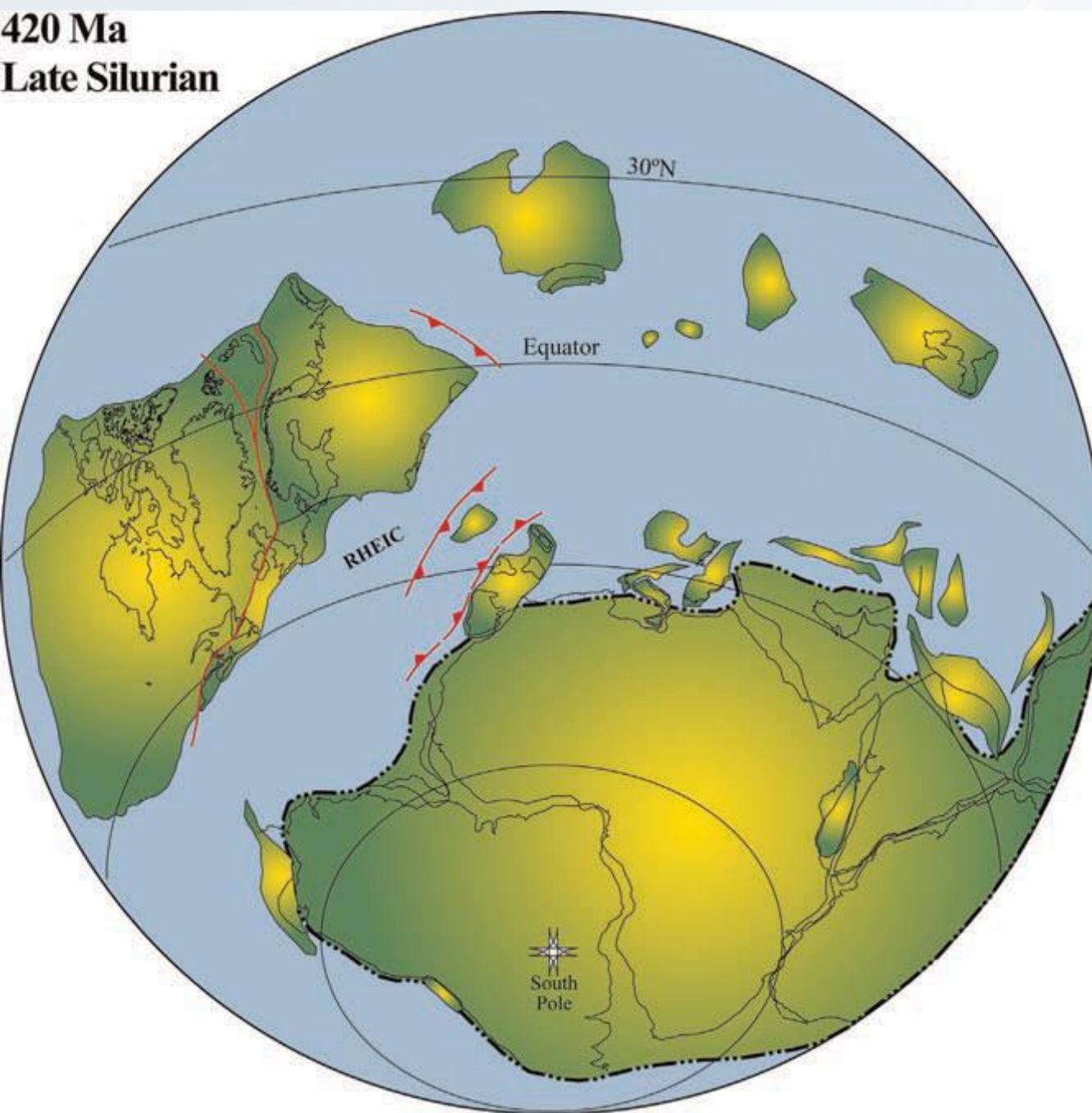
900

Neoproterozoic

1000  
Neoproterozoic

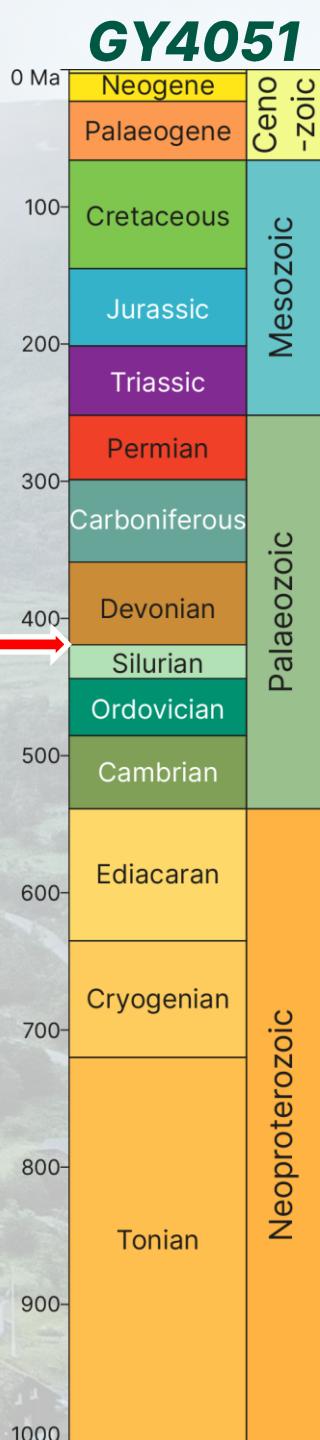
Neoproterozoic

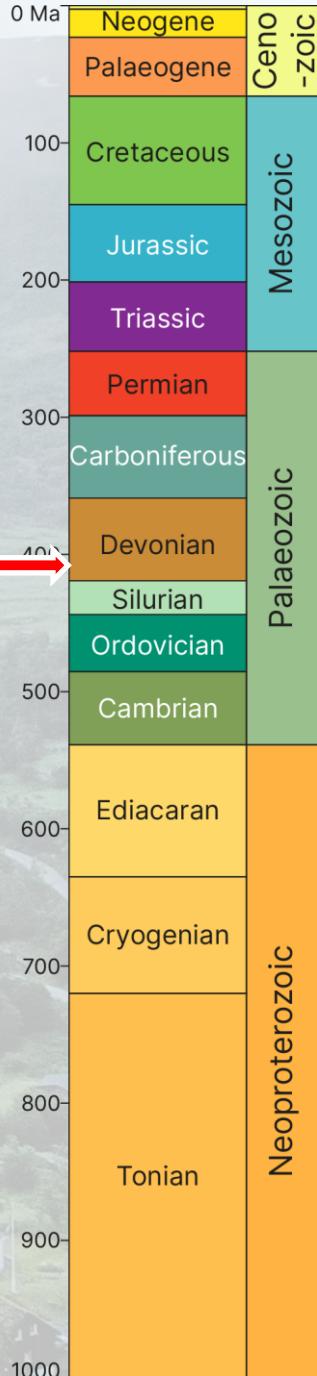
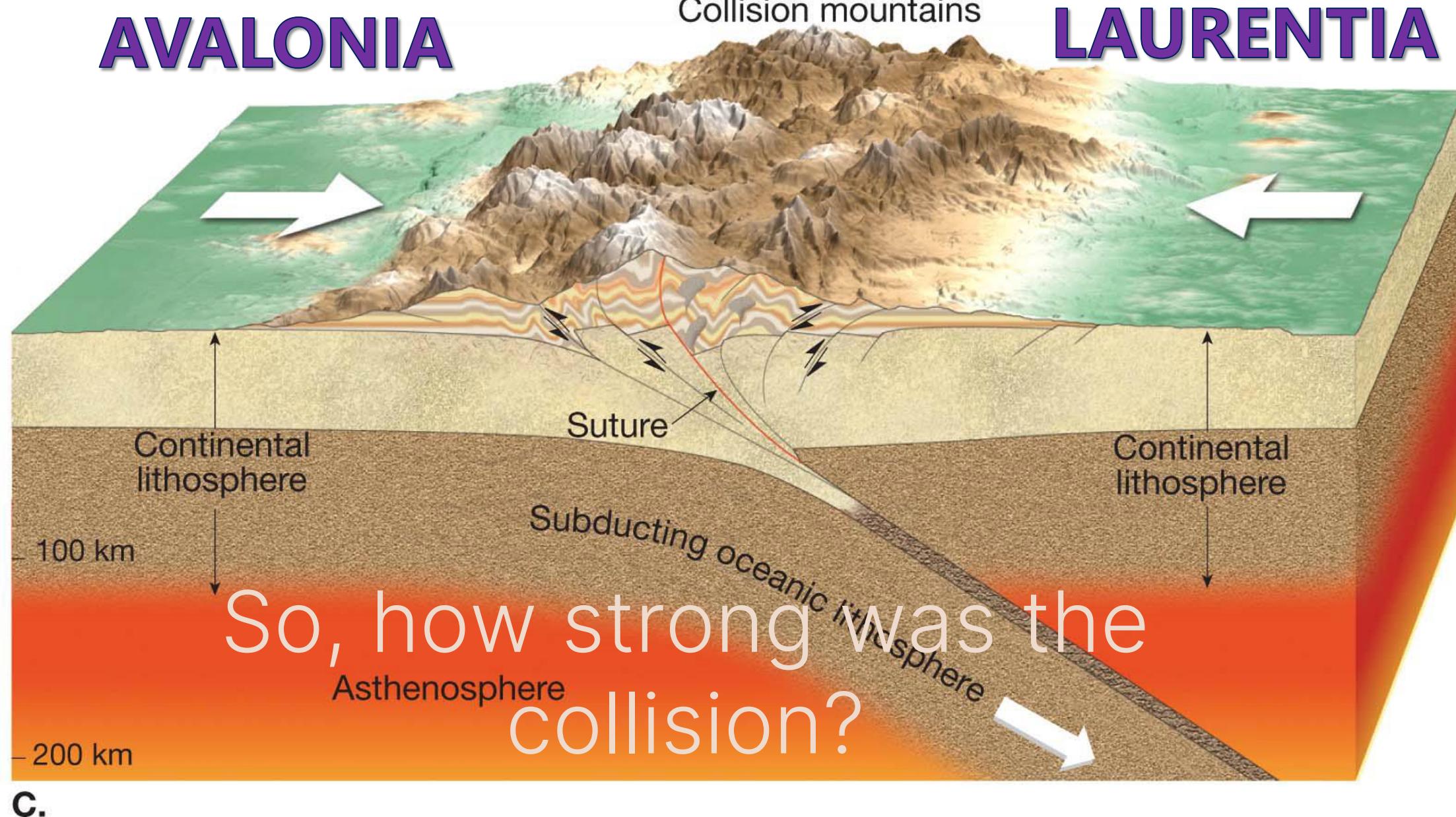
# Rise and Fall of The Caledonian Mountains | Late Silurian



## Iapetus Ocean is gone

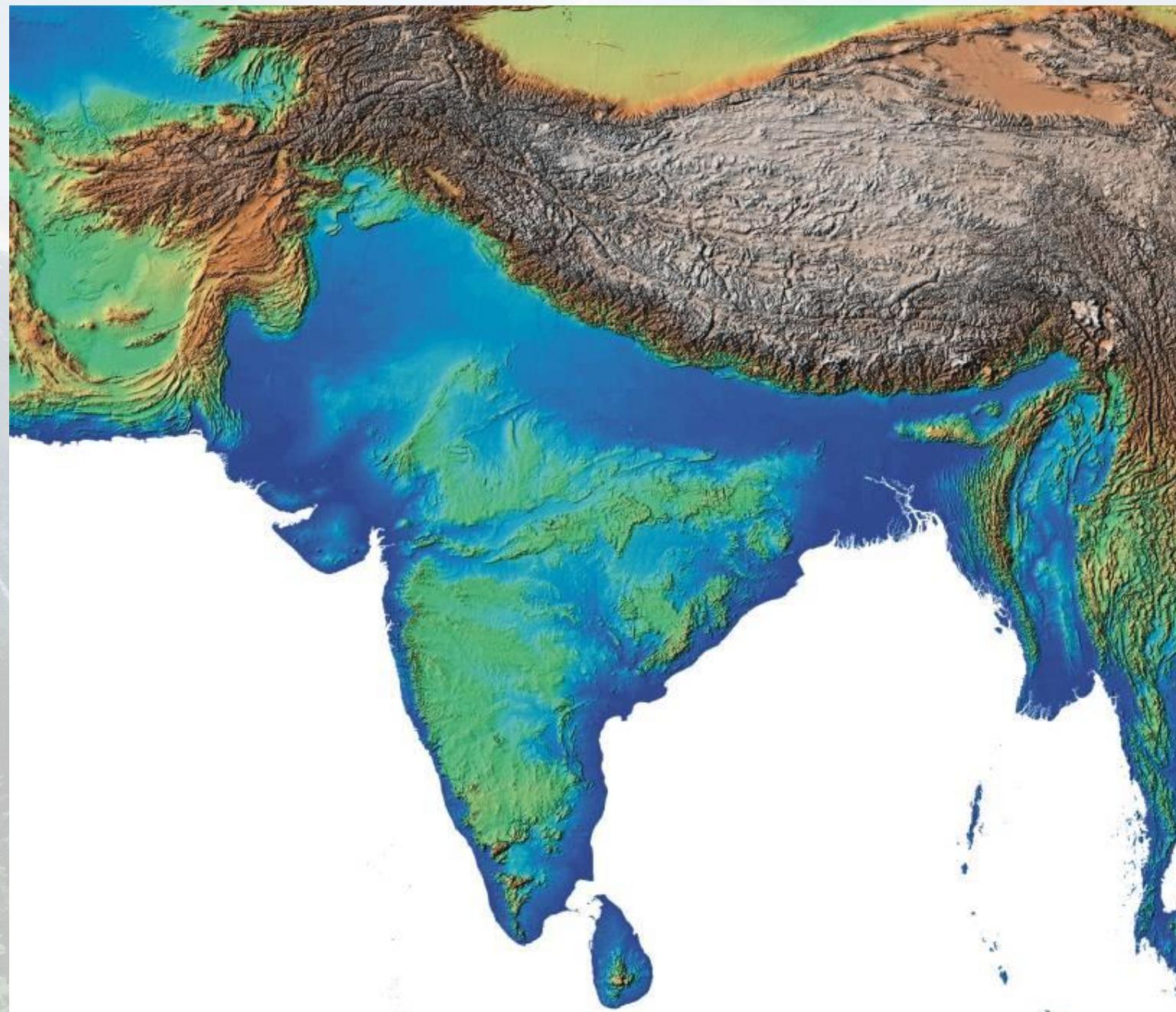
- Avalonia has collided with Laurentia and Baltica in the Caledonian Orogeny
- Continent of Laurussia
- UK and Ireland joined, separated from Gondwana by the Rheic Ocean



