



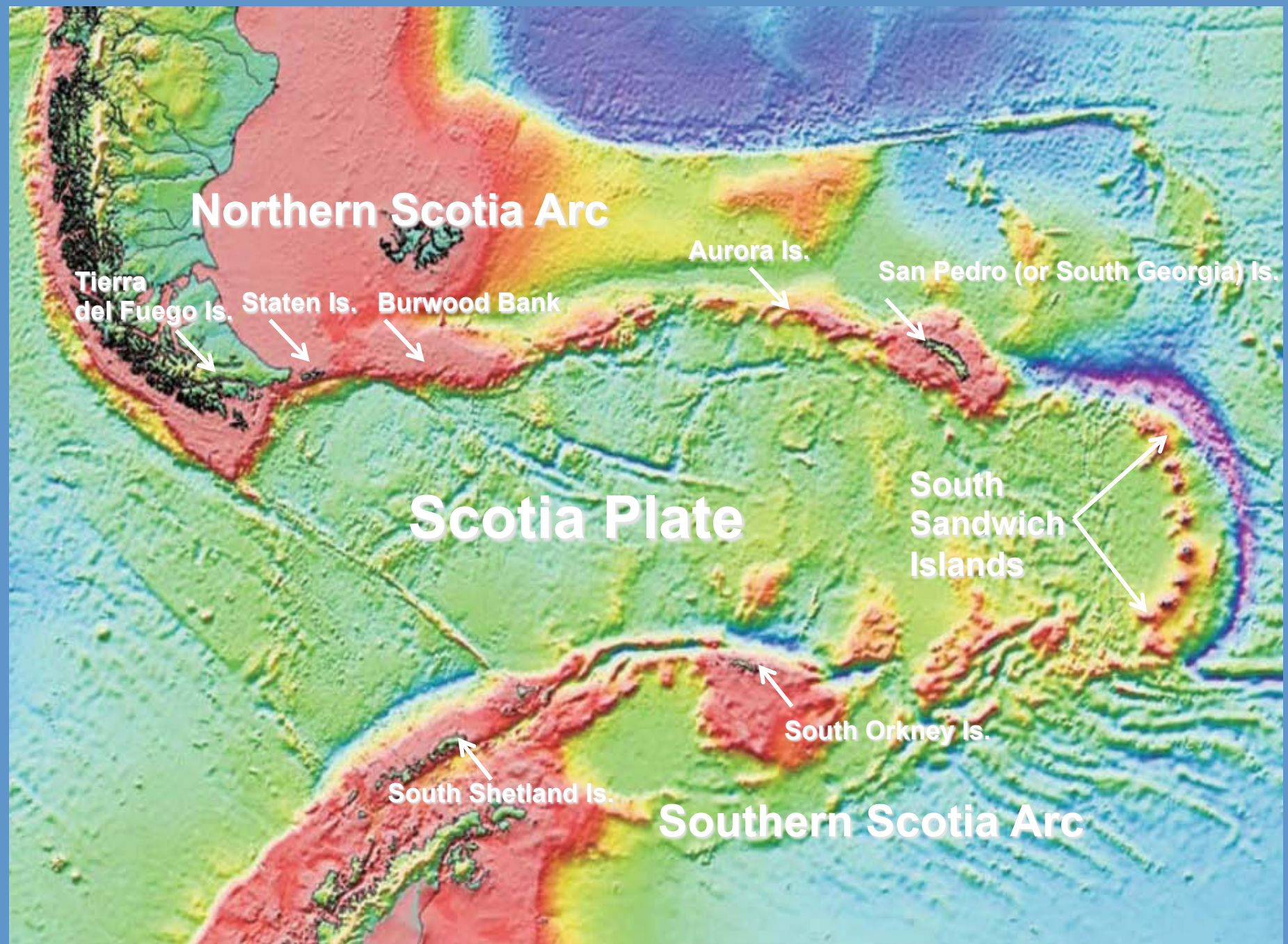
The islands of the Scotia Arc

Victor A. Ramos
Universidad de Buenos Aires

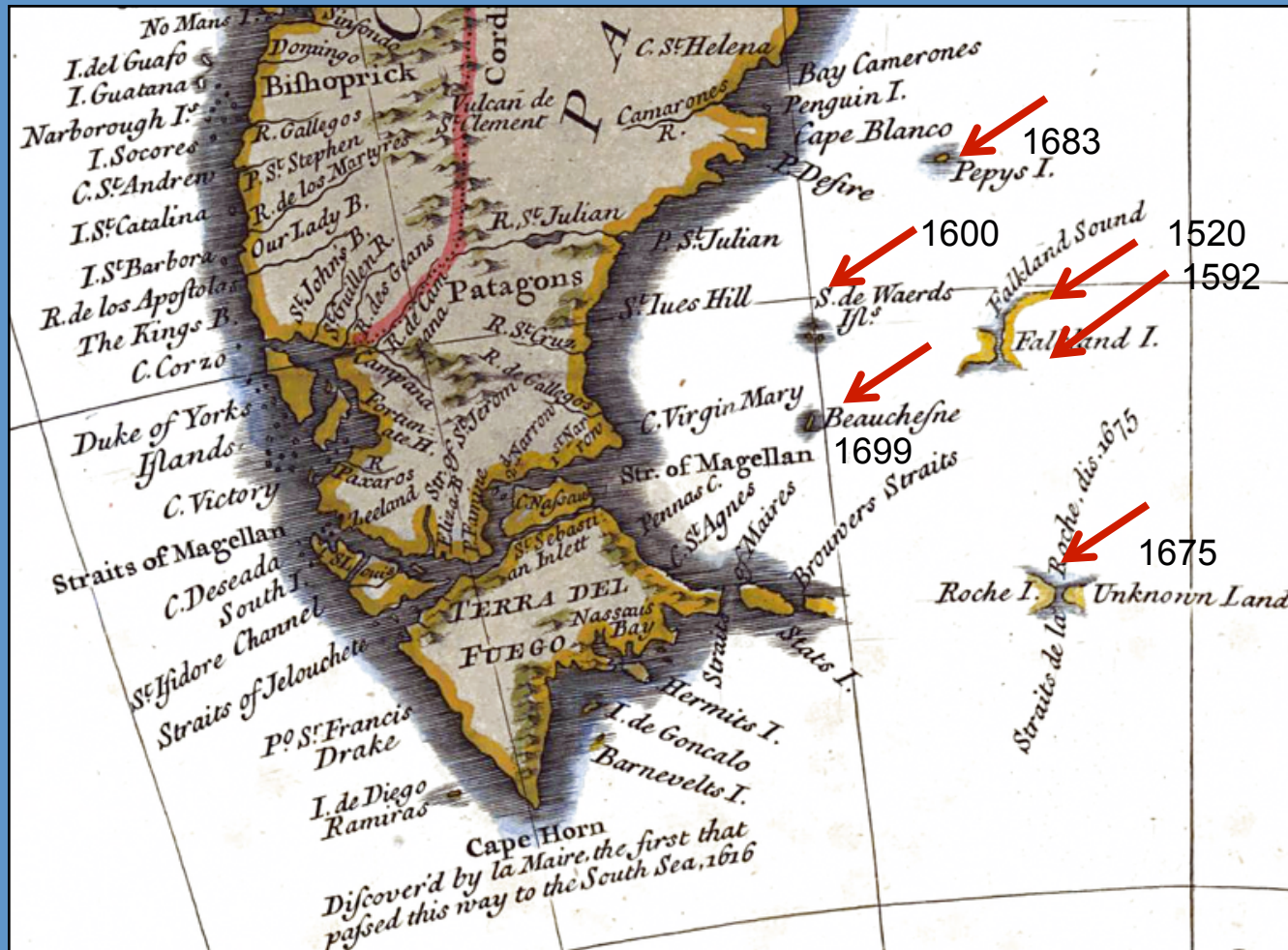


OUTLINE:

- **Brief geographic location**
- **History of the discovery**
- **Why the islands are there?**
- **Geologic evolution**
- **Plate tectonic history and implications**



Southern and Northern Scotia Arcs



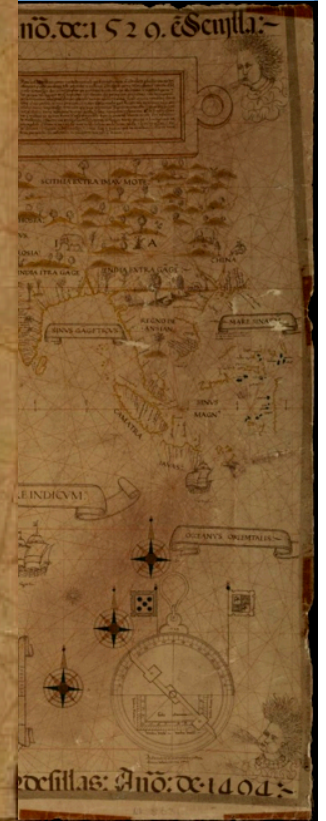
"A map of southern South America with all the European settlements & whatever else is remarkable from the latest & best observations".
Richard W. Seale (ca. 1745).

FIRST MAPAMUNDI WITH SAN ANTÓN ISLANDS



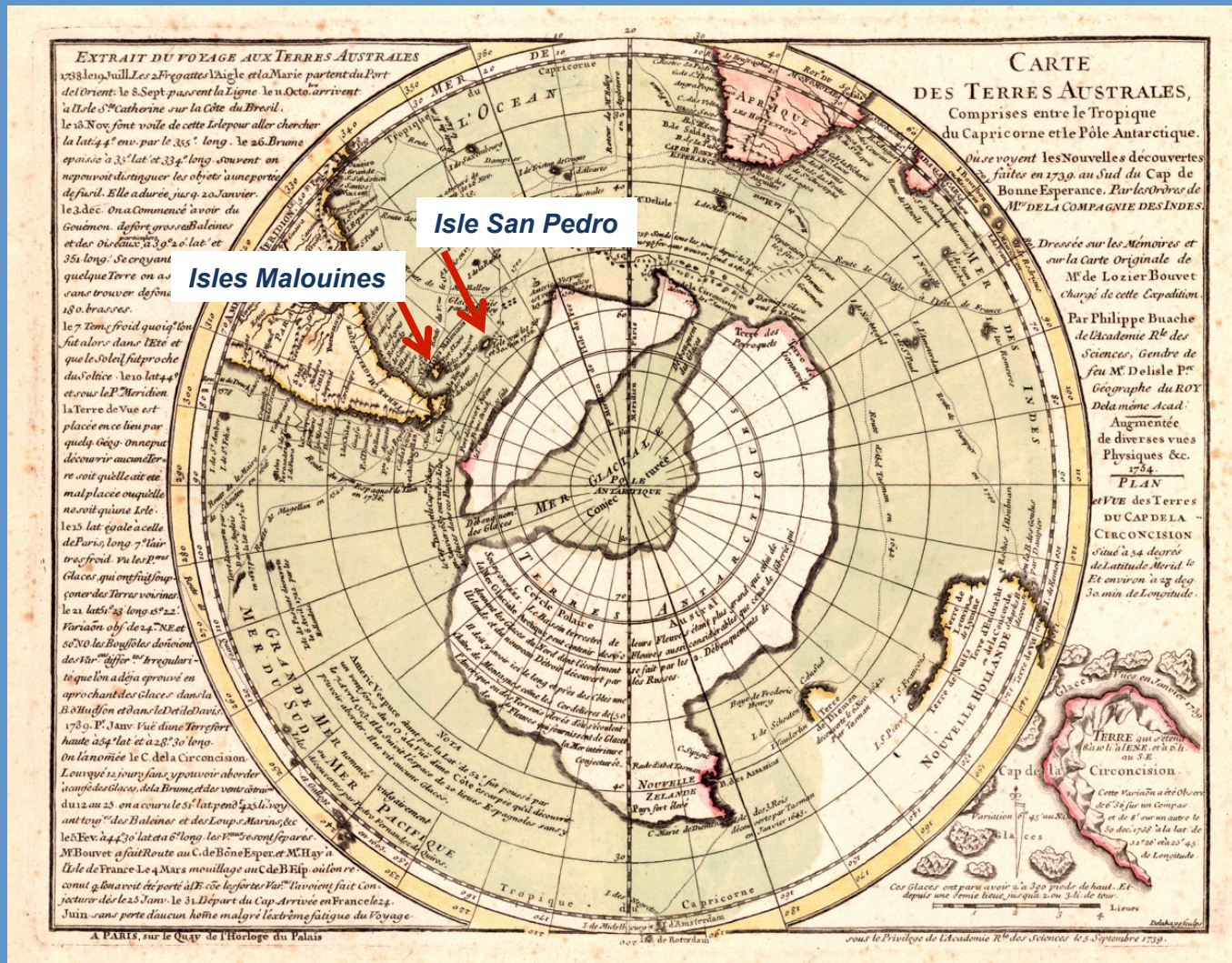
Map of Diego Ribero (1529) Vatican Apostolic Library, Vatican.