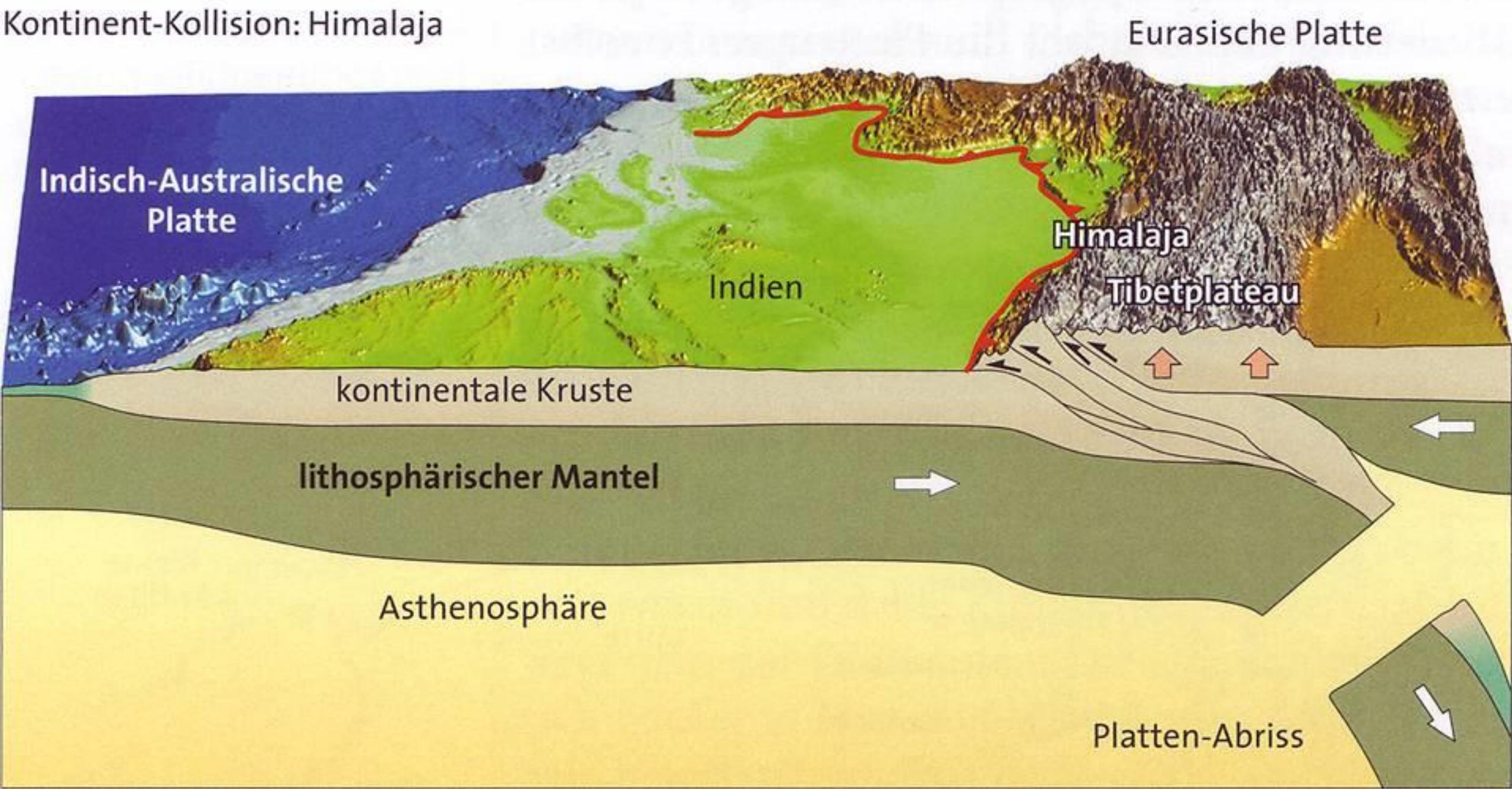


# *Rise and Fall of The Caledonian Mountains | Himalayas*

**GY4051**



Kontinent-Kollision: Himalaja



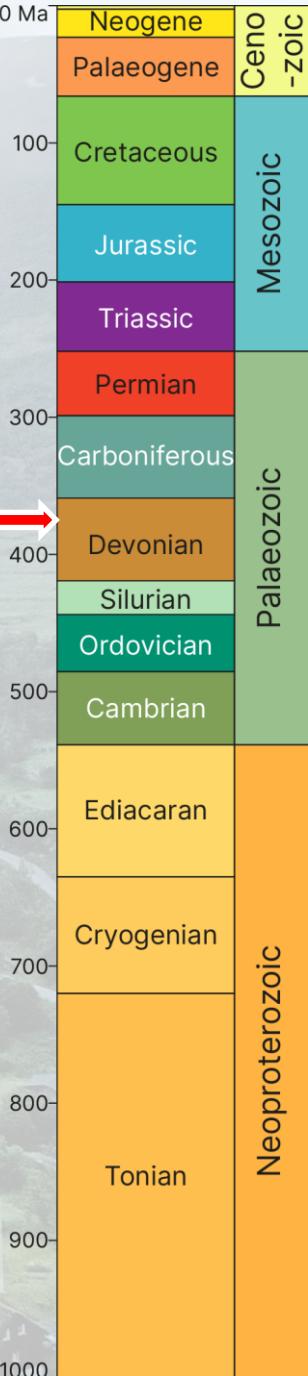




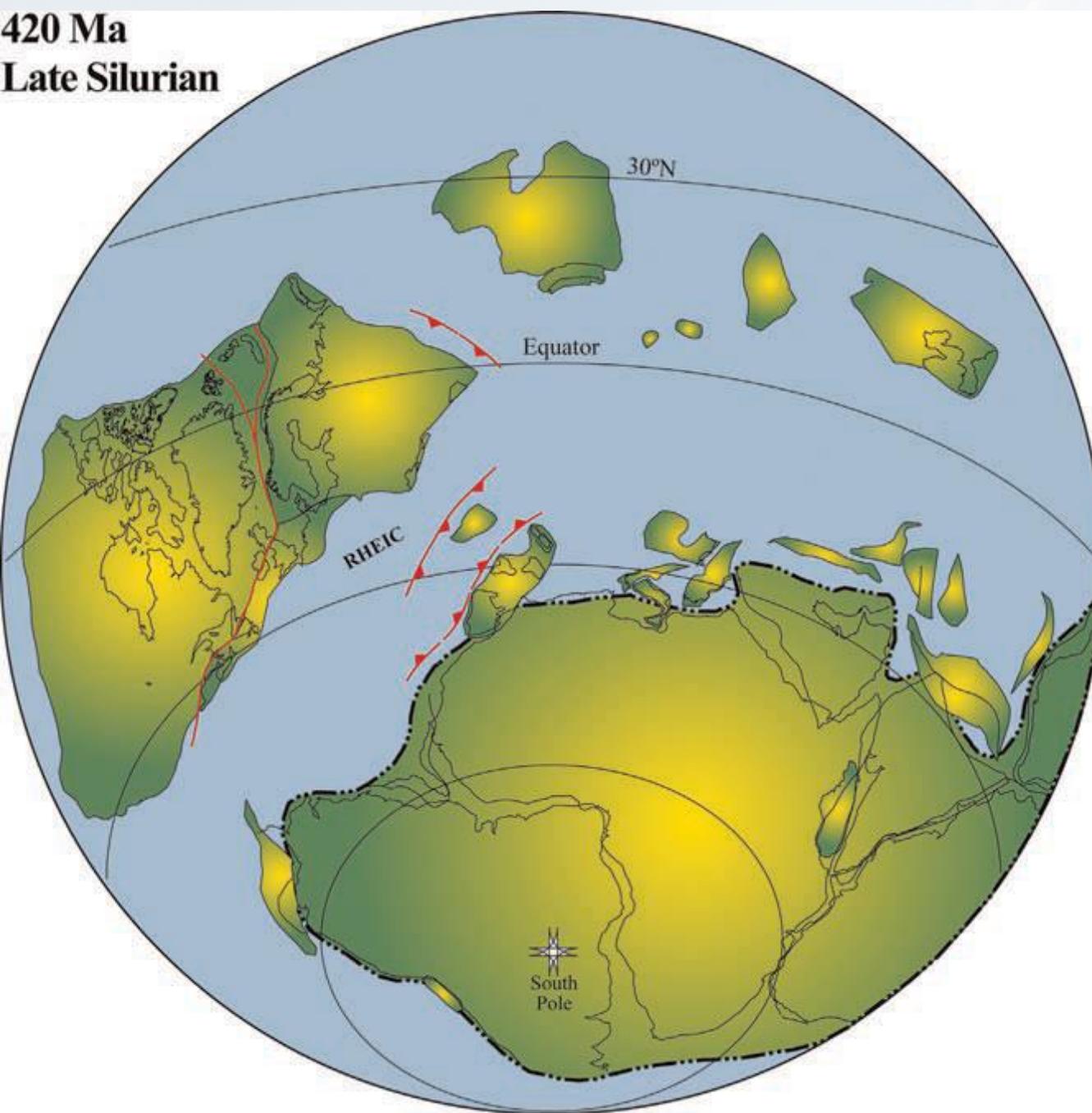


# Rise and Fall of The Caledonian Mountains | Guess what didn't exist in the Devonian?

GY4051

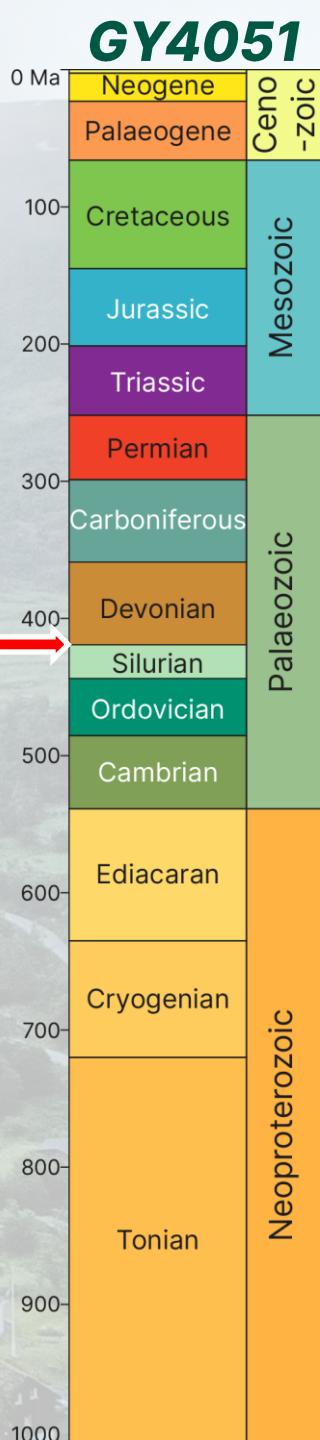


# Rise and Fall of The Caledonian Mountains | Late Silurian



## Iapetus Ocean is gone

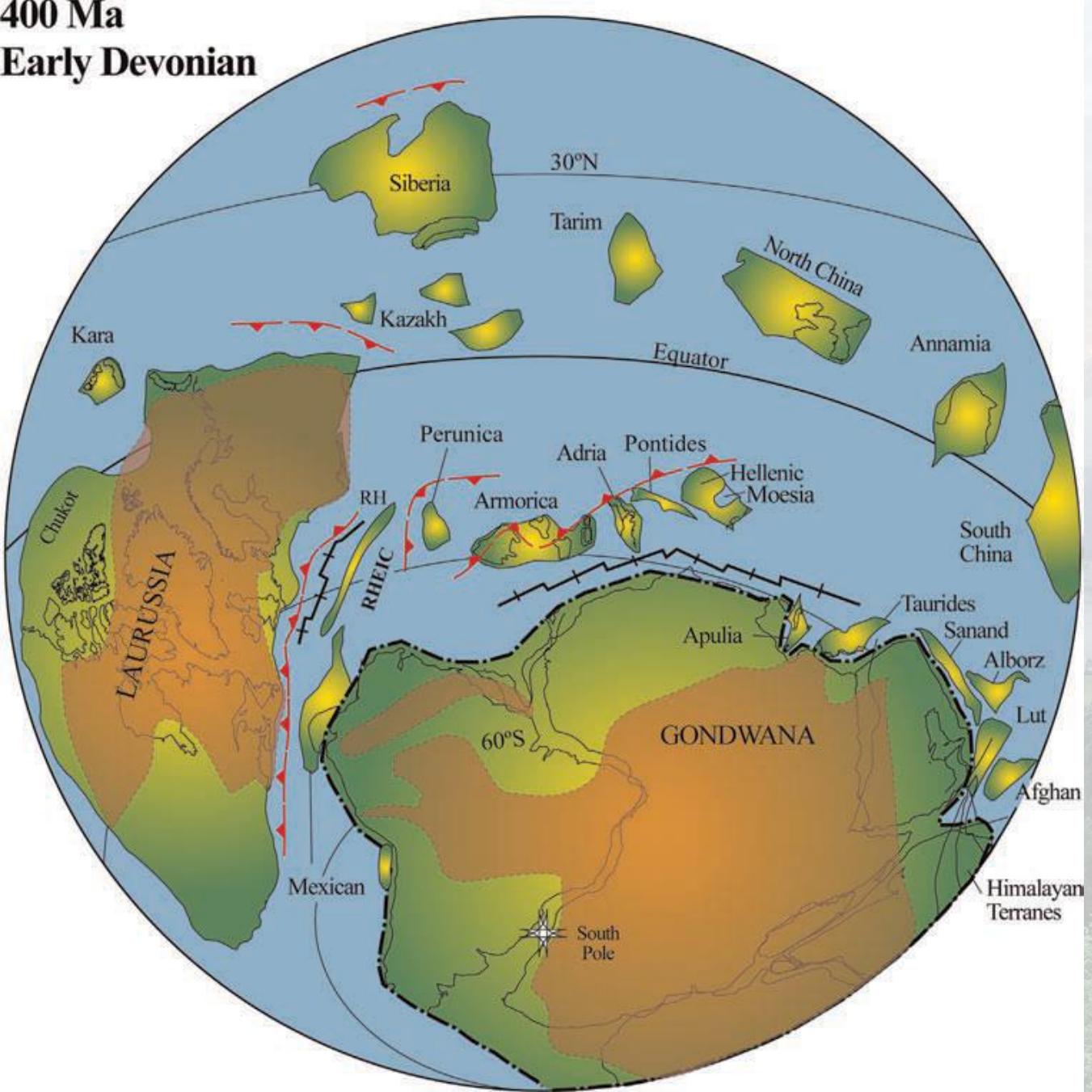
- Avalonia has collided with Laurentia and Baltica in the Caledonian Orogeny
- Continent of Laurussia
- UK and Ireland joined, separated from Gondwana by the Rheic Ocean



# Rise and Fall of The Caledonian Mountains | Early Devonian

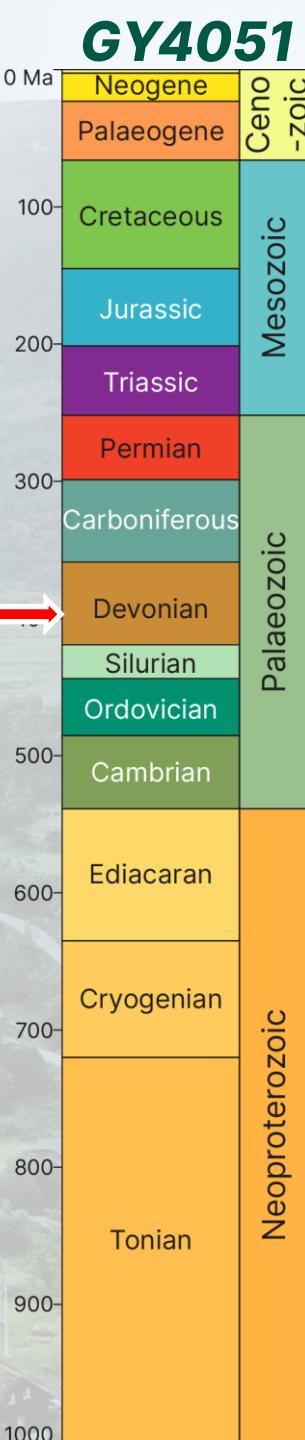
400 Ma

Early Devonian



## Old Red Sandstone

- Laurussia – the Old Red Sandstone Continent – mostly emergent
- Southernmost Britain and Ireland on the continental margin





Arid Environments: Hammada | Rocky desert (Sahara)







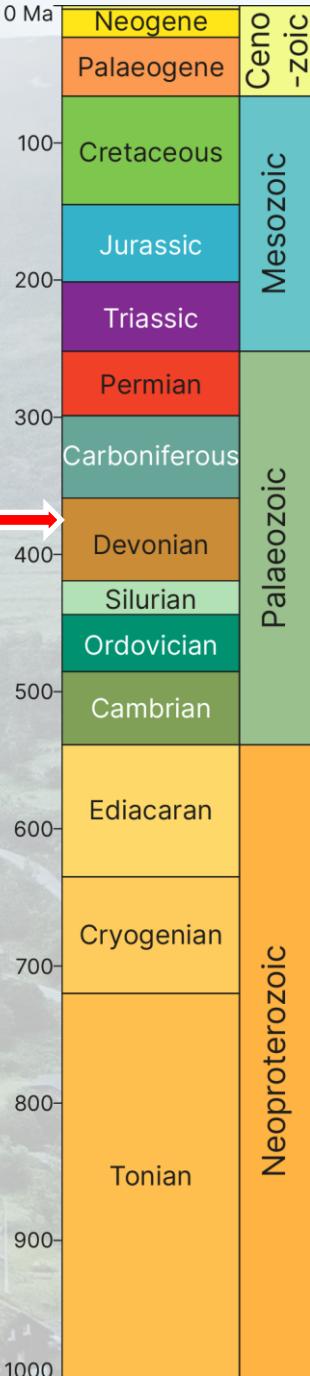






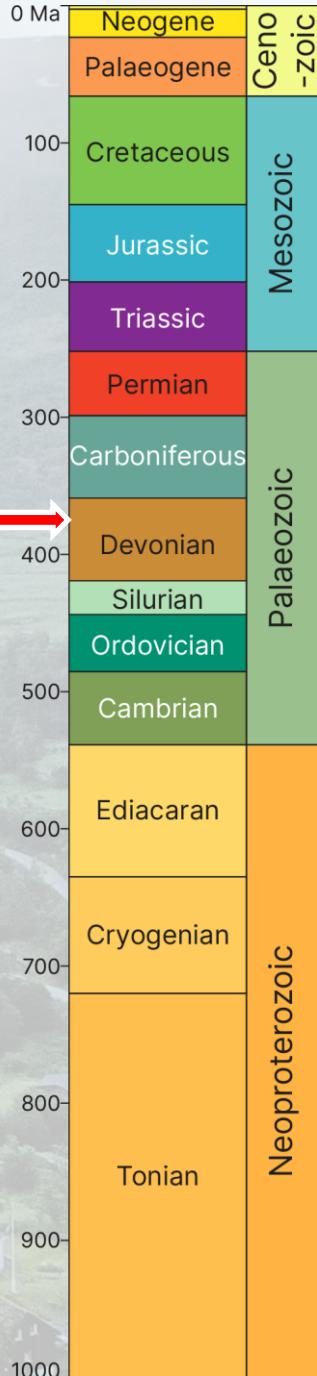
# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

GY4051



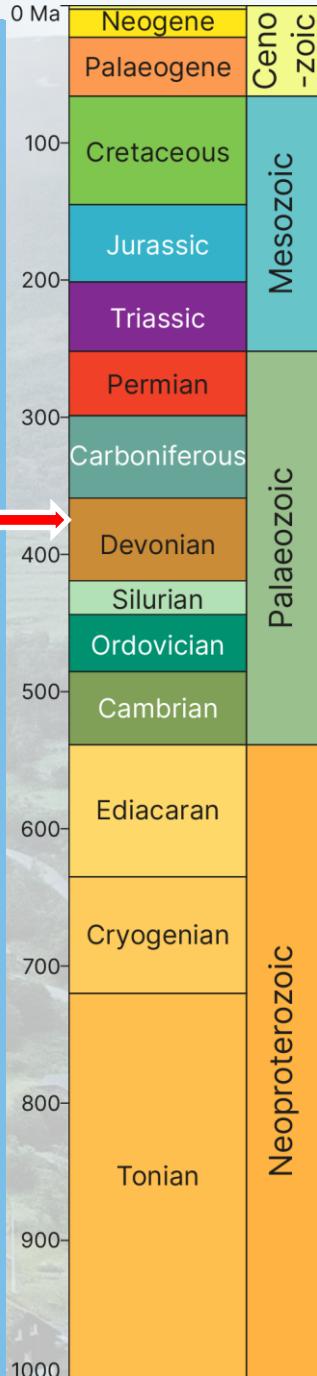
# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

GY4051



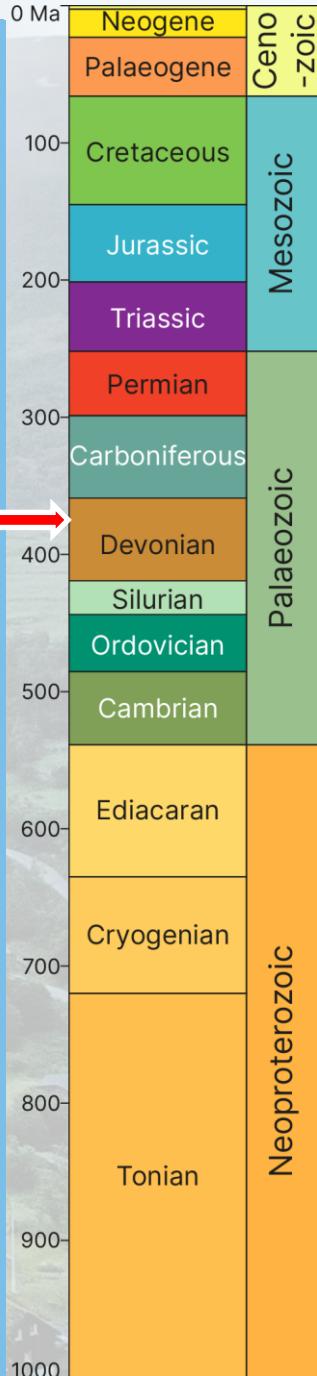
# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

GY4051



# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

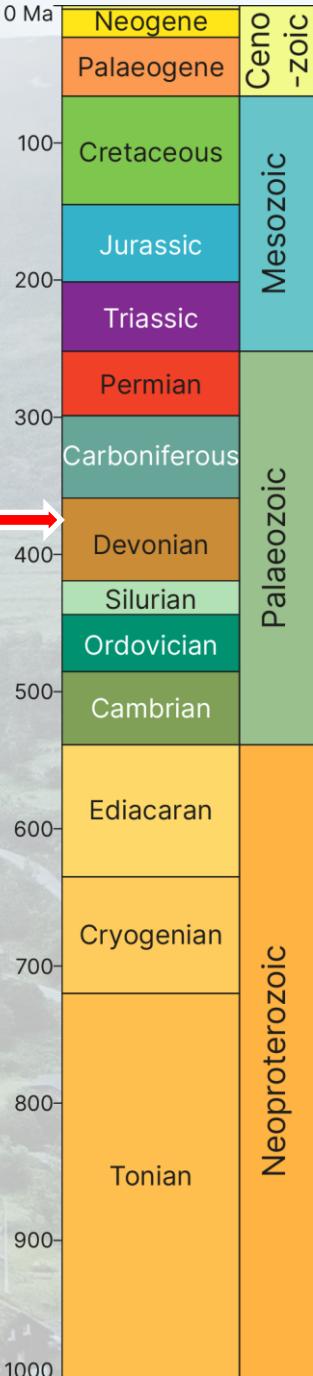
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# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

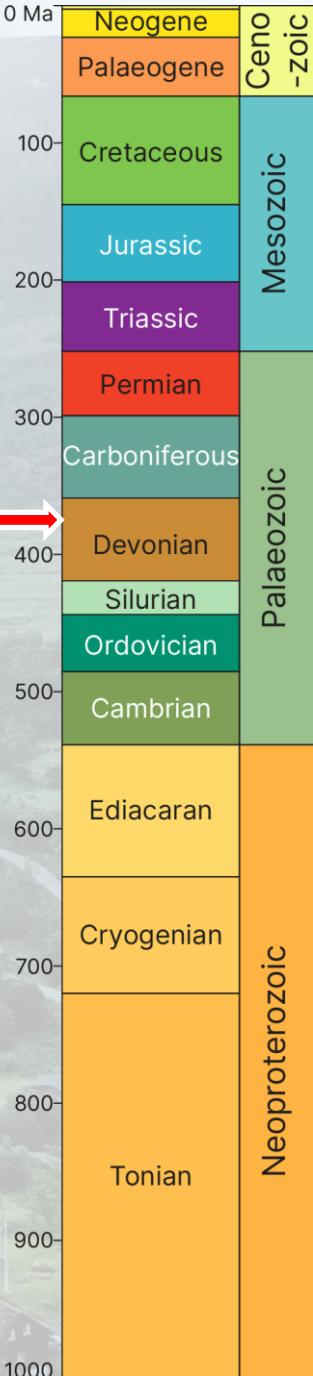
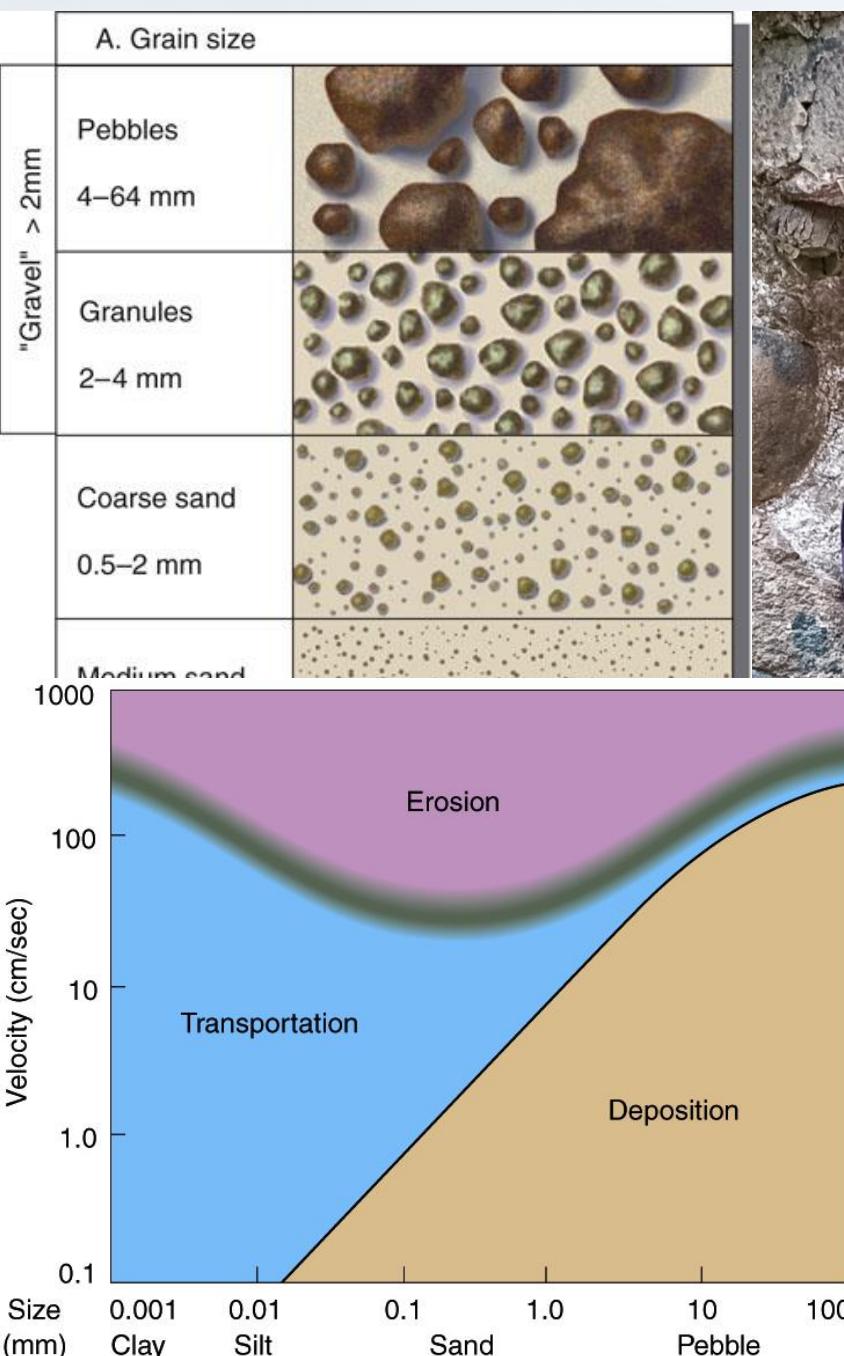
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A. Grain size	
"Gravel" > 2mm	Pebbles 4–64 mm
	Granules 2–4 mm
	Coarse sand 0.5–2 mm
	Medium sand 0.25–0.5 mm
	Fine sand 0.06–0.25 mm
	Silt 0.004–0.06 mm
	Clay < 0.004 mm



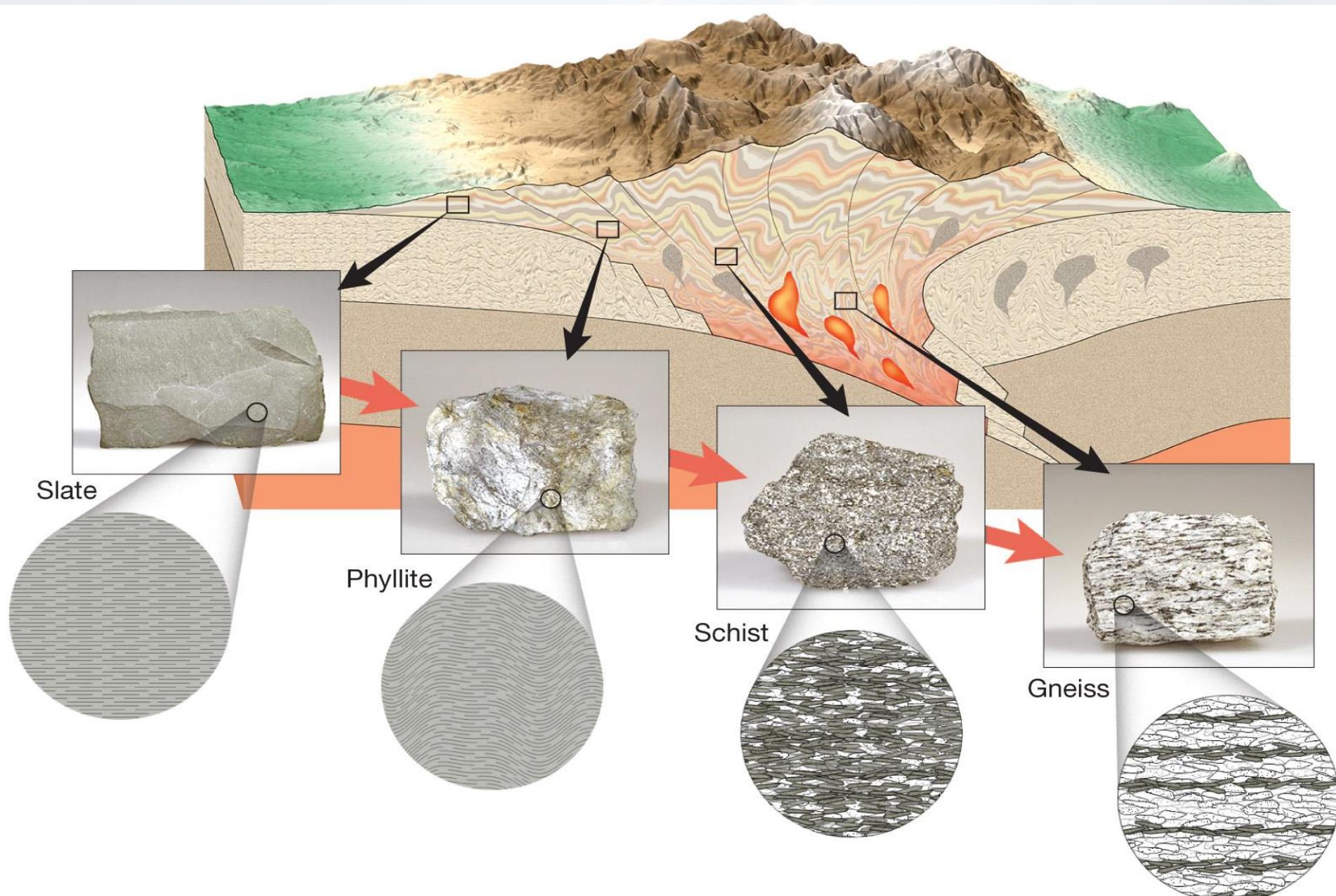
# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