NDS



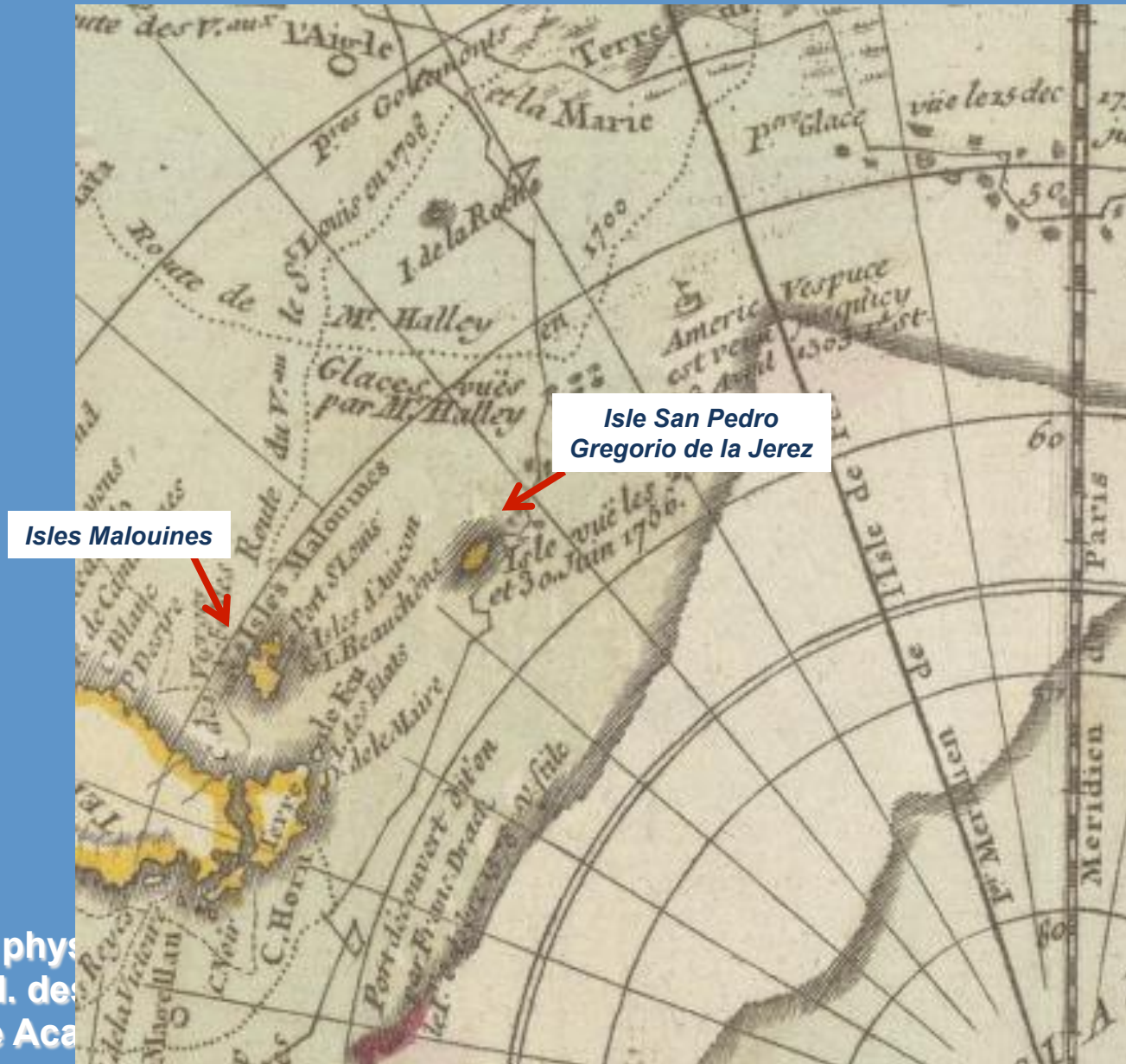
The Second Borgian Map by Diego Ribero, S

Southern and Northern Scotia Arcs



Carte des Terres Australes, Comprises entre le Tropique du Capricorne et le Pôle Antarctique. Philippe Buache (1757), Paris.

Southern and Northern Scotia Arcs



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SEVENTH INTERNATIONAL GEOGRAPHICAL CONGRESS Berlin, 1899.-

- *“Exploration of Antarctica as the greatest piece of geographical exploration still to be undertaken”.*
- *Congress set-off a period of exploration (1901-1904) in Antarctica motivated more by competition than collaboration.*
- *Delegates formulated a reasearch program structured around a strict demarcation of each nation´s zone of activity.*

The Great International Antarctic Expedition of 1901



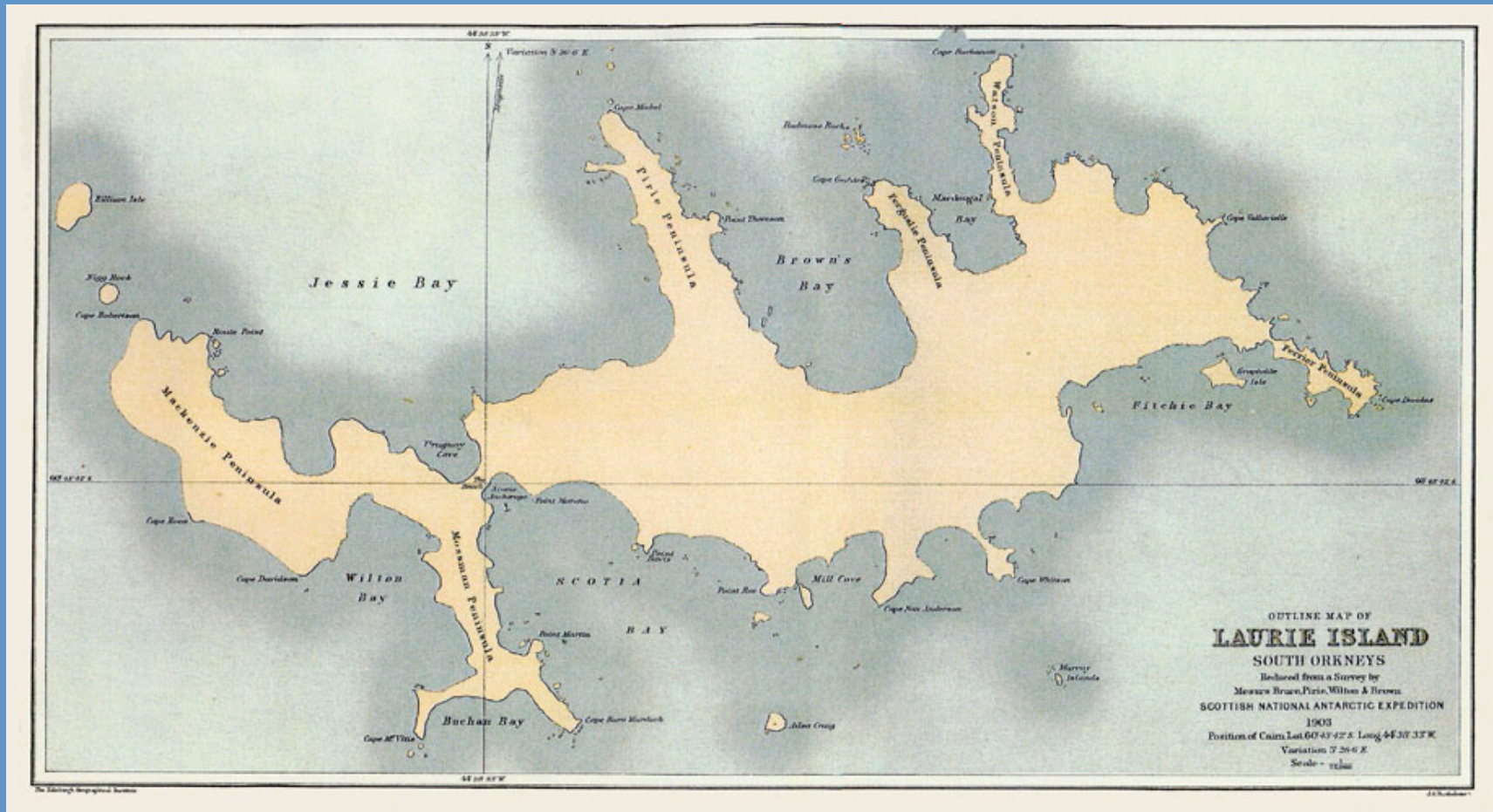
SEVENTH INTERNATIONAL GEOGRAPHICAL CONGRESS Berlin, 1899.-

The Great International Antarctic Expedition of 1901

- *England with the “Discovery” under Captain Scott*
- *Germany with the “Gauss” under Captain Drygalsky*
- *France with the “Le Francais” under scientist Dr. Charcot*
- *Sweden with the “Antarctic” under Dr. Nordenskjöld*

Argentina participated in the Congress but as we did not have any available ship for this polar exploration, the government offered logistical support for those expeditions going through Buenos Aires.