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# Rise and Fall of The Caledonian Mountains | Metamorphic Rocks

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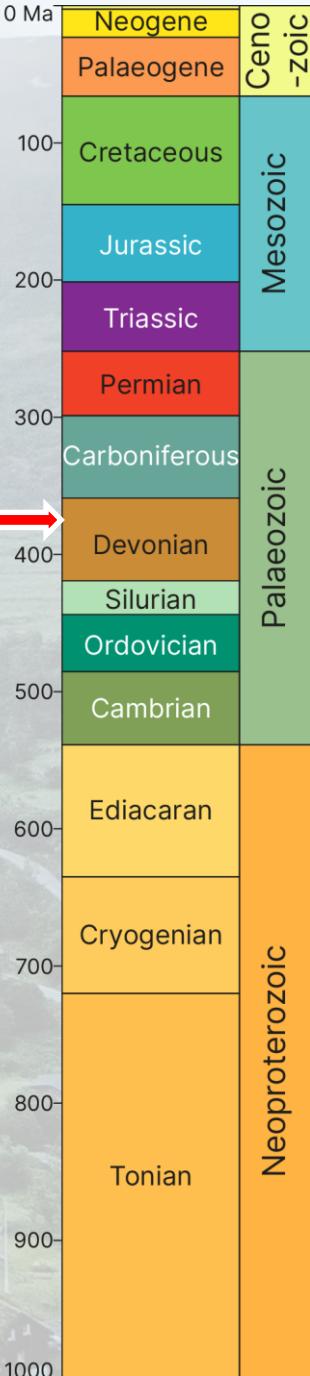
# Rise and Fall of The Caledonian Mountains | Alps - Malbun, Liechtenstein

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# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

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## Distance of transport

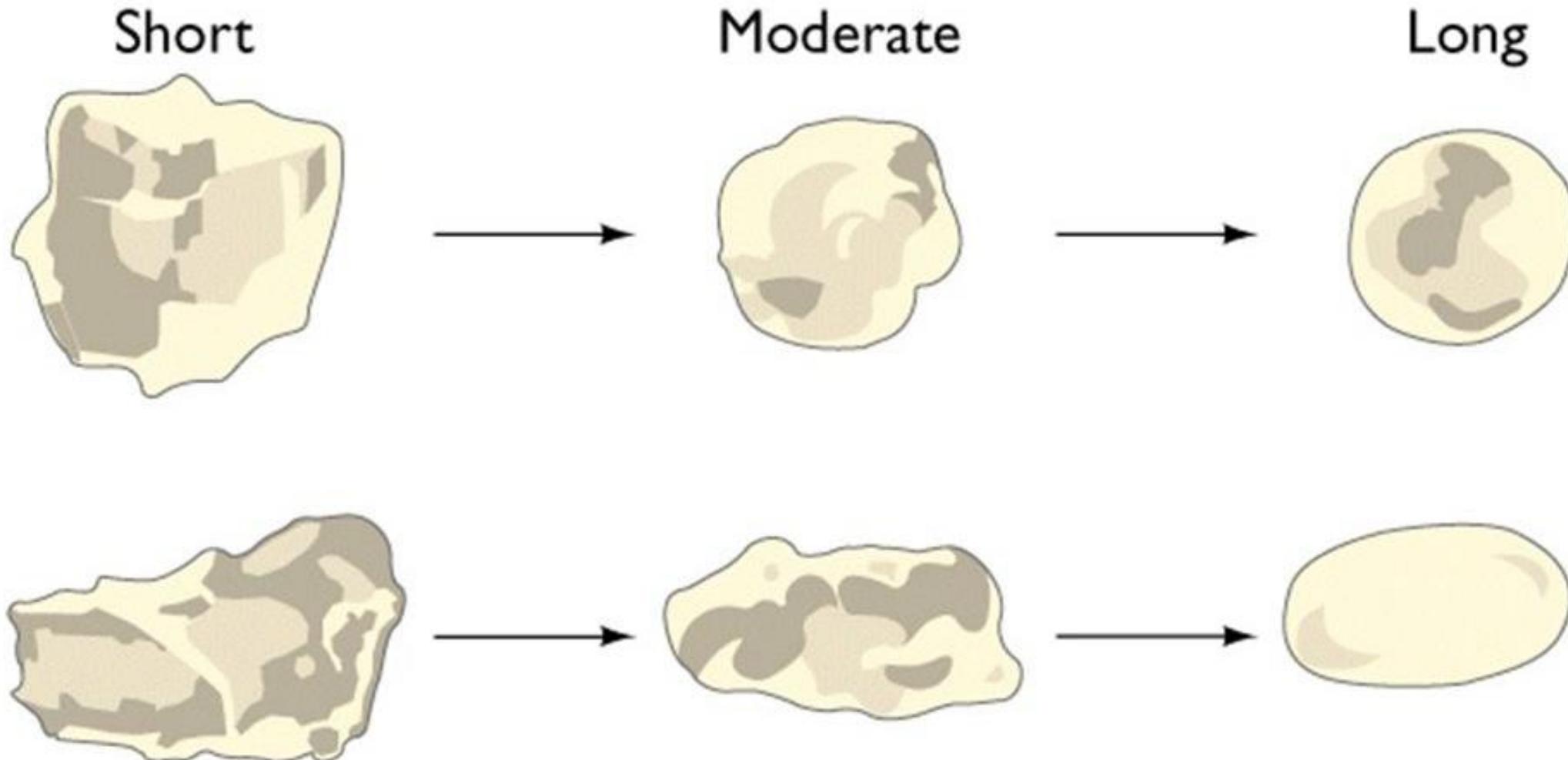
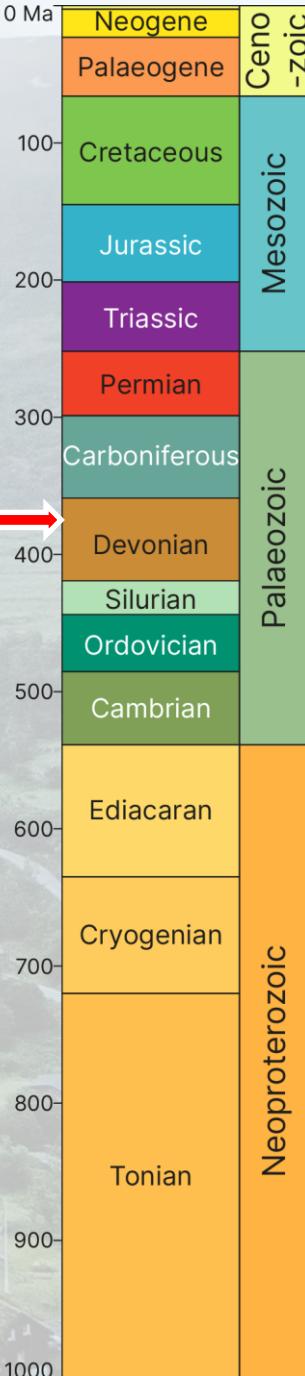


Fig. 7.3

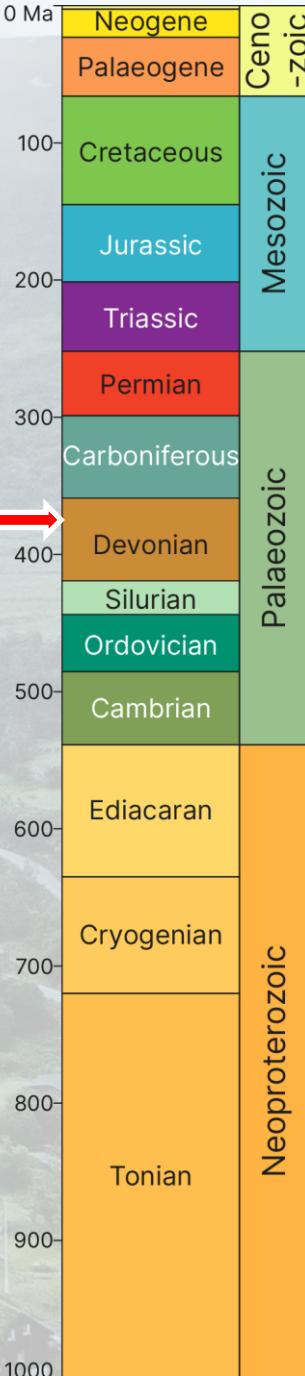
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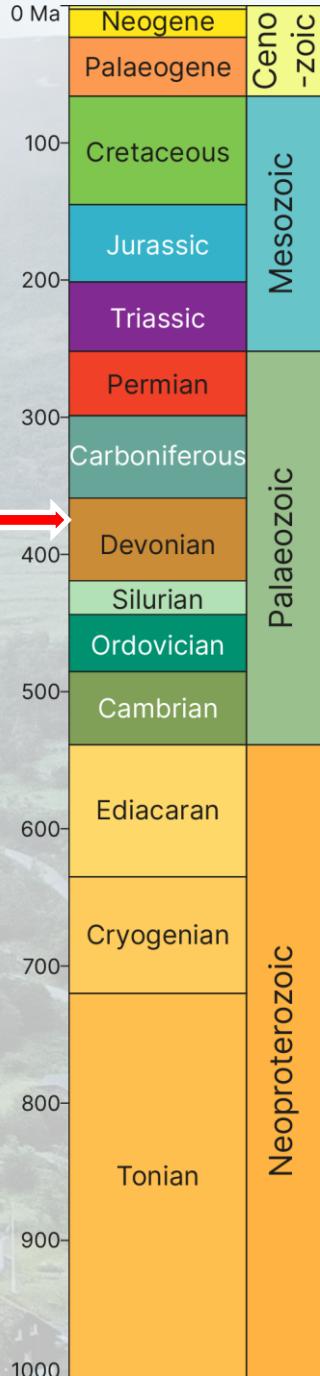
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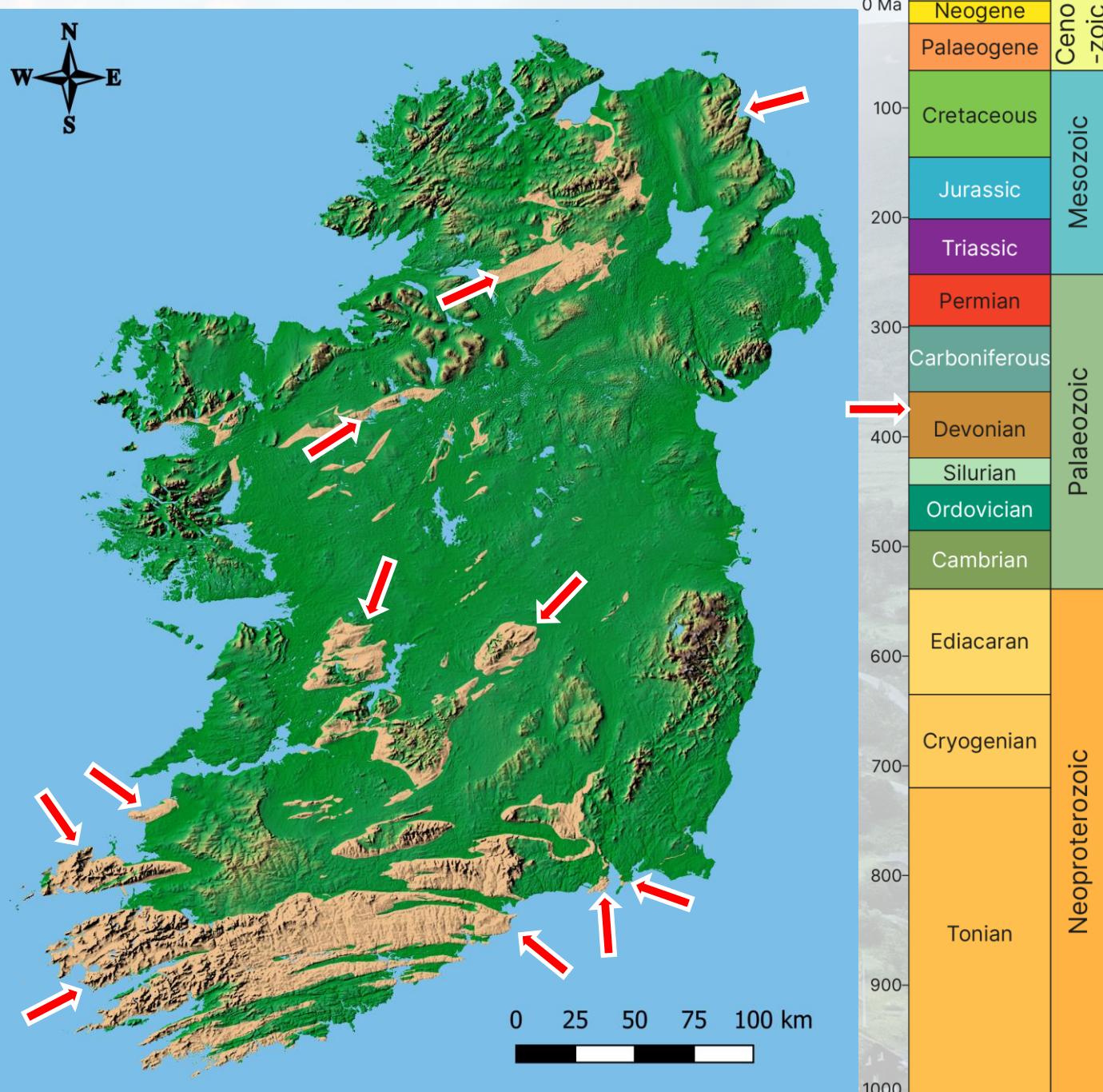
# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

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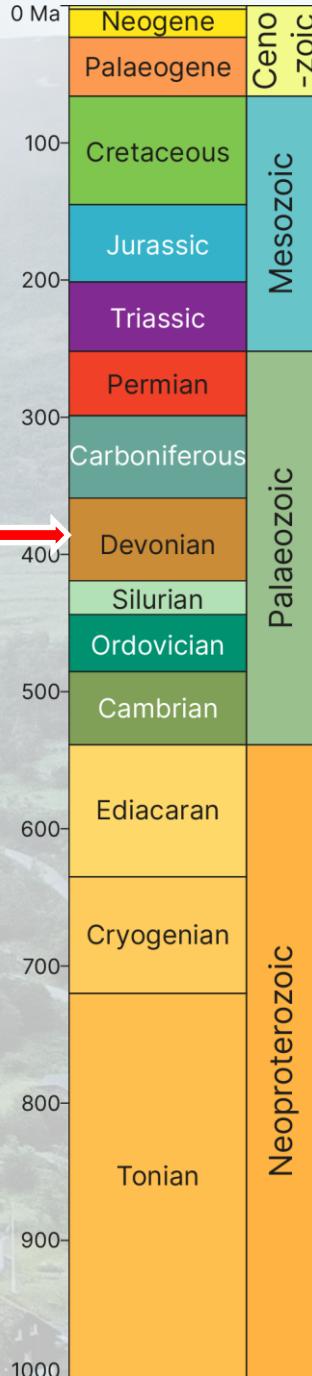
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0 Ma	Neogene	Ceno-zoic
100	Palaeogene	
200	Cretaceous	Mesozoic
300	Jurassic	
400	Triassic	
500	Permian	
600	Carboniferous	
700	Devonian	Palaeozoic
800	Silurian	
900	Ordovician	
1000	Cambrian	
1100	Ediacaran	
1200	Cryogenian	
1300	Tonian	Neoproterozoic

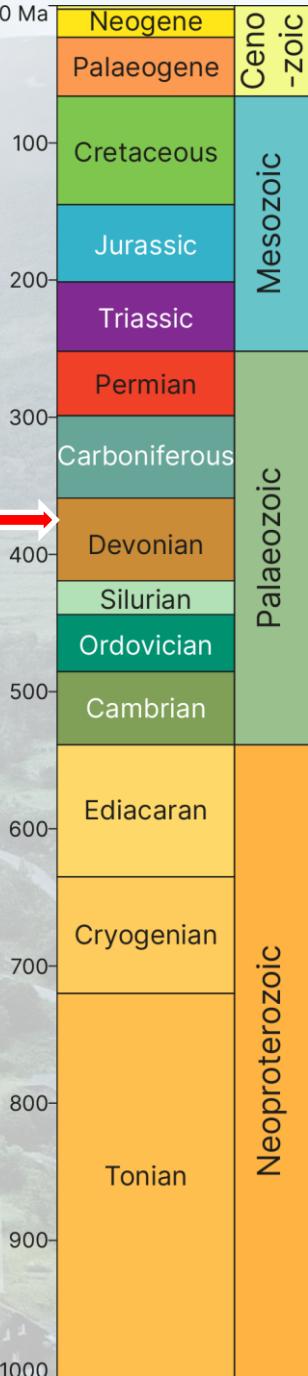
# Rise and Fall of The Caledonian Mountains | Devonian River Sandstones of Ireland

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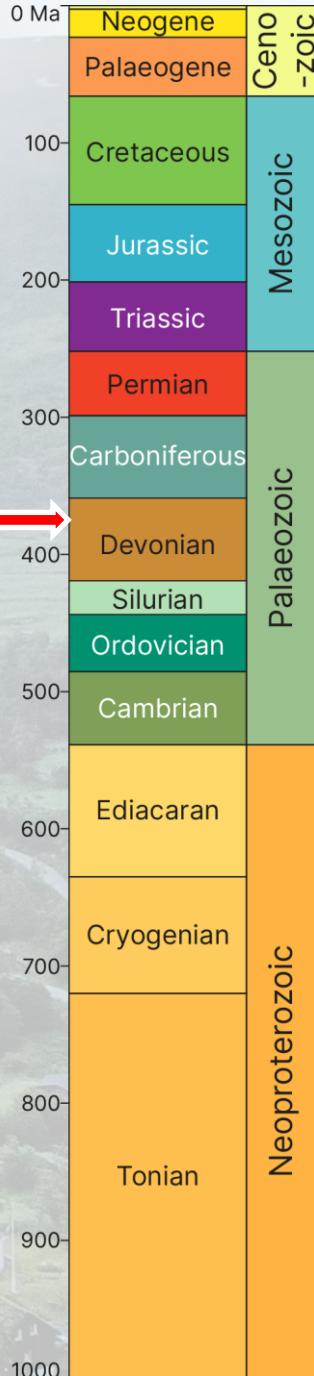


# Rise and Fall of The Caledonian Mountains | Devonian Millstones of Ireland

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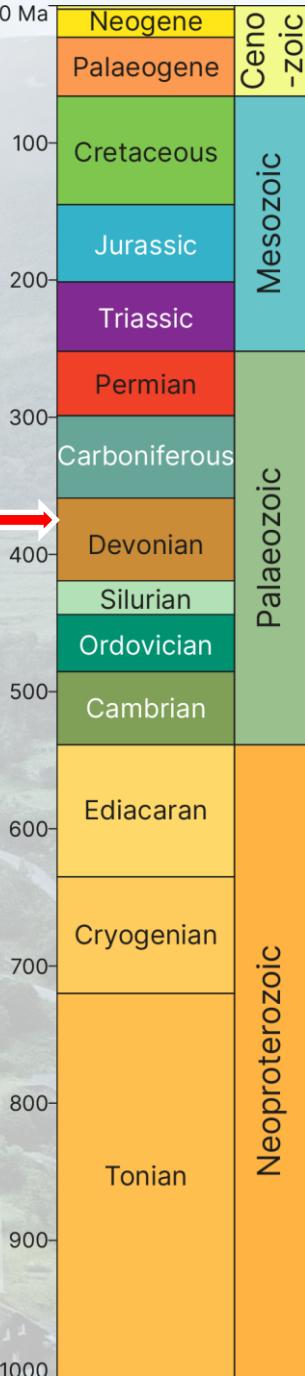


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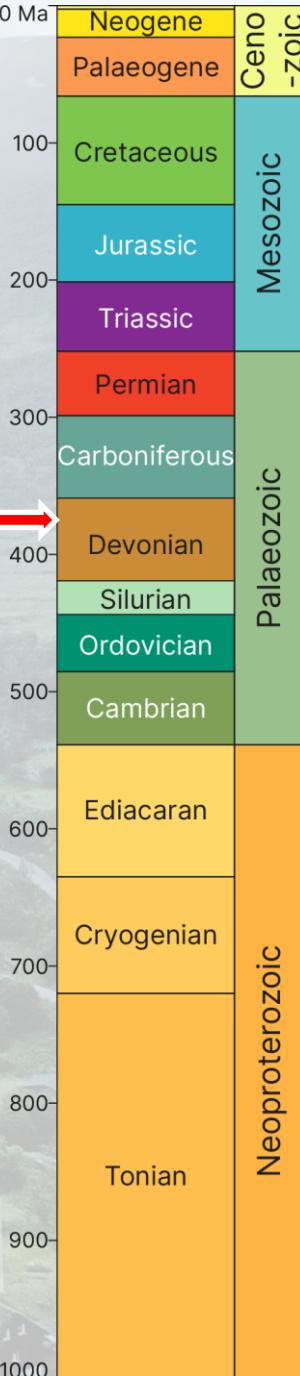
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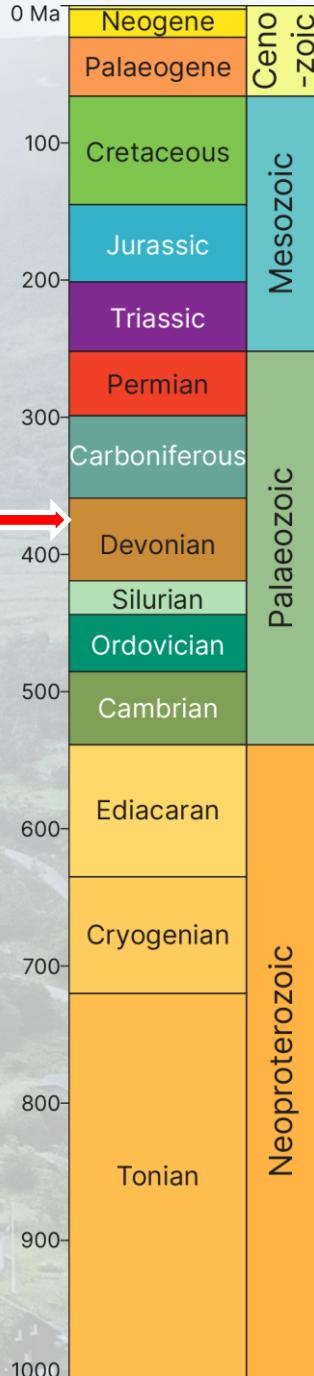
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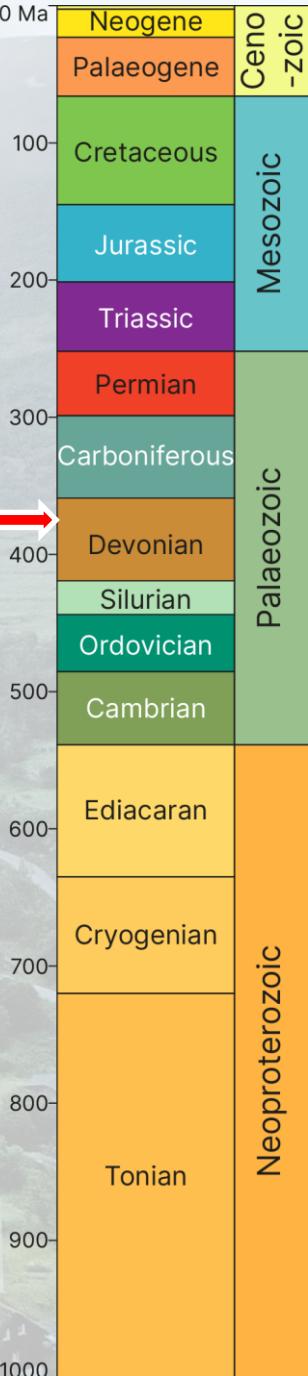
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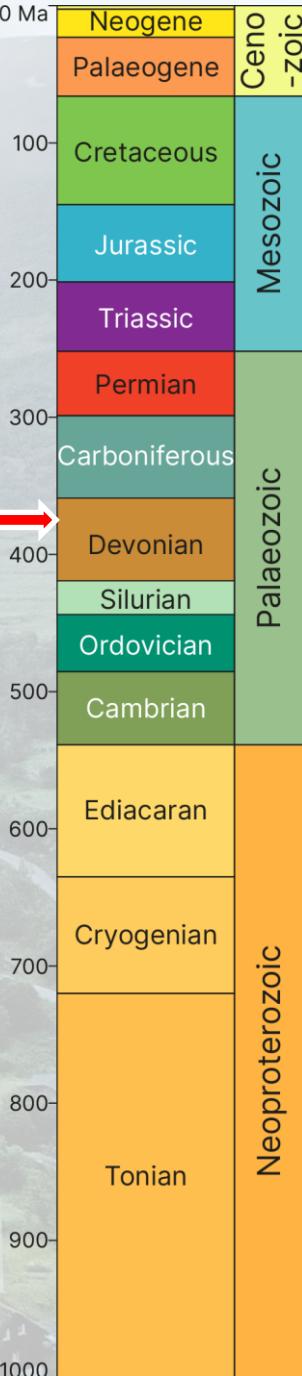
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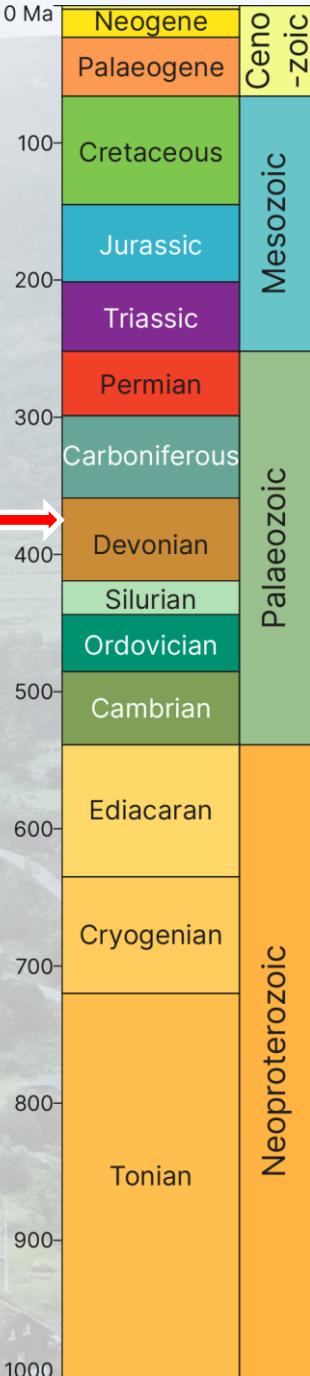






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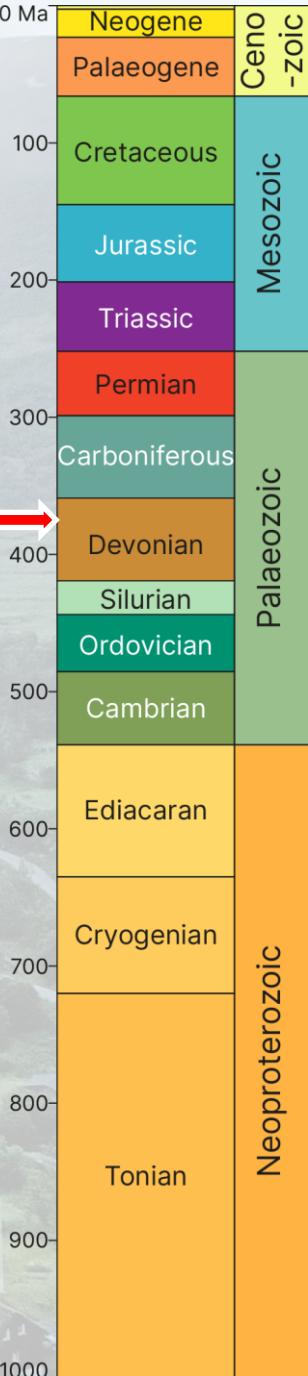