Southern Scotia Arc: South Orkney Islands



Discovered by James Weddell in 1823

1902-1904 Scottish National Antarctic Expedition

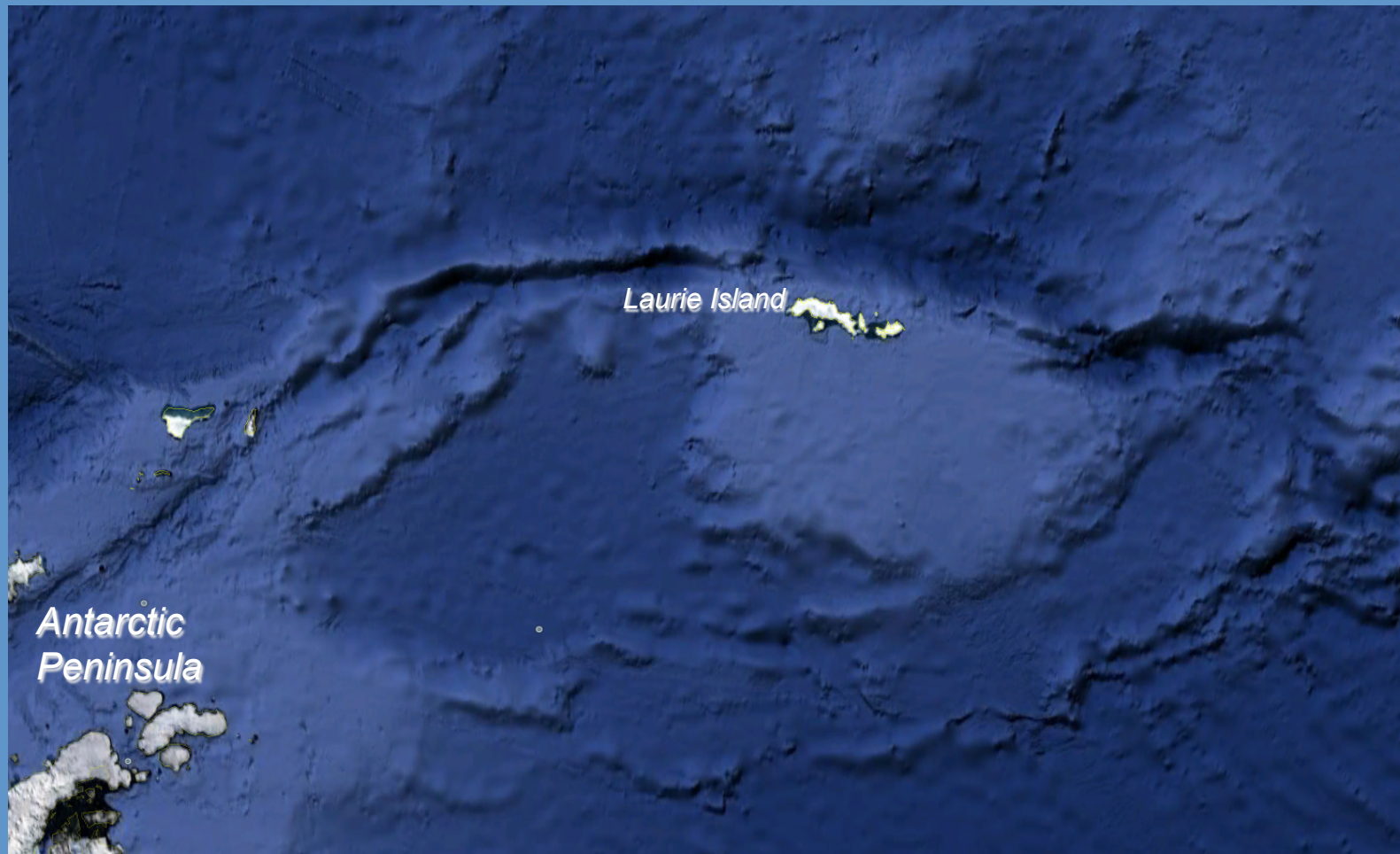


The Scotia



**Dr. William S Bruce
(1867-1921)
Expedition leader**

1902-1904 Scottish National Antarctic Expedition



South Orkneys Islands: Southern Scotia Arc

1902-1904 Scottish National Antarctic Expedition



The Scotia trapped in ice

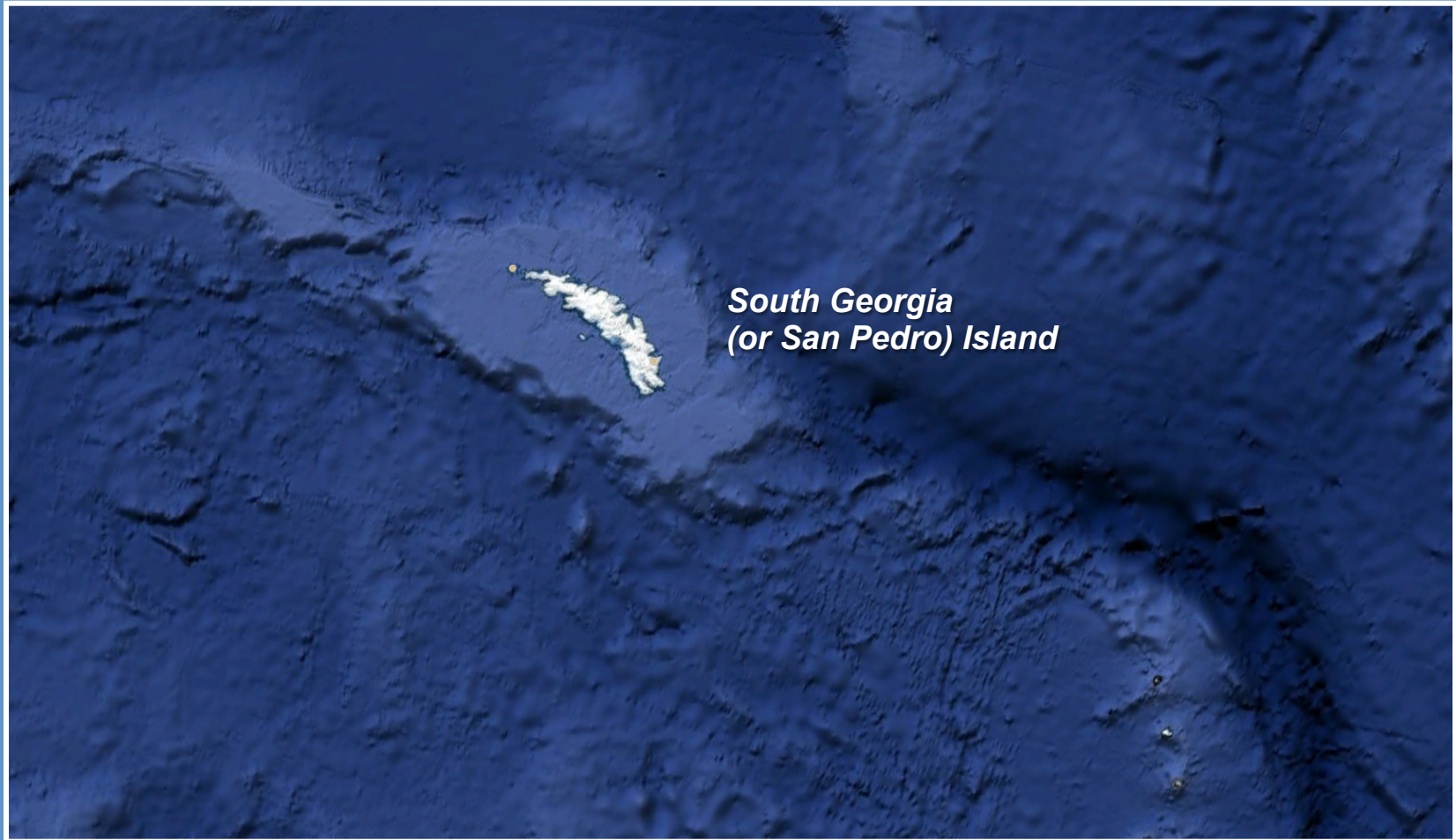
Dr. William S Bruce established in 1902 in the South Orkneys the first and southernmost Metereological and Geomagnetic Observatory

1902-1904 Scottish National Antarctic Expedition



Dr. William S. Bruce with two Argentine meteorologists in 1904 in the Laurie Island after building the Omond House.

Northern Scotia Arc: South Georgia Island



The island was sighted and named 'San Pedro' by the Spanish vessel Leon under Captain Gregorio Jerez sailing in the service of the French company Sieur Duclos of Saint-Malo, with the merchant Duclos Guyot on board (1756).

Northern Scotia Arc: South Georgia Island



Isle of Georgia with Clerke's Isles and Pickersgill's Isle plan with panorama from charts, and views of headlands, taken during Captain Cook's Second Voyage in 1772-1775 , who was the first to land (1775) British Library.

Northern Scotia Arc: South Georgia Island

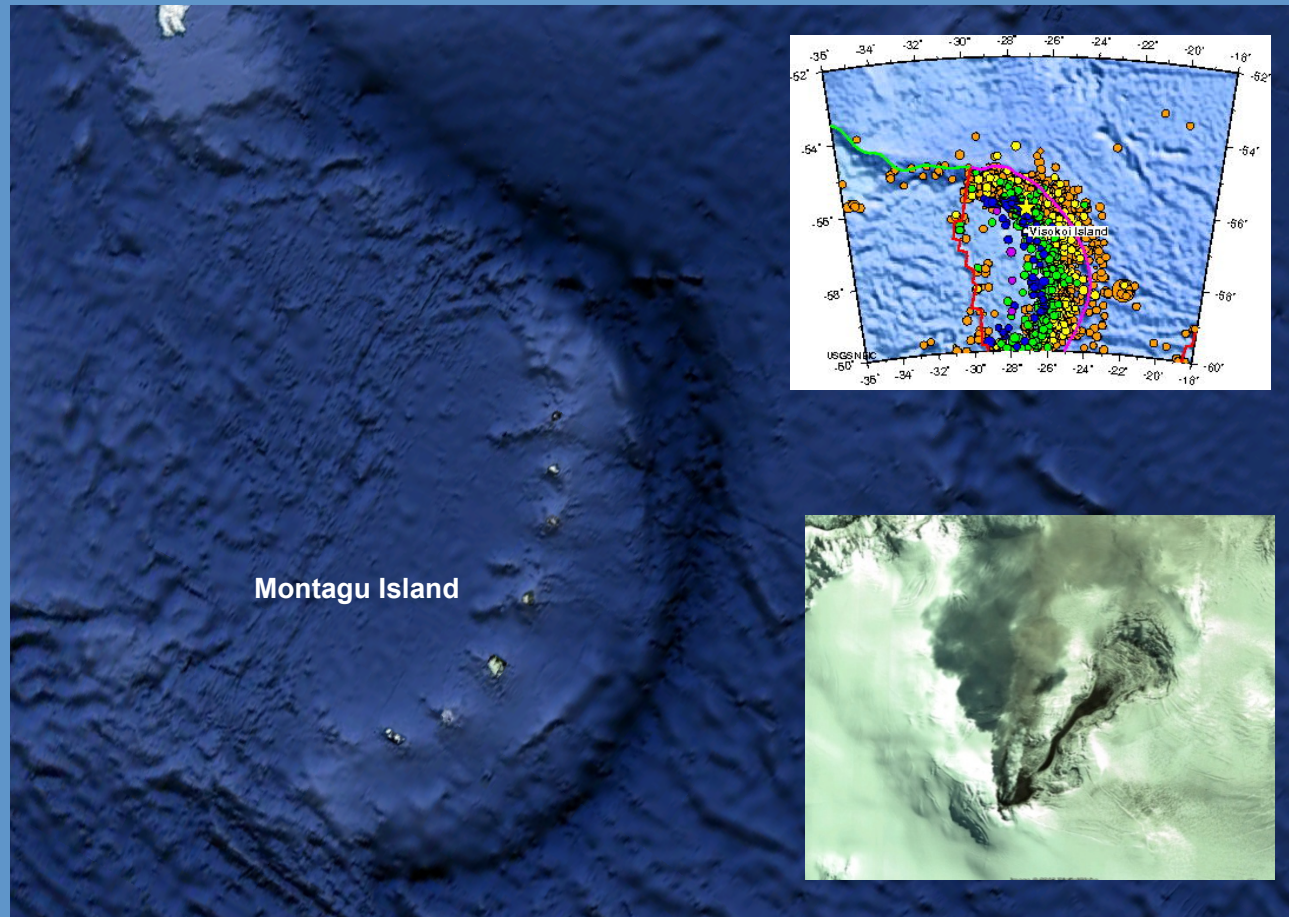


Northern Scotia Arc: Burwood Bank and Aurora Is.



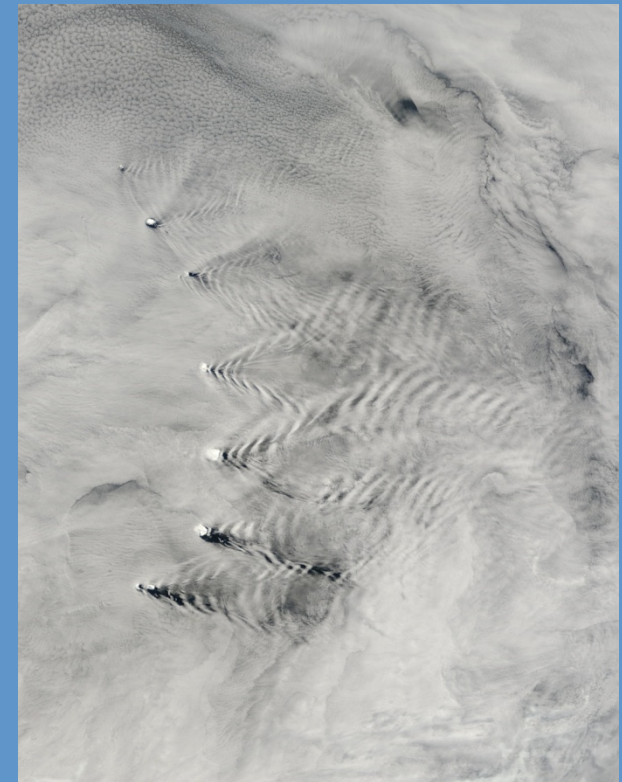
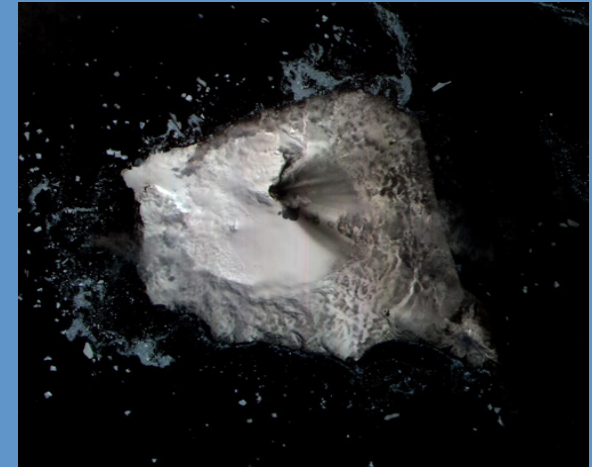
Staten Island: Argentine pilot Luis Piedra Buena established a shelter 1862, and built a small seal oil extraction facility on the island. In 1884 was built the “*Lighthouse at the end of the world*” and the 1st. Meteorological Observatory.

South Sandwich Islands



James Cook discovered the southern five islands. The Russian imperial expedition leaded by Fabian Gottlieb von Bellingshausen found the three northern ones in 1819.