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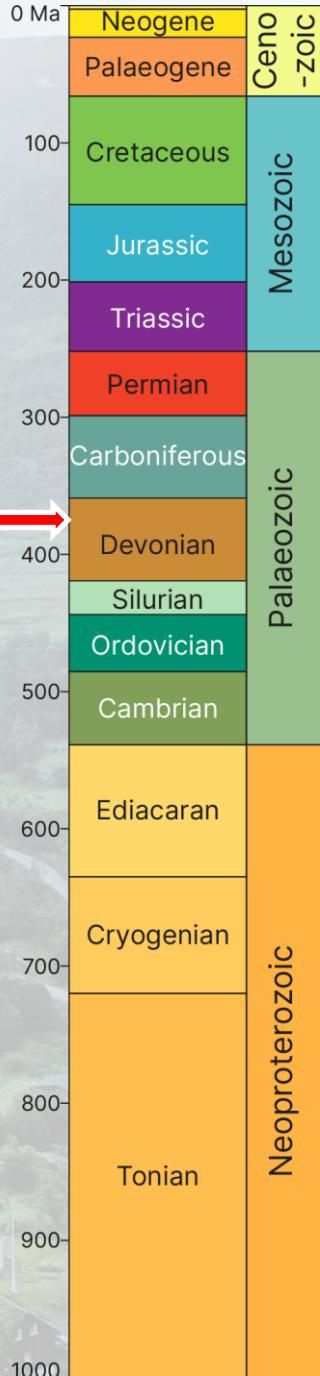
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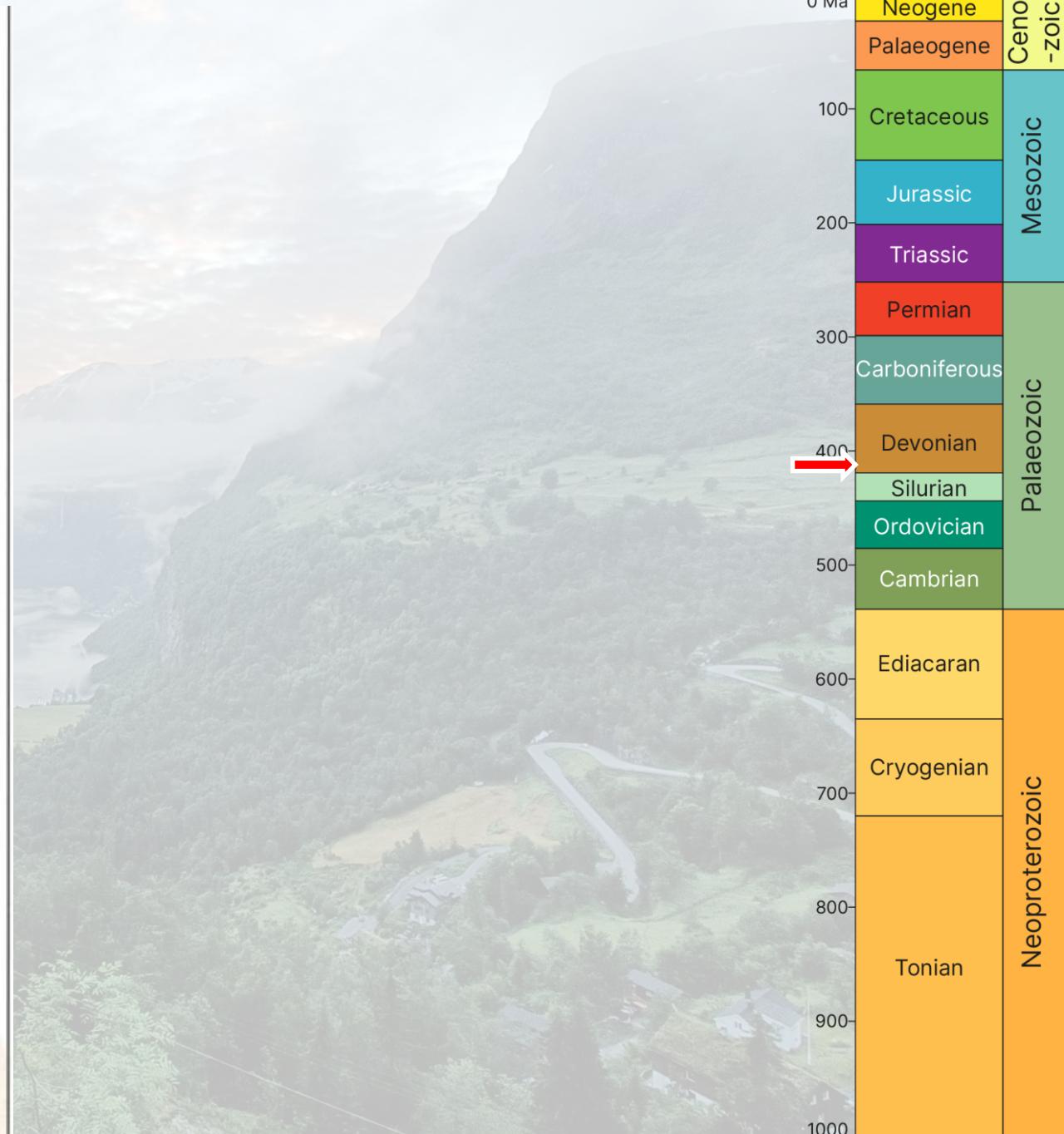
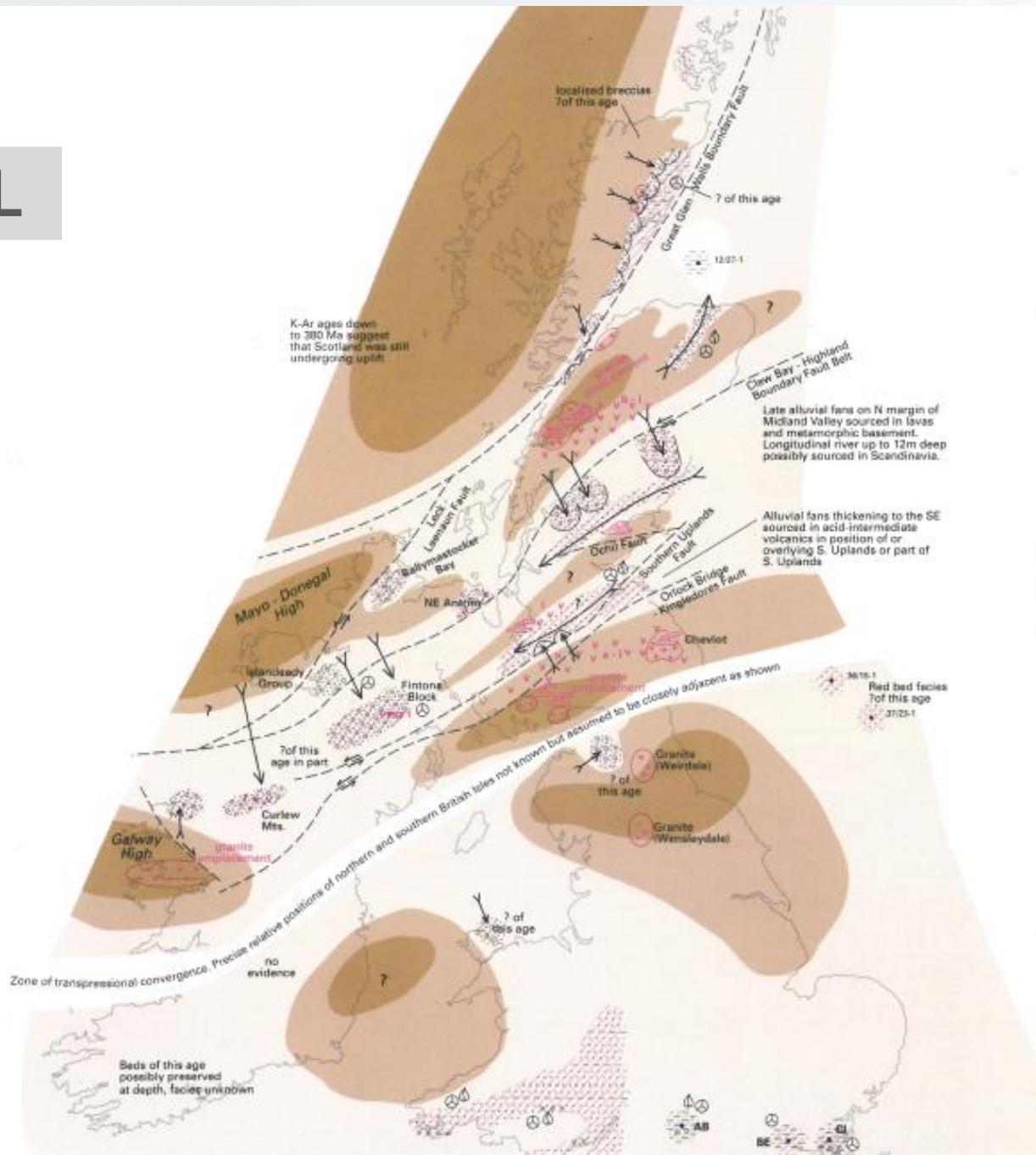
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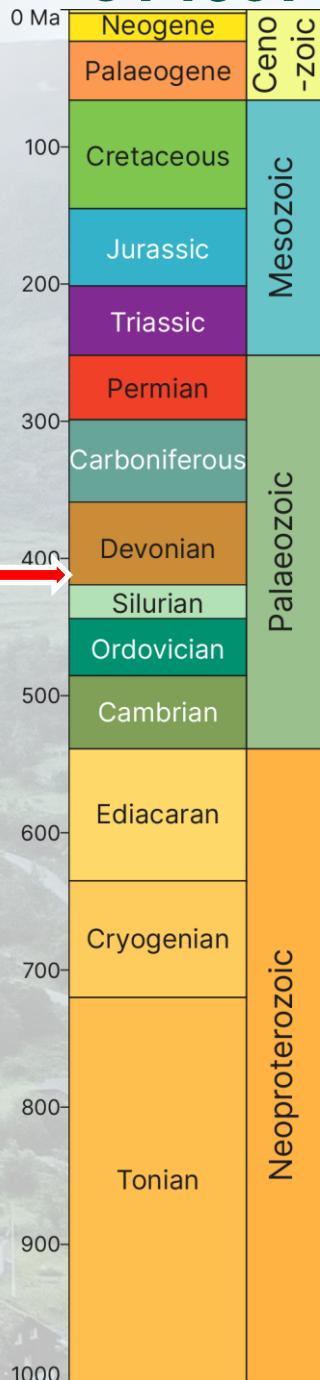


# Fall of The Caledonian Mountains | Devonian of Ireland

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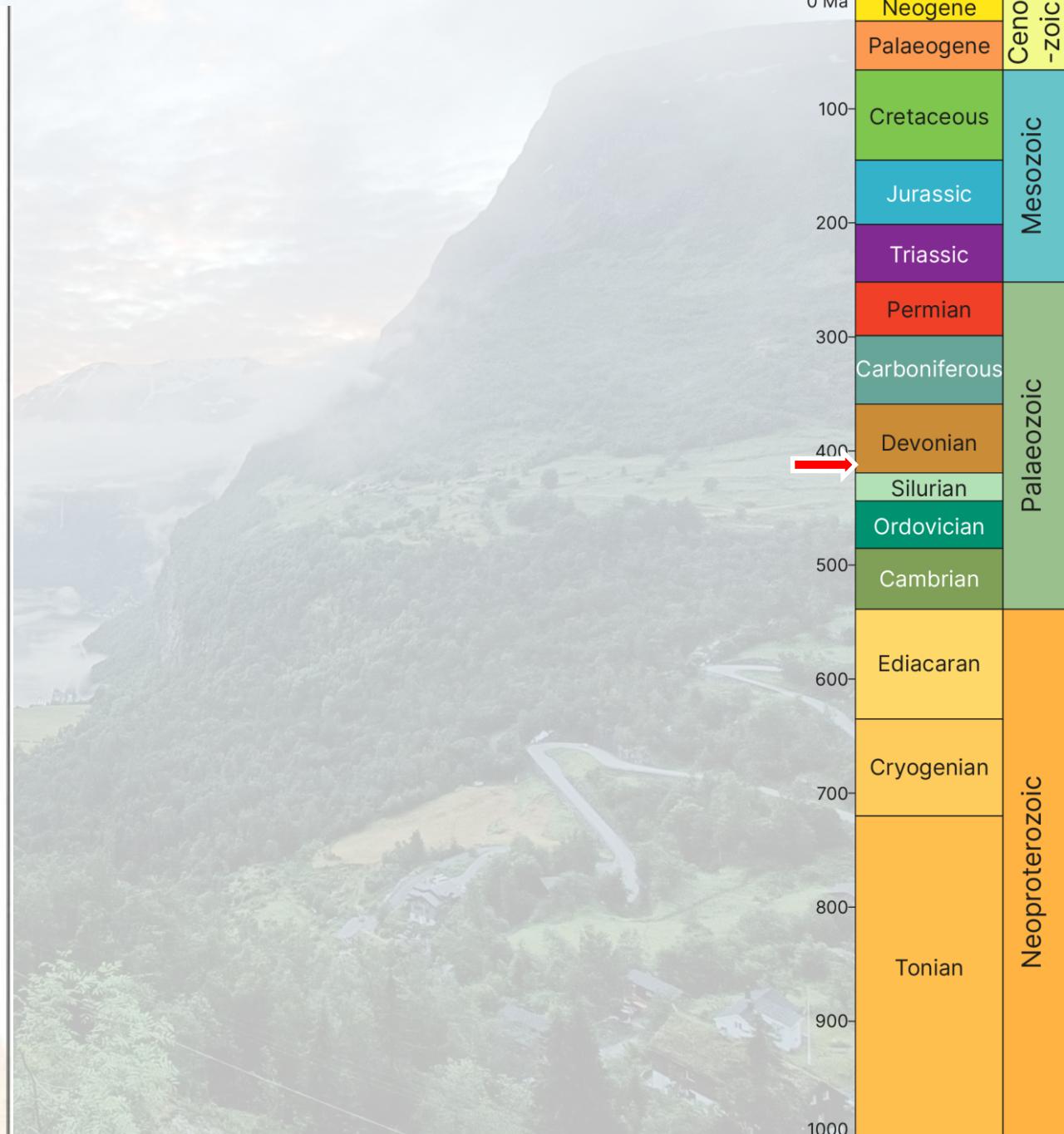
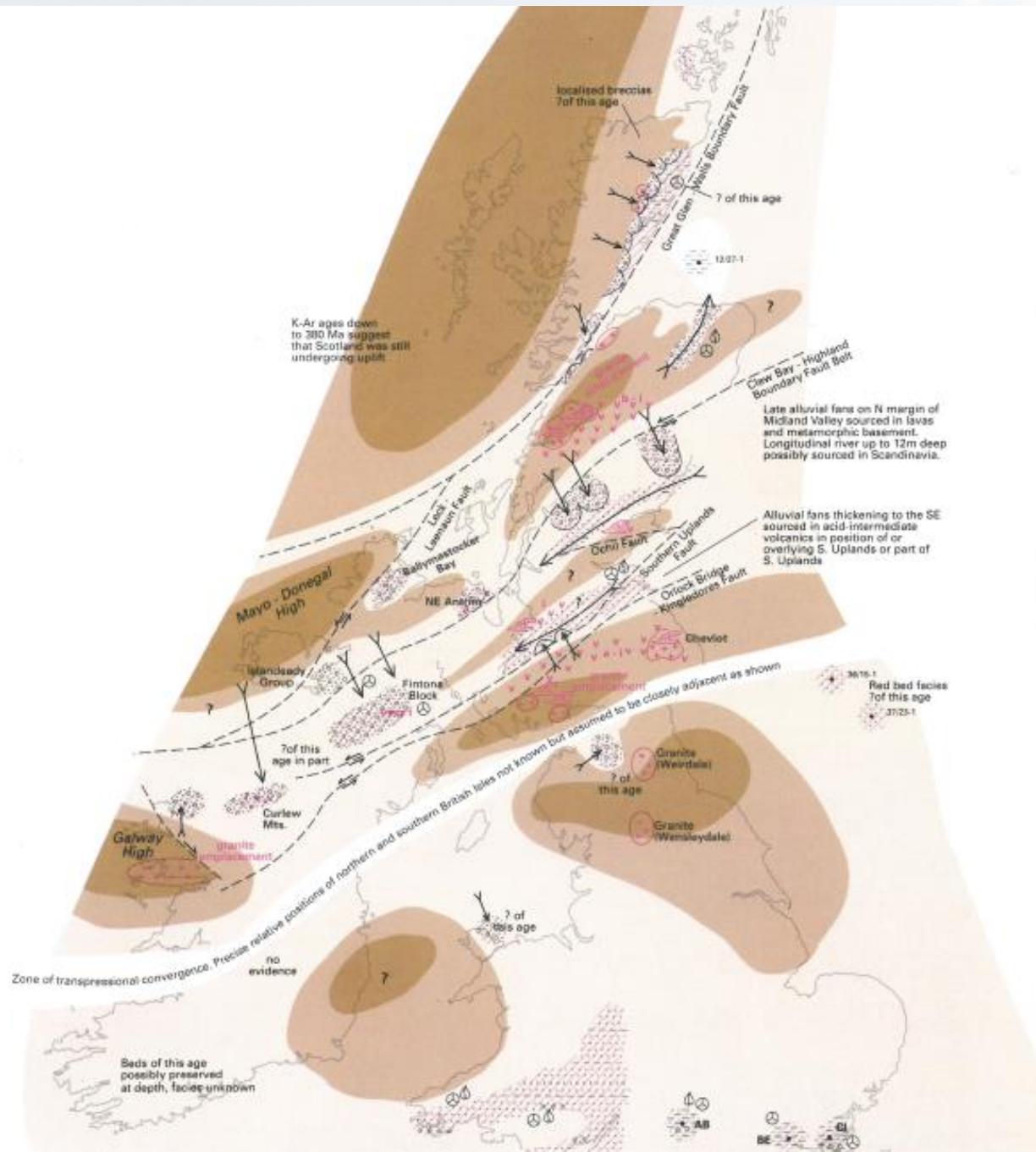


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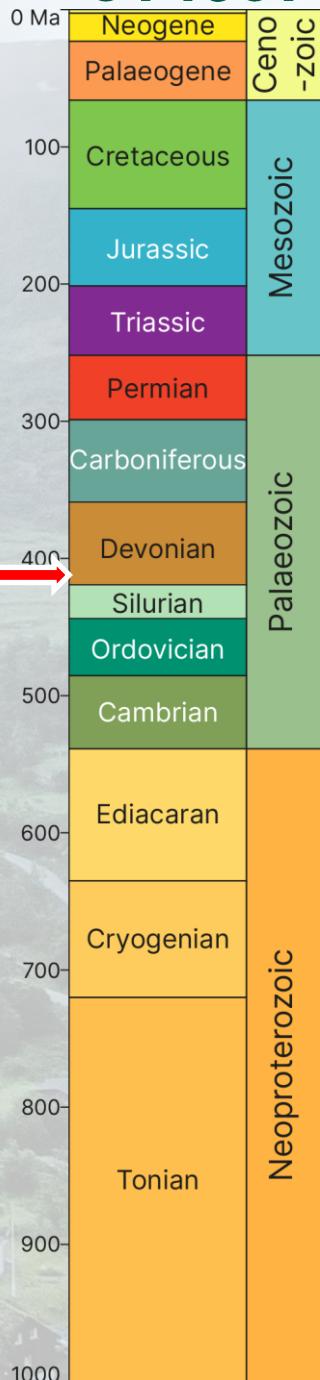




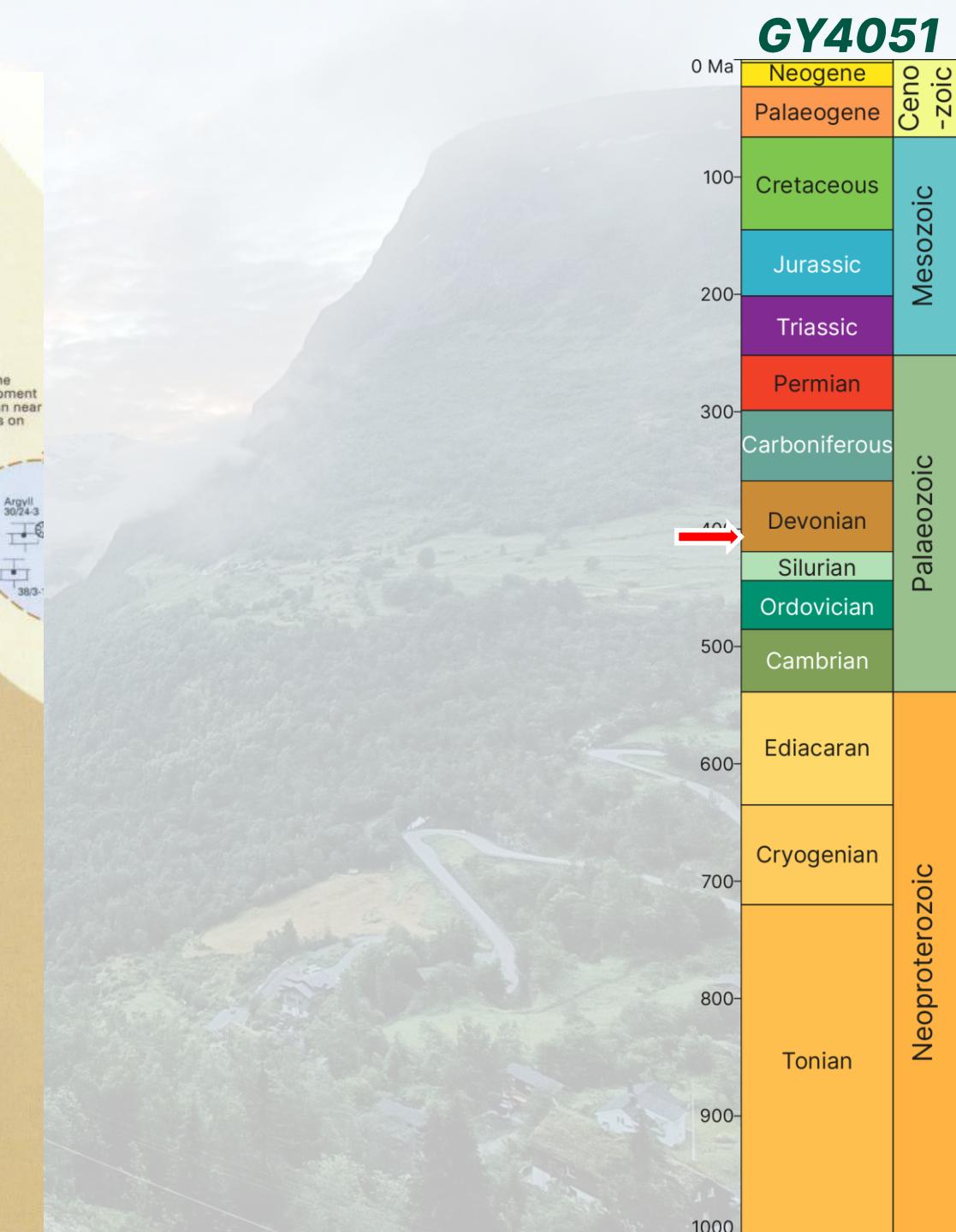
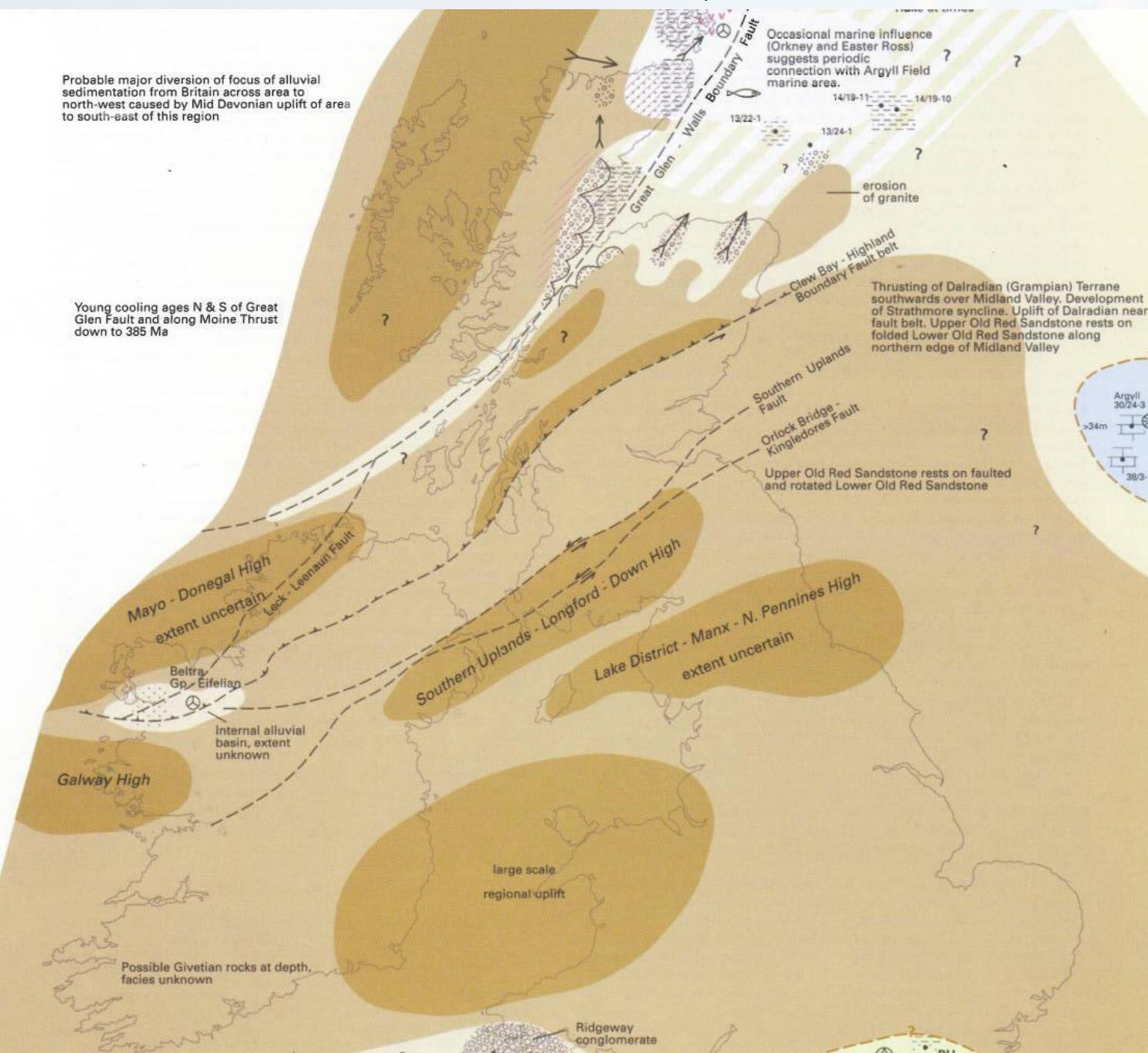
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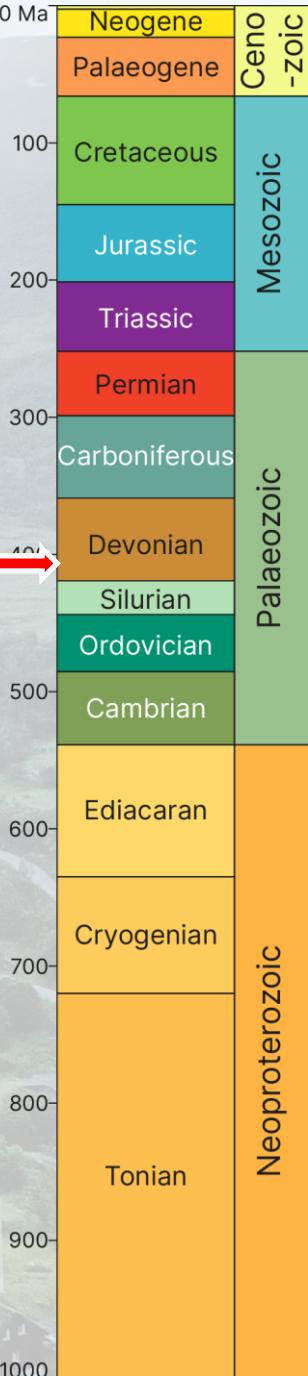
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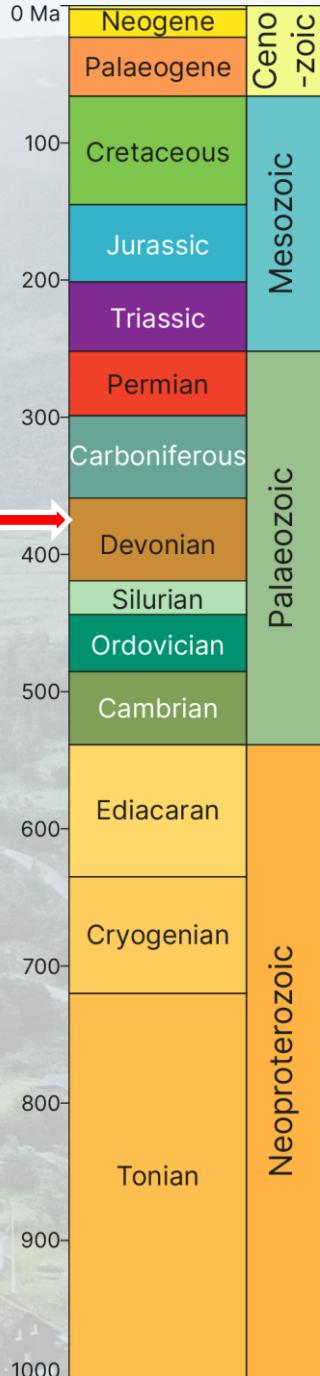
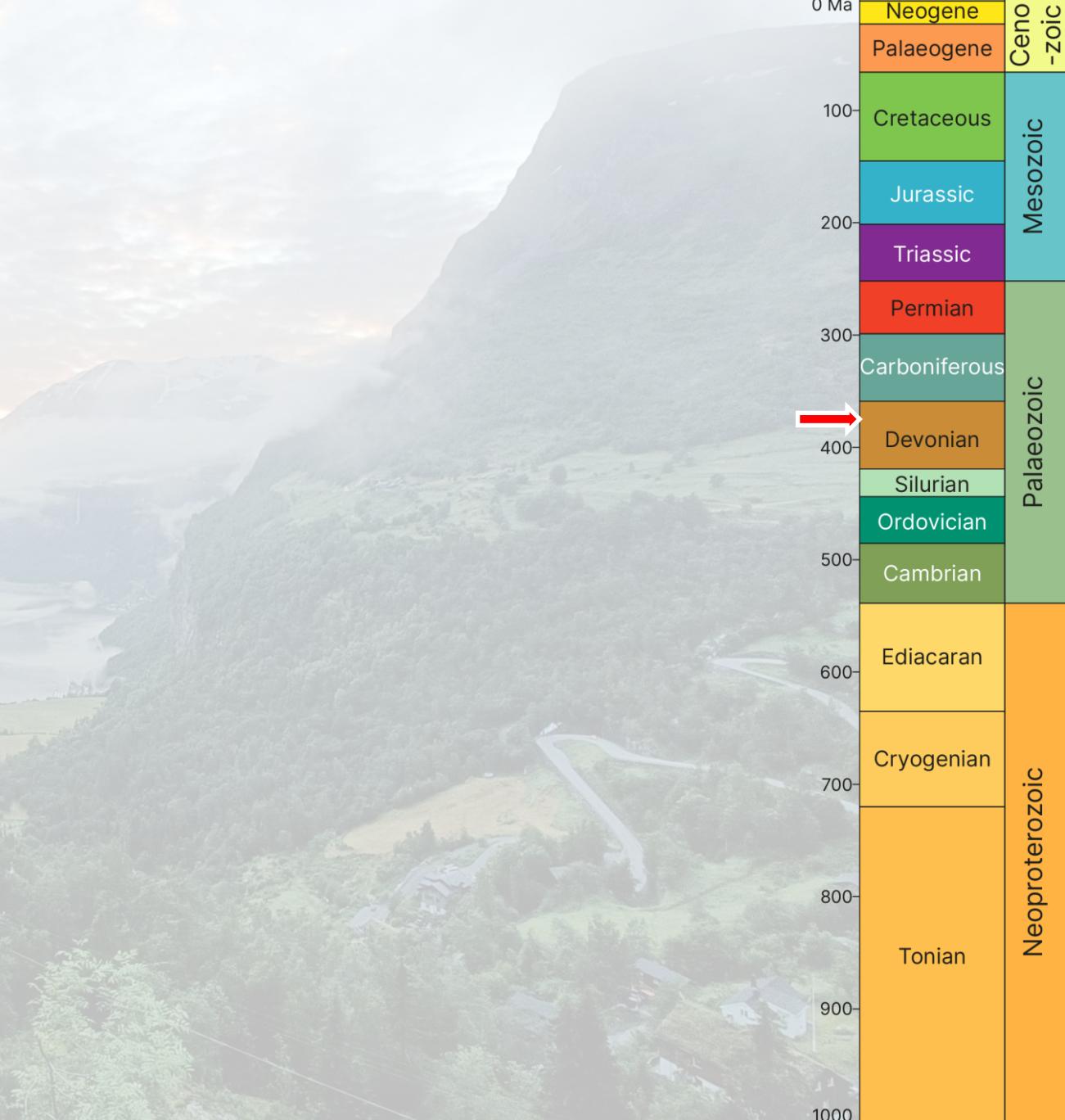