South Sandwich Islands



Young volcanic edifices with rugged summits above the ocean surface.



**South America
Is bounded by
two oceanic plates:**

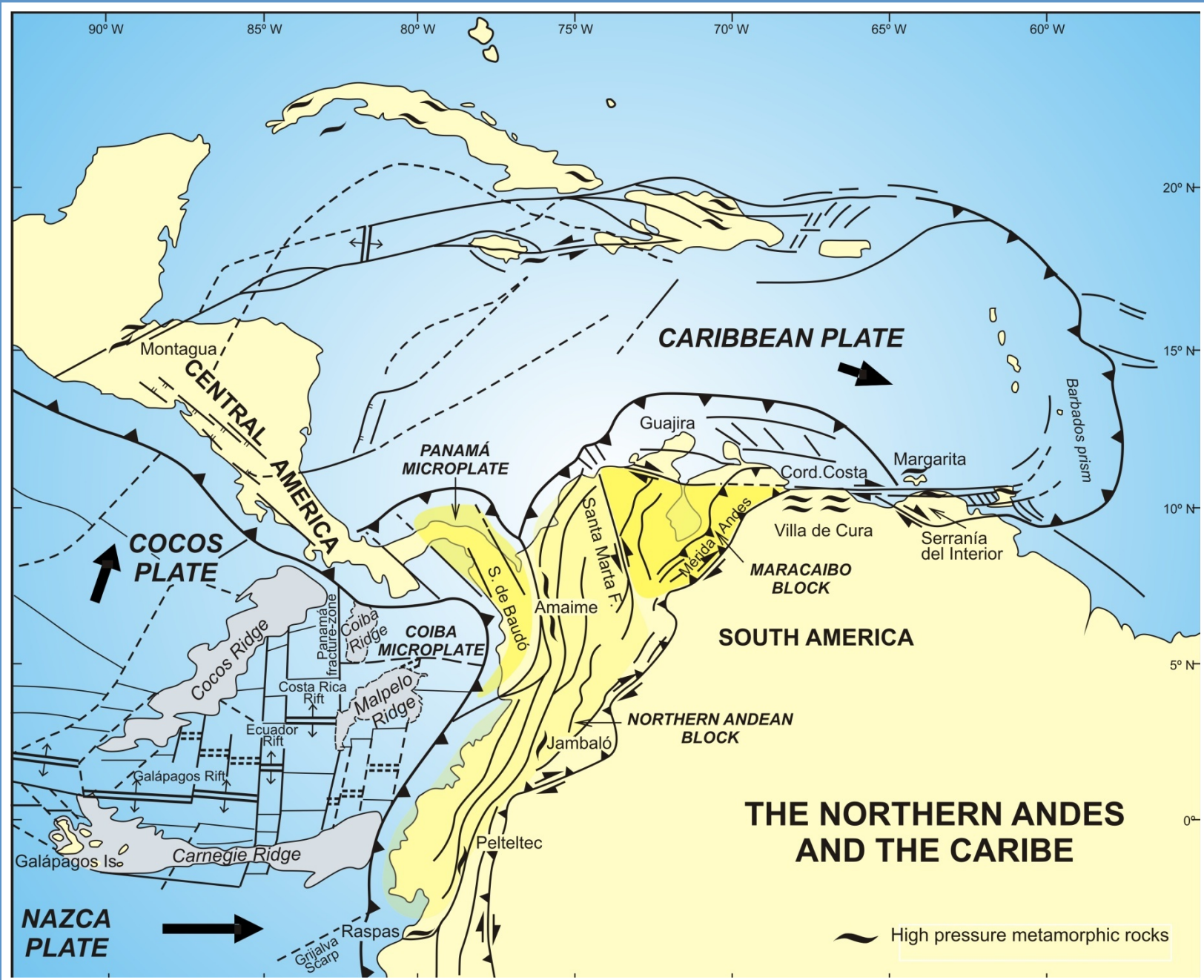
***The Caribbean and the
Scotia plates***

- Both plates are oceanic peaces.
- Both plates are moving to the east.
- Both plates have active volcanoes.



Northern Antilles





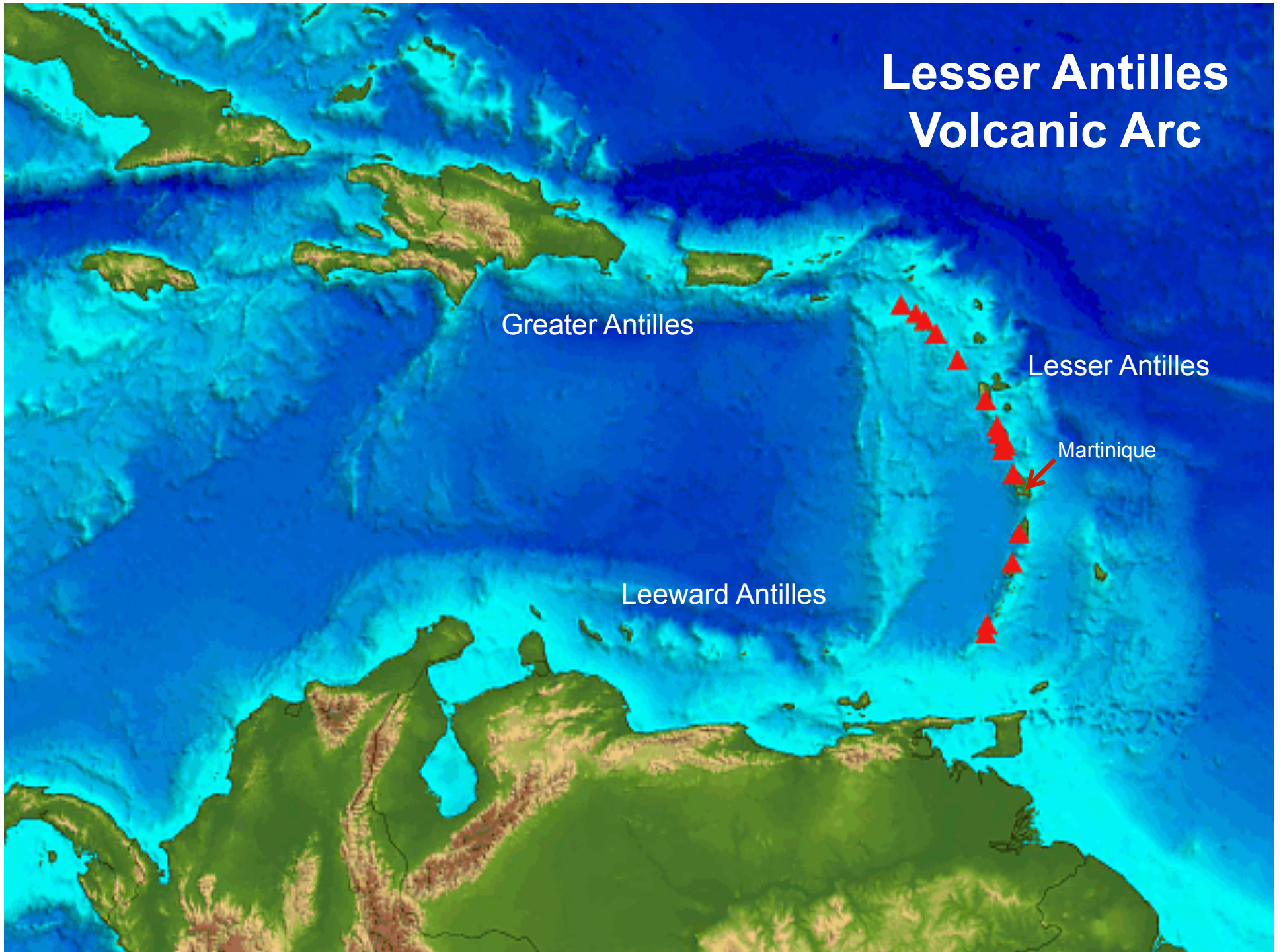
Lesser Antilles Volcanic Arc

Greater Antilles

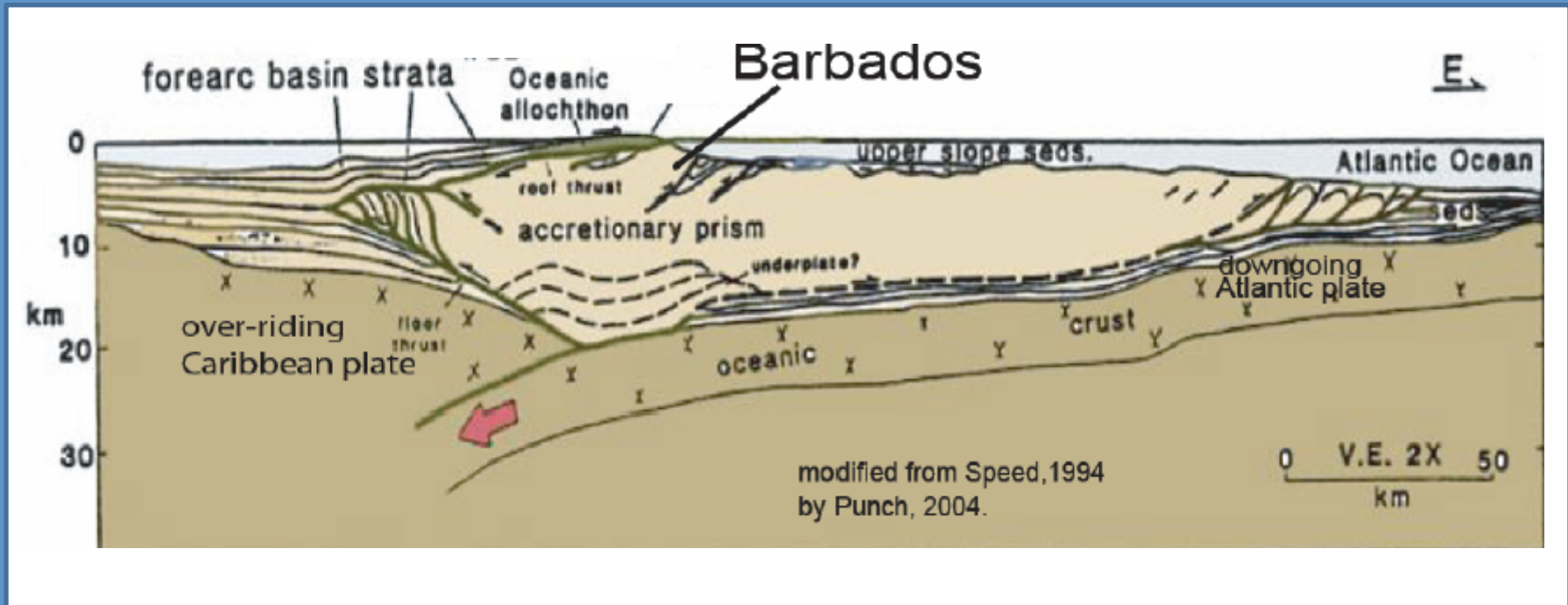
Lesser Antilles

Martinique

Leeward Antilles



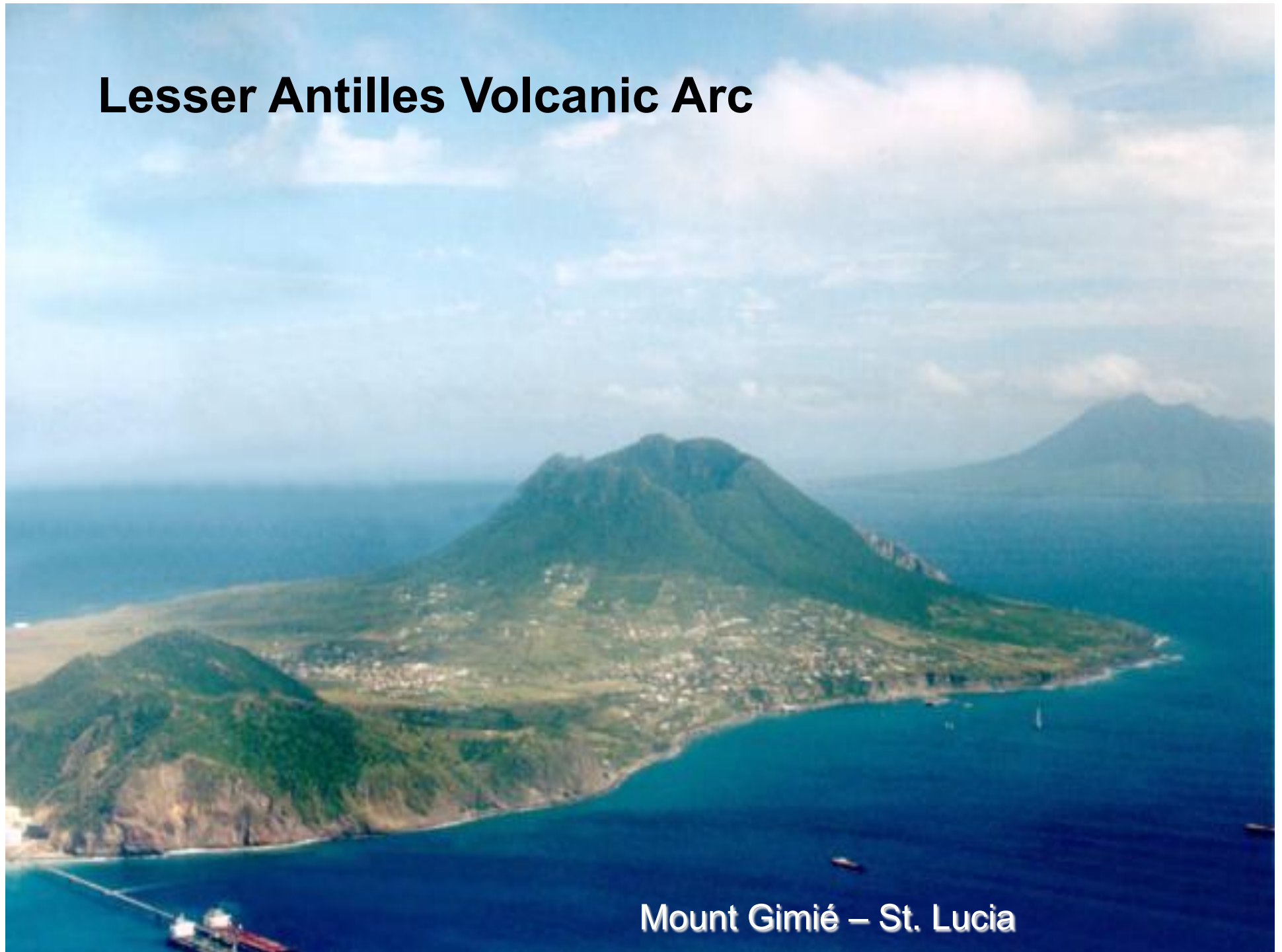
Subduction zone of the Lesser Antilles Volcanic Arc



Barbados accretionary prism

Escalona (2006)

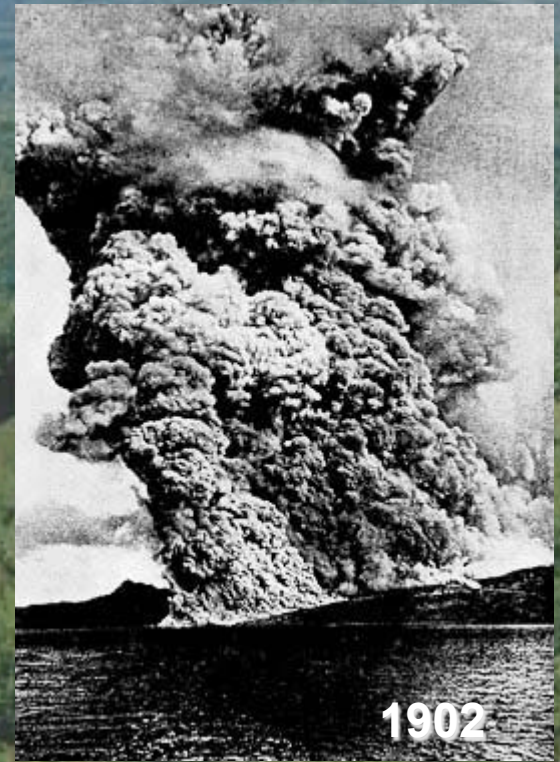
Lesser Antilles Volcanic Arc

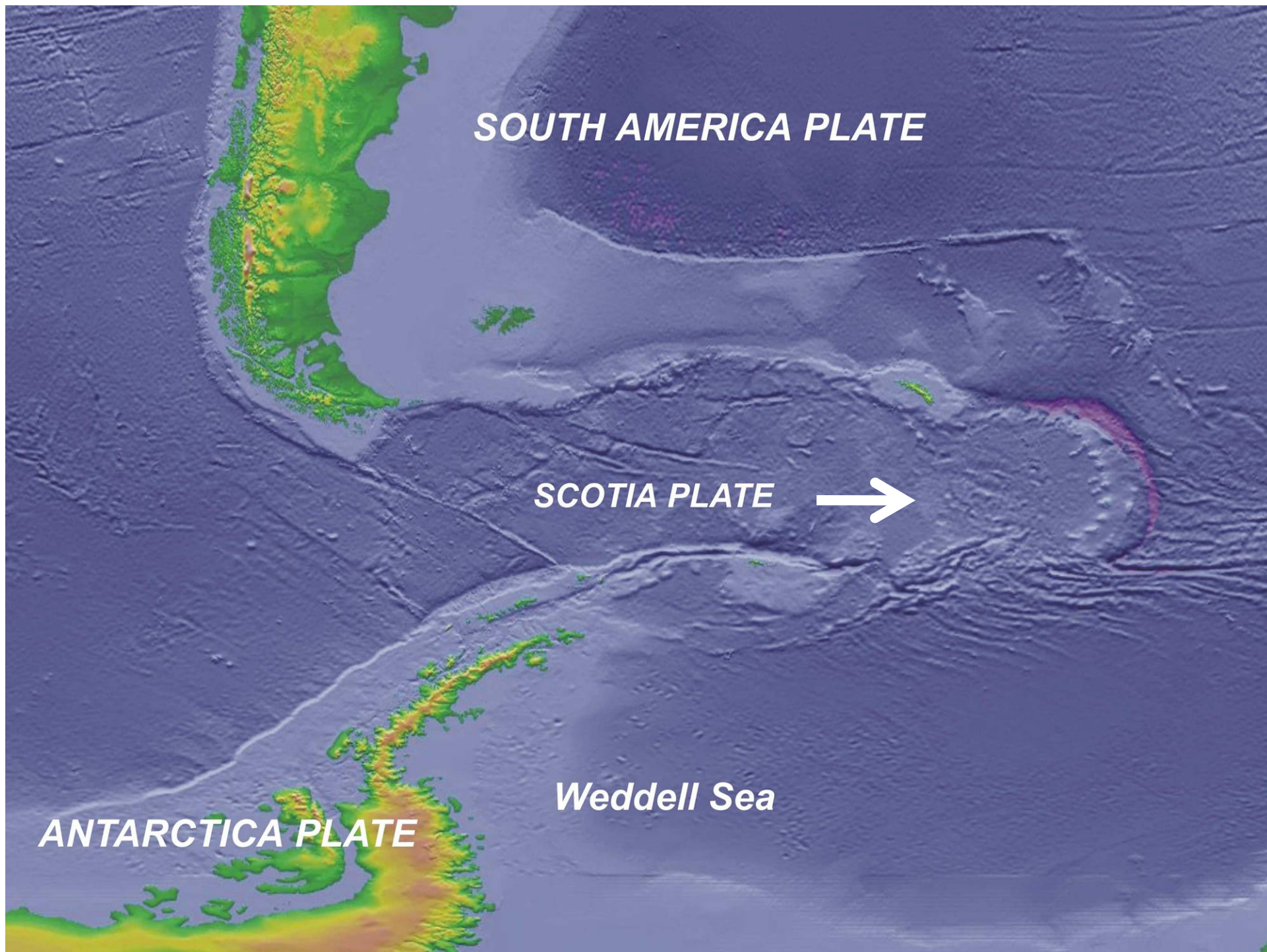


Mount Gimie – St. Lucia

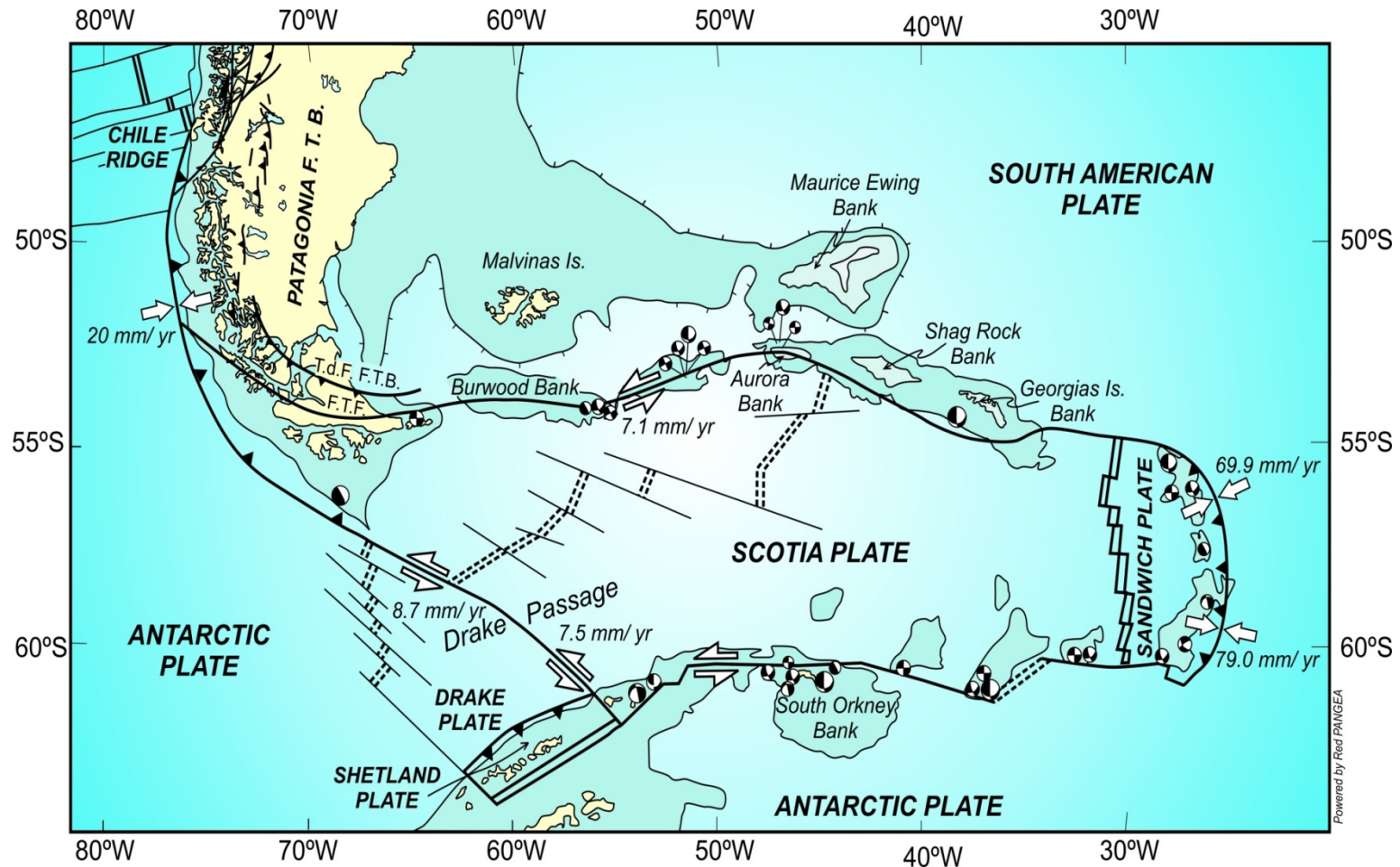
Lesser Antilles Volcanic Arc

Mont Peleé – Martinica Island



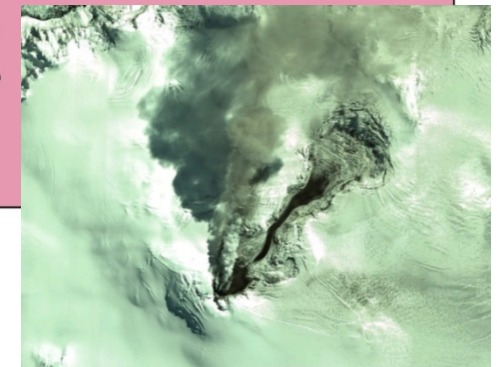
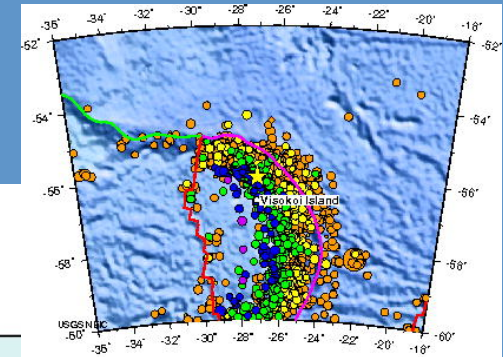
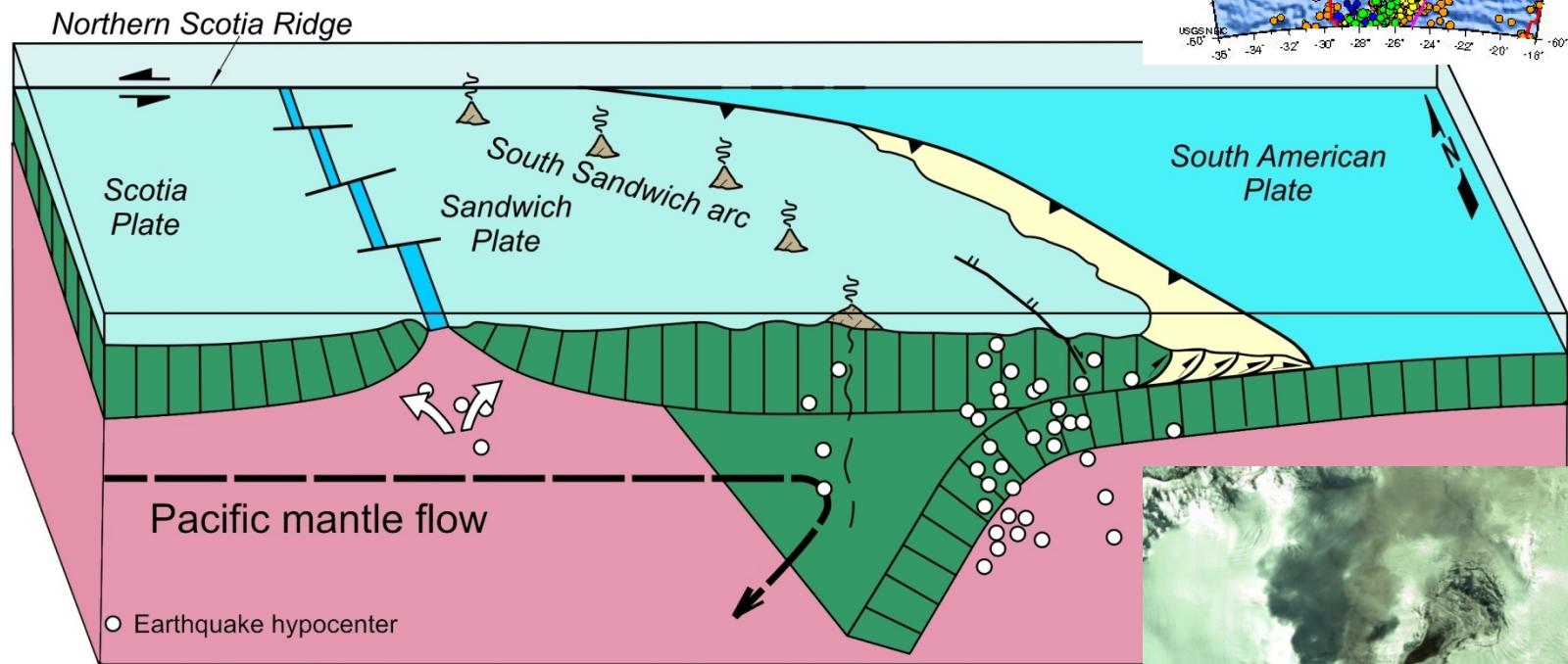


Scotia Plate Tectonics



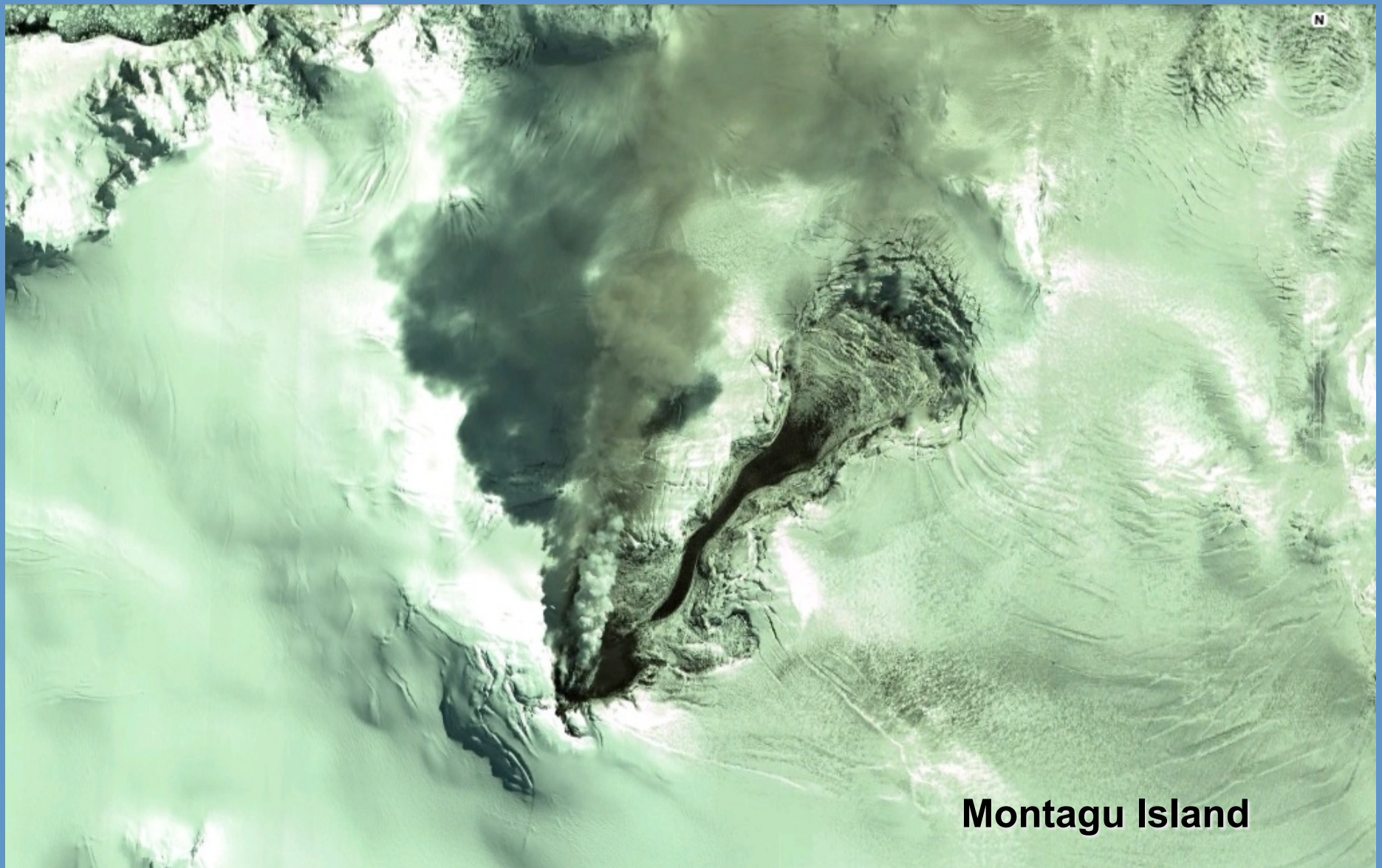
Scotia Plate is moving to the east; South America is moving to the northwest.

Scotia Plate Tectonics



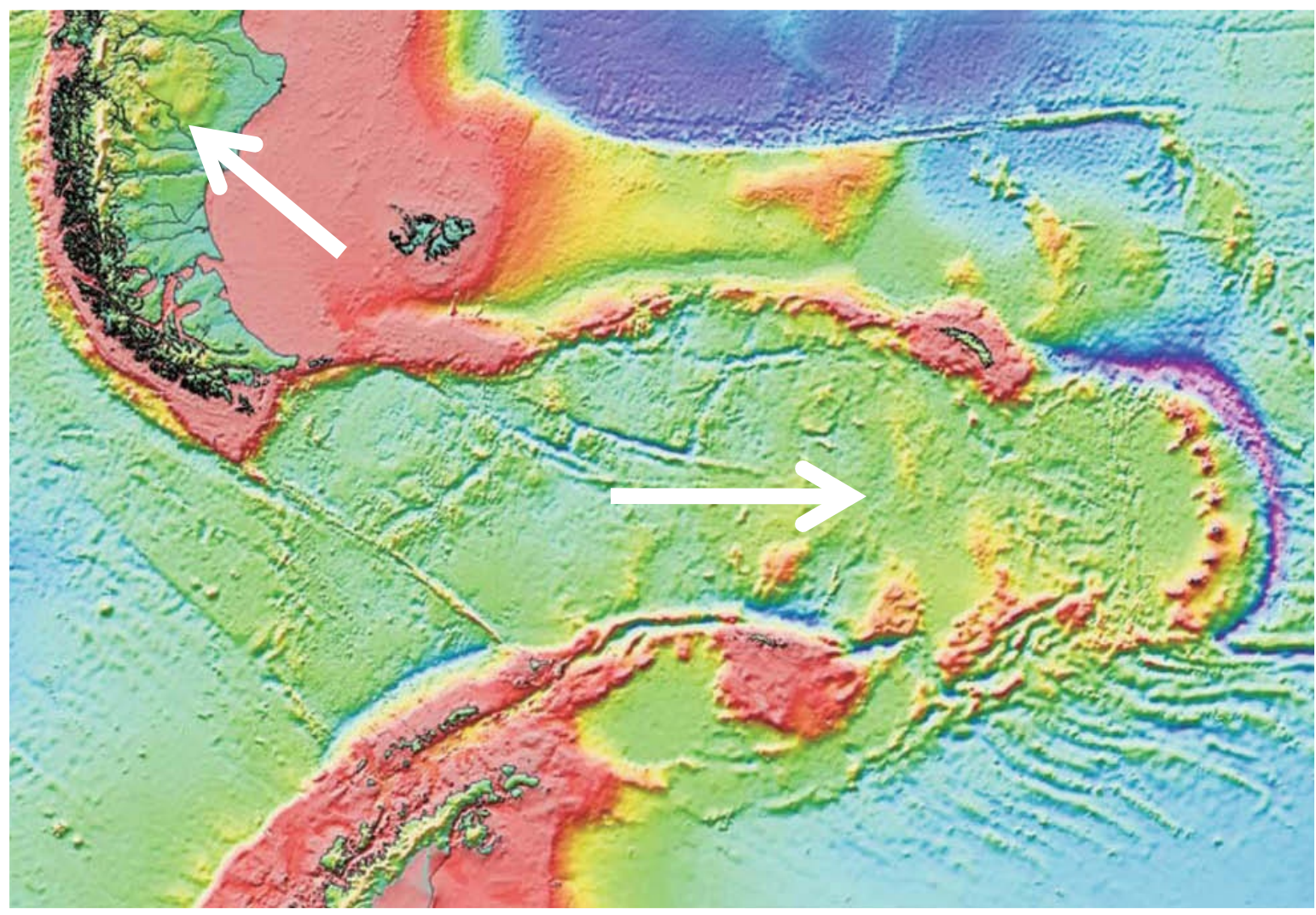
Subduction zone of the South Sandwich Volcanic Arc: Volcanoes and Earthquakes

South Sandwich Volcanic Arc



Belinda Mountain: an active volcano

Scotia Plate Tectonics



Scotia Plate is moving to the east; South America is moving to the northwest.

Patagonia

South America – Antarctica
Connections prior to the opening
of the Drake Passage

Future inception
of the Scotia
oceanic plate

South Georgias

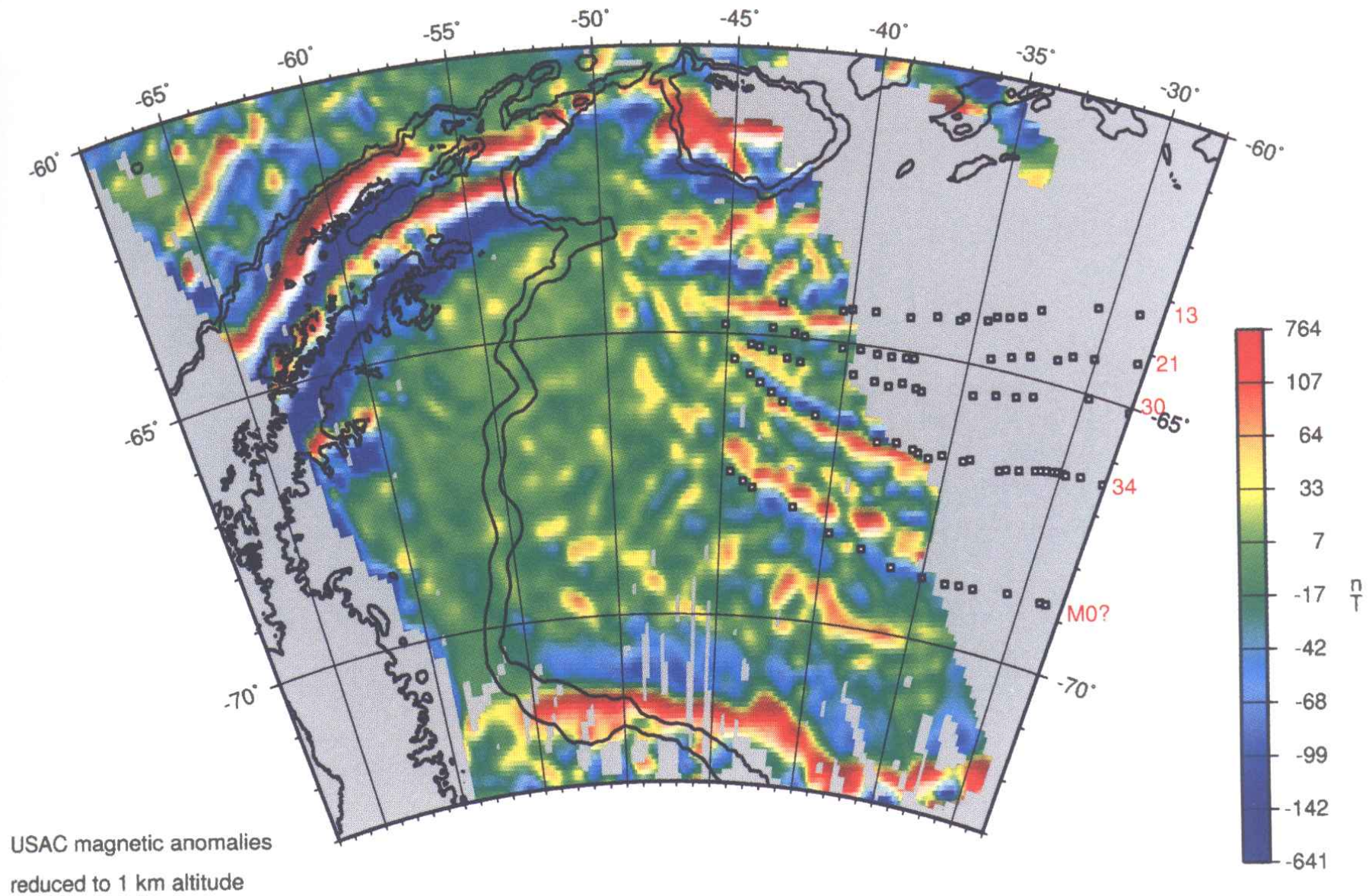
South Orkneys

Antarctic
Peninsula

After Dalziel (1983)

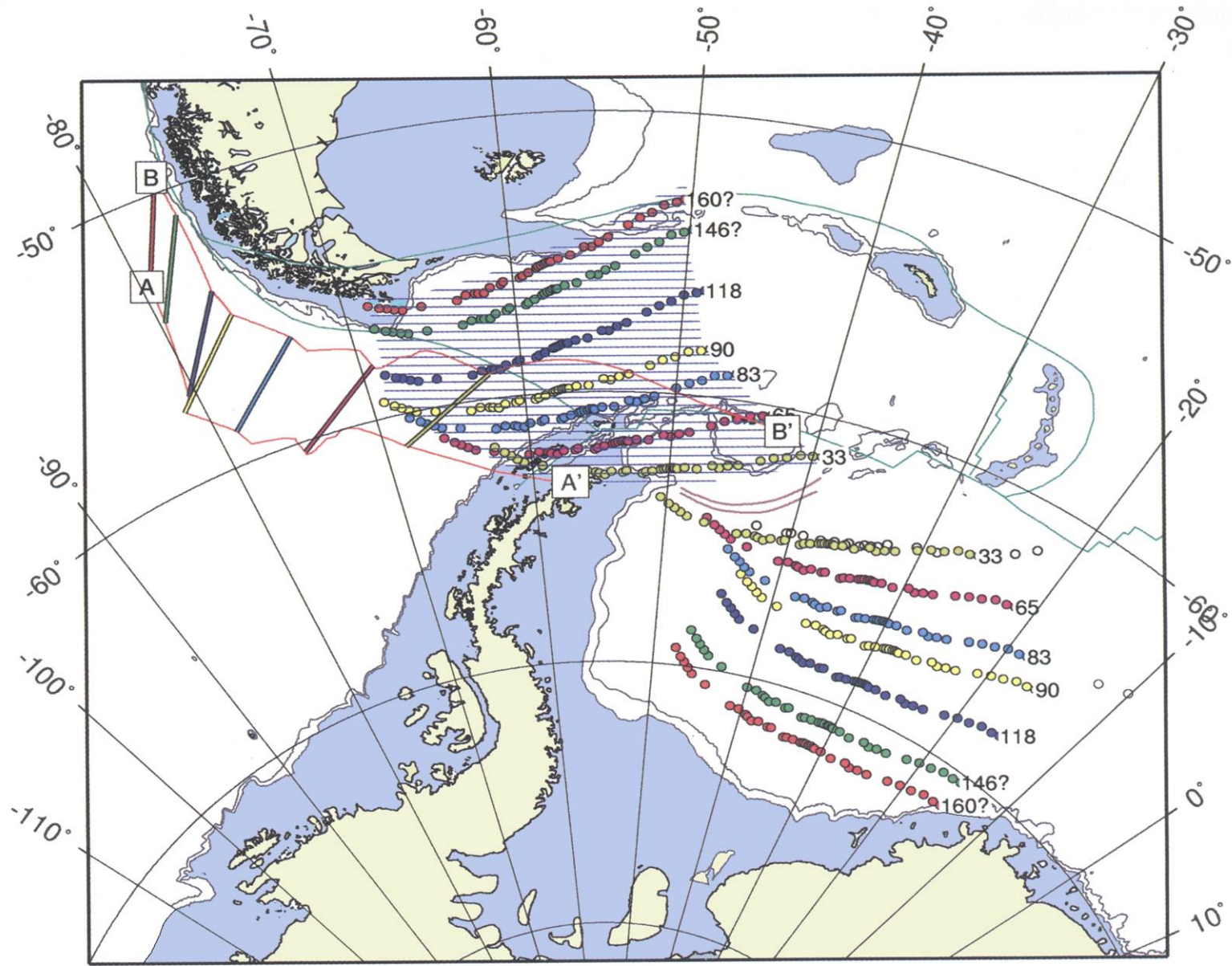


MAGNETIC ANOMALIES OF WEDDELL SEA



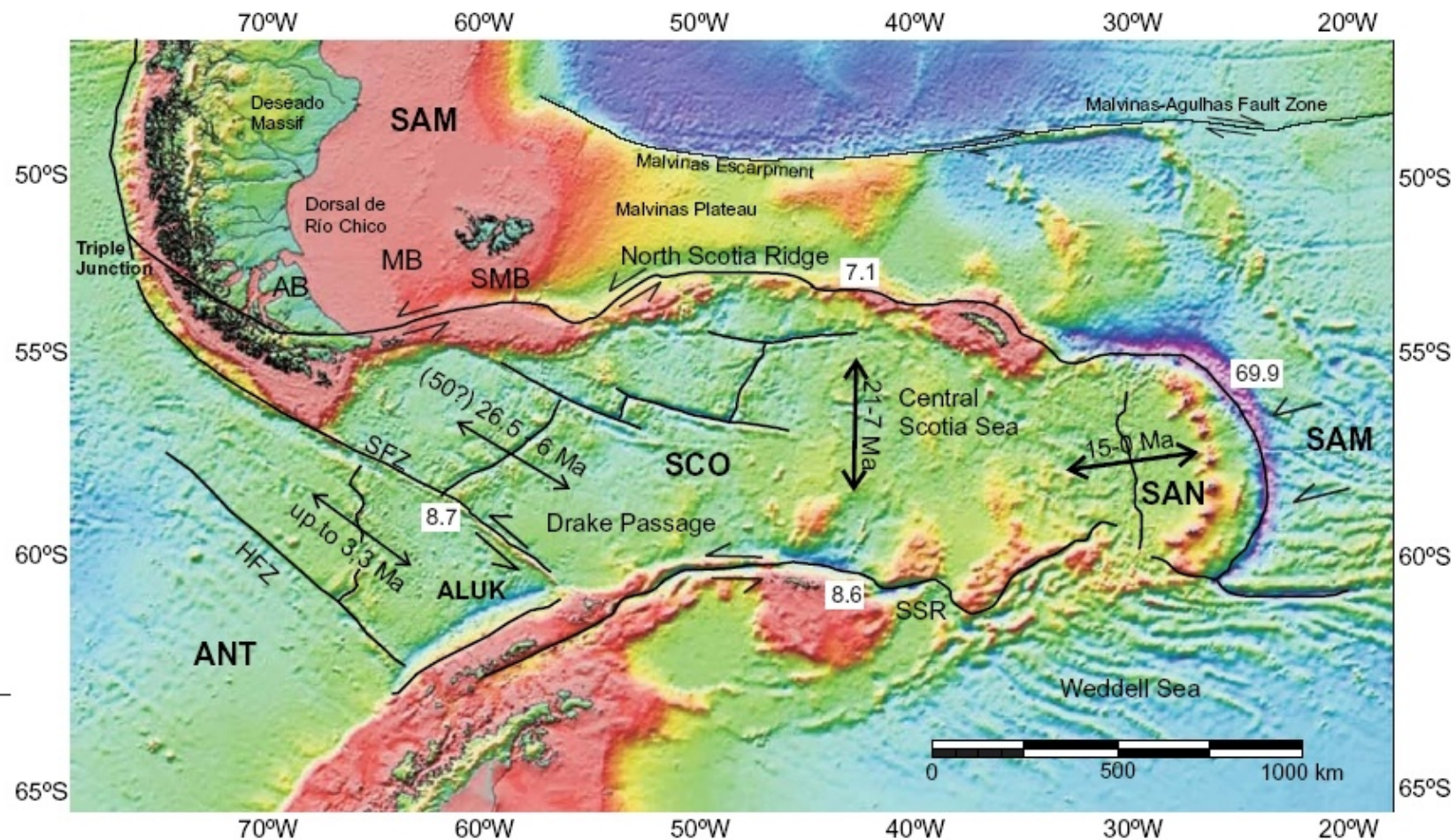
Ghidella et al. (2002)

SYNTHETIC ISOCHRONS



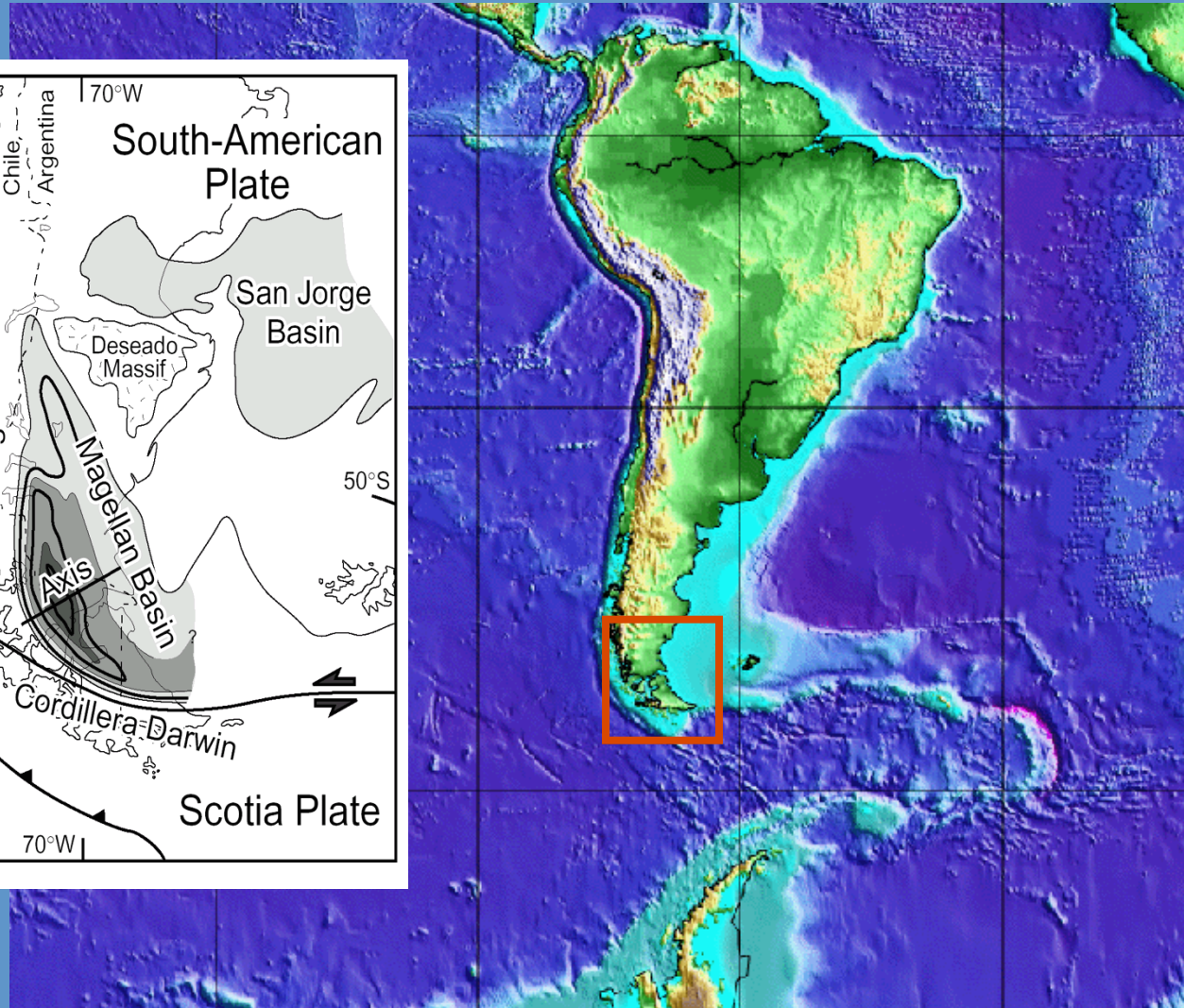
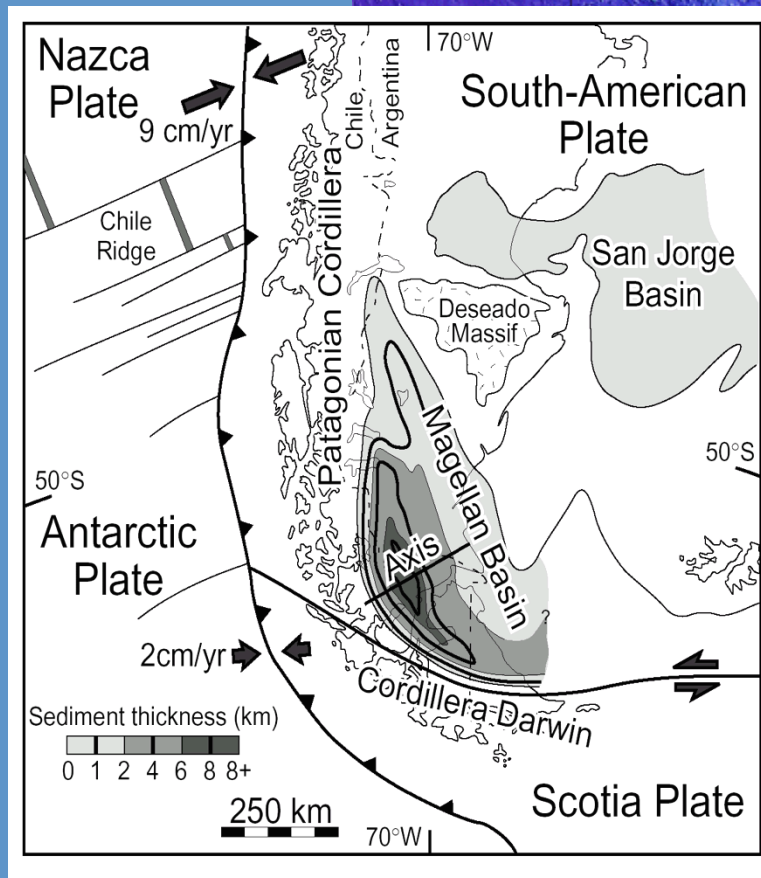
Ghidella et al. (2002)

Scotia Plate Tectonics



There is an important wrench fault: ~ 1 cm/year strike-slip displacement.

Scotia Plate Tectonics



There is an important wrench fault along Fagnano Lake and Darwin Cordillera.



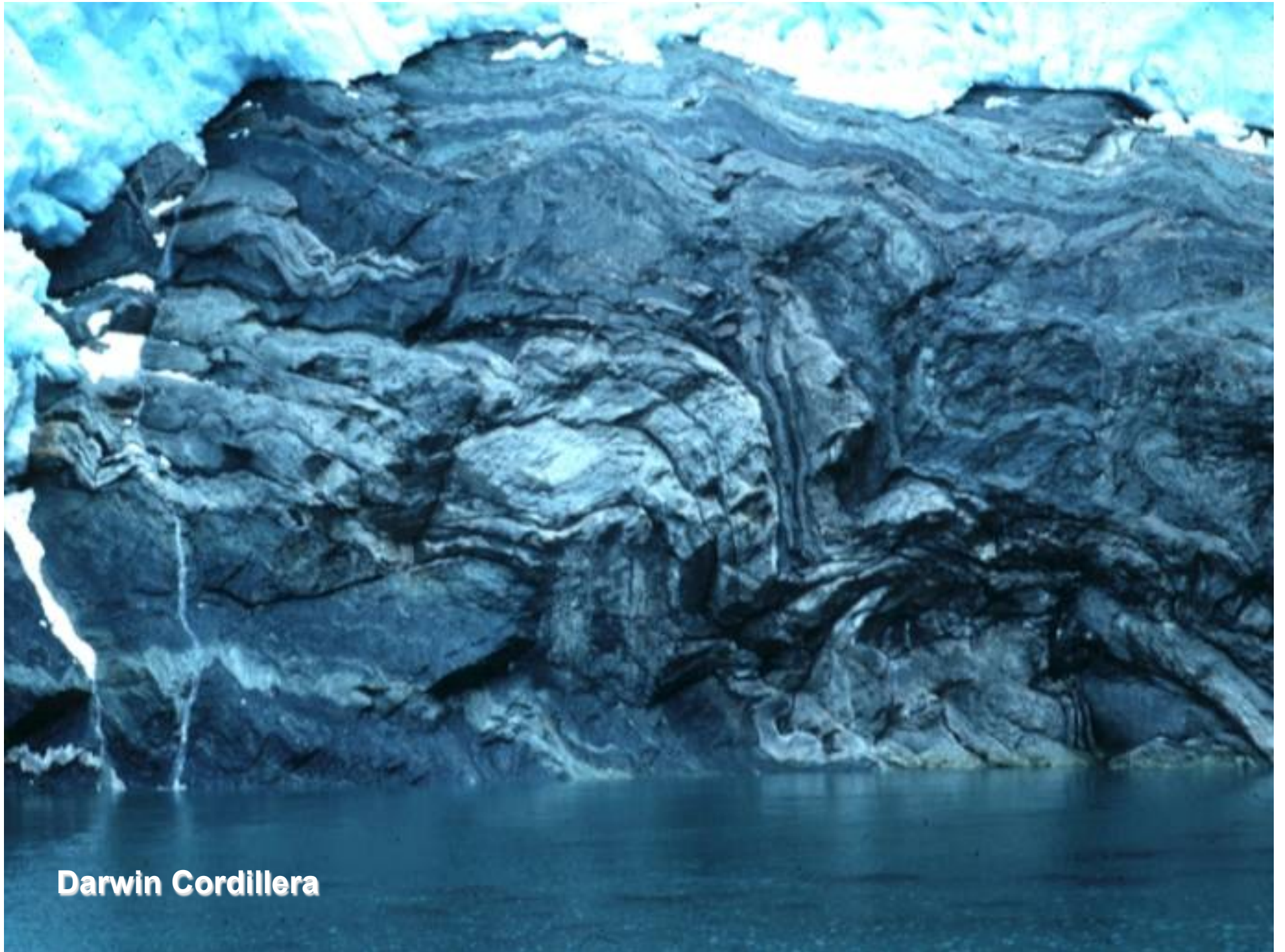
Darwin Cordillera

25.11.2005

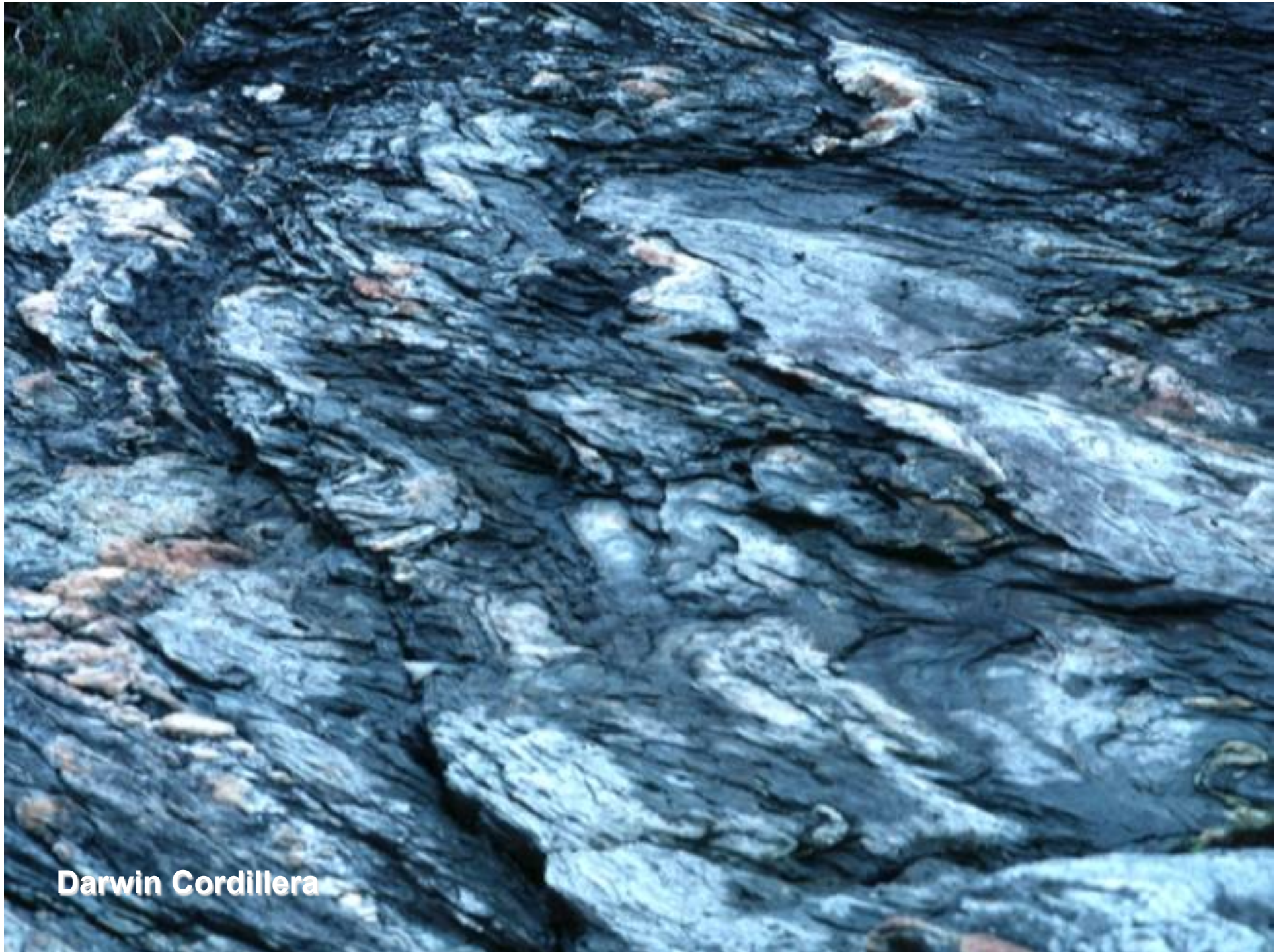