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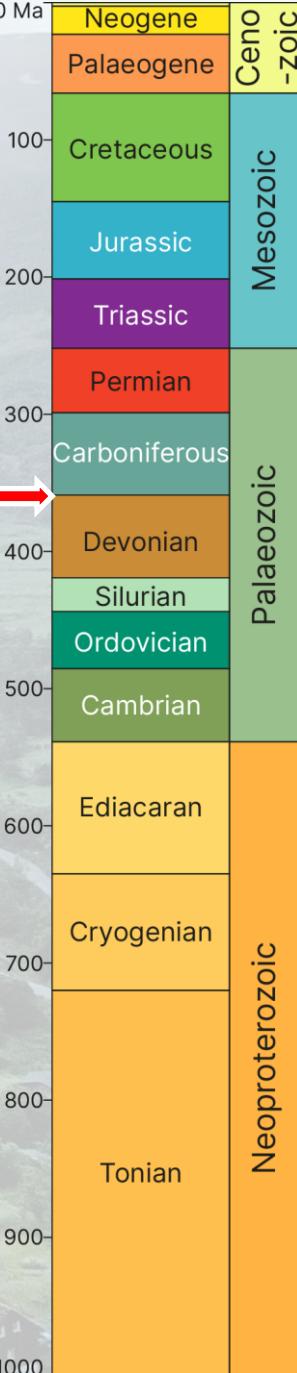
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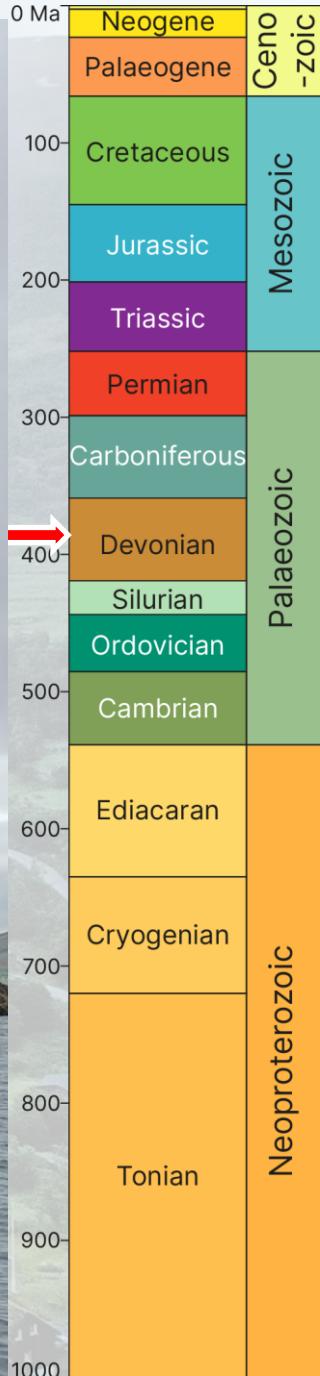
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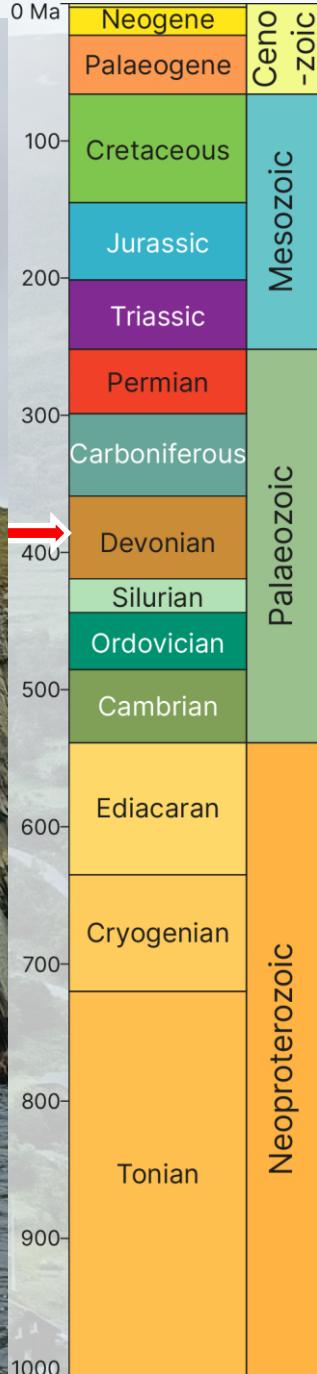
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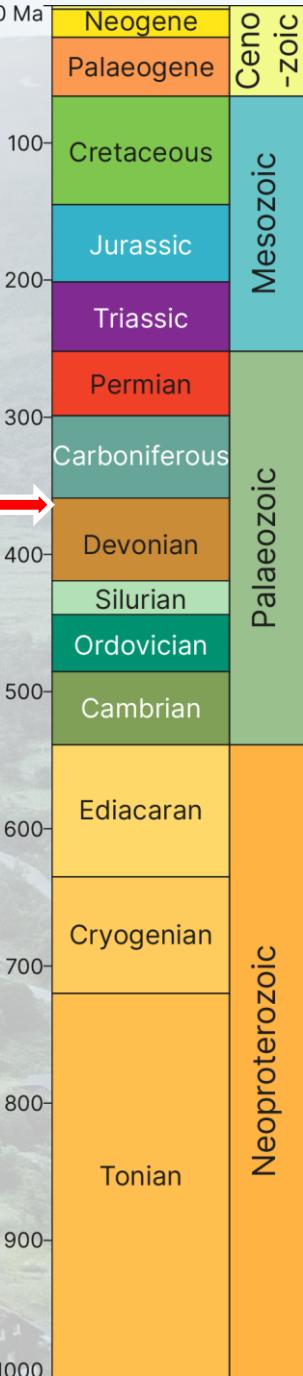
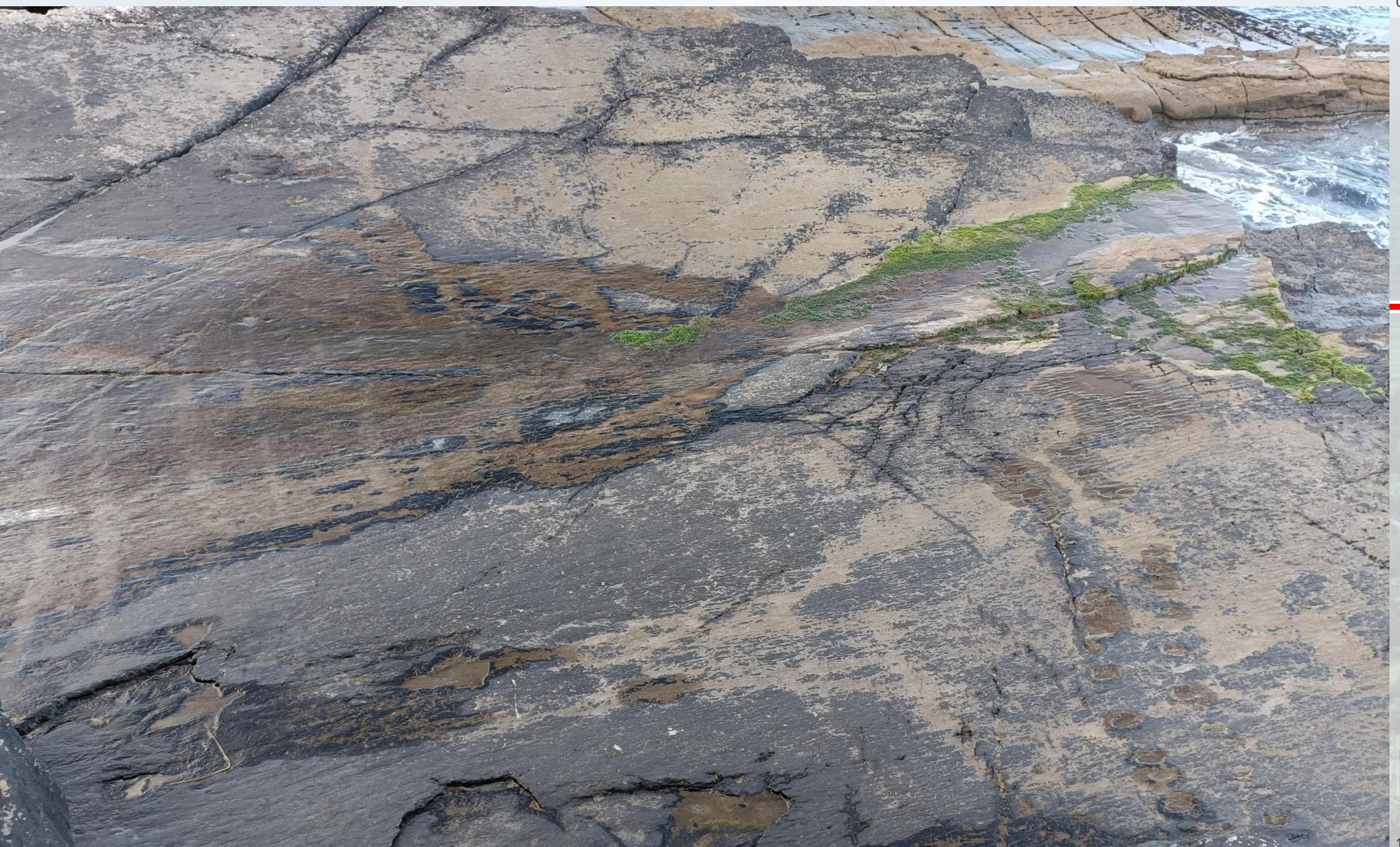
# Rise and Fall of The Caledonian Mountains | Marine Transgression

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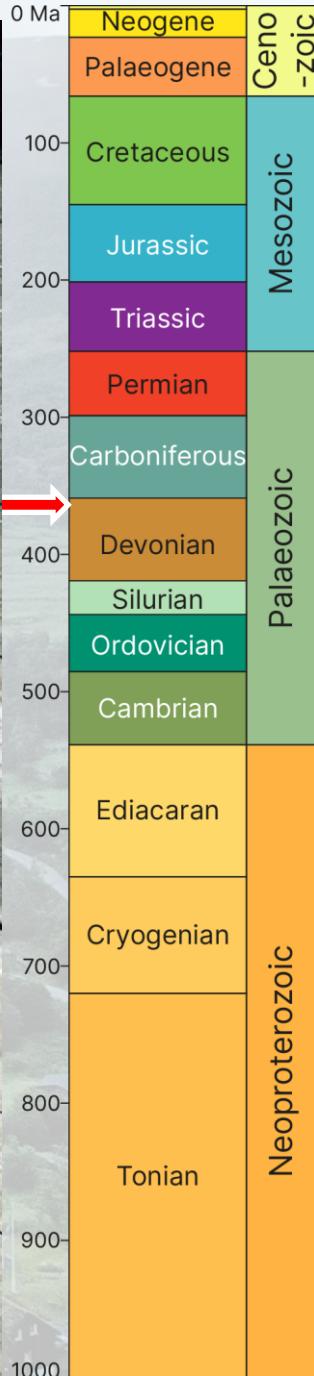
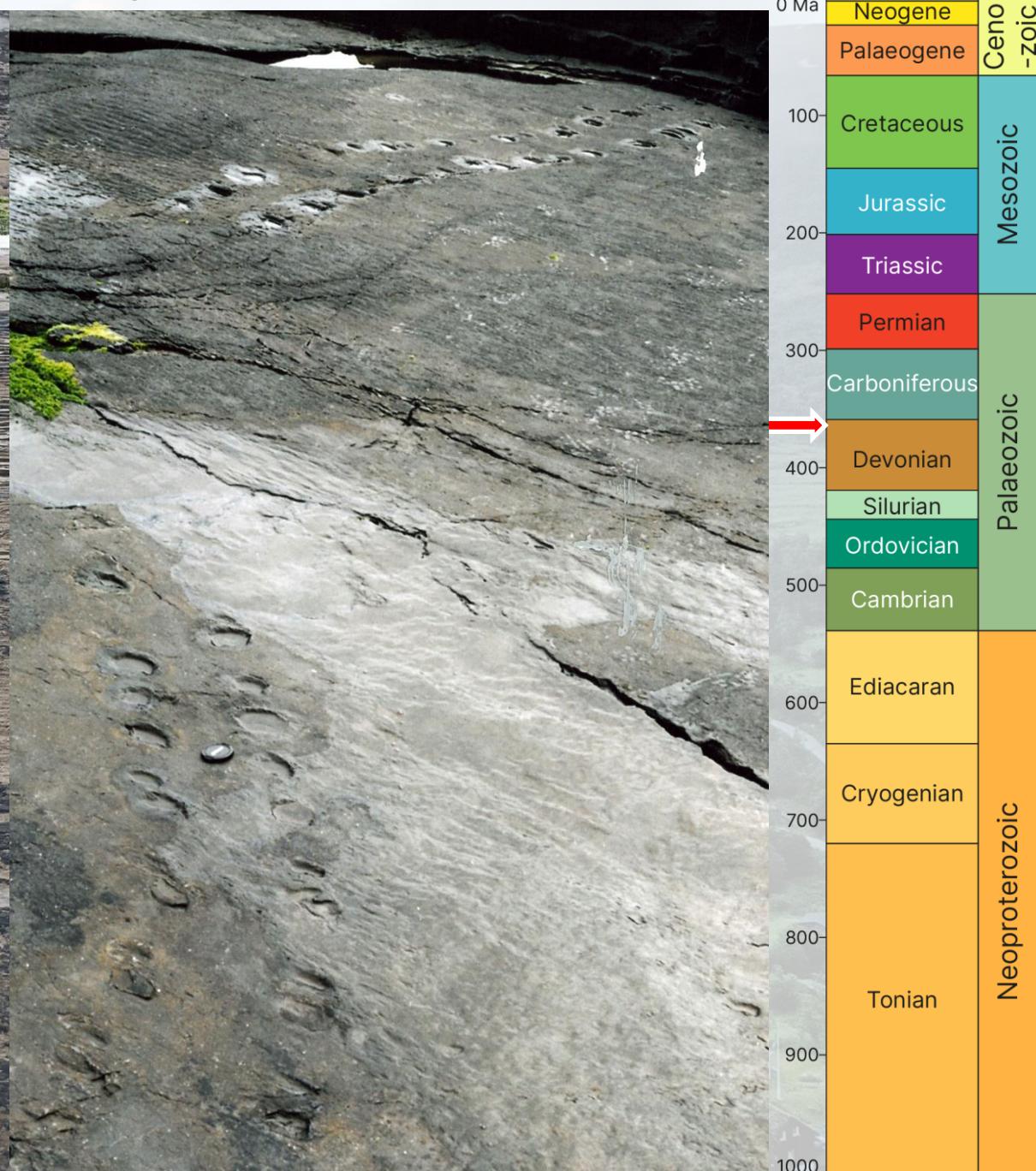
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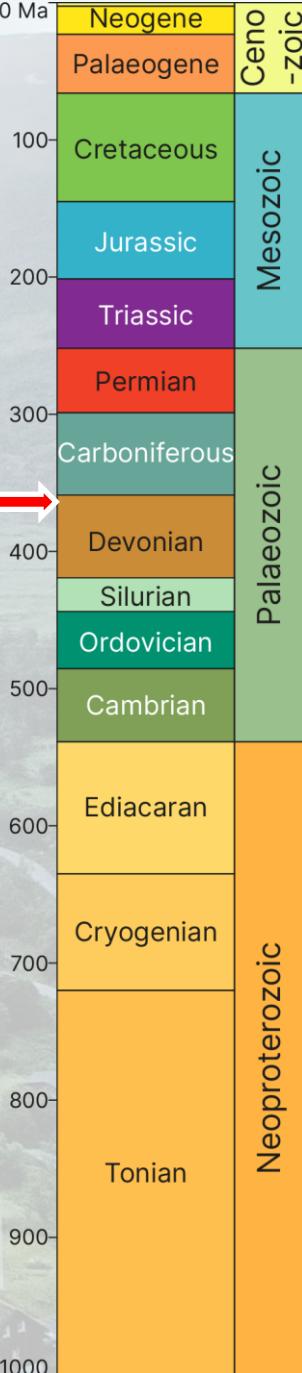
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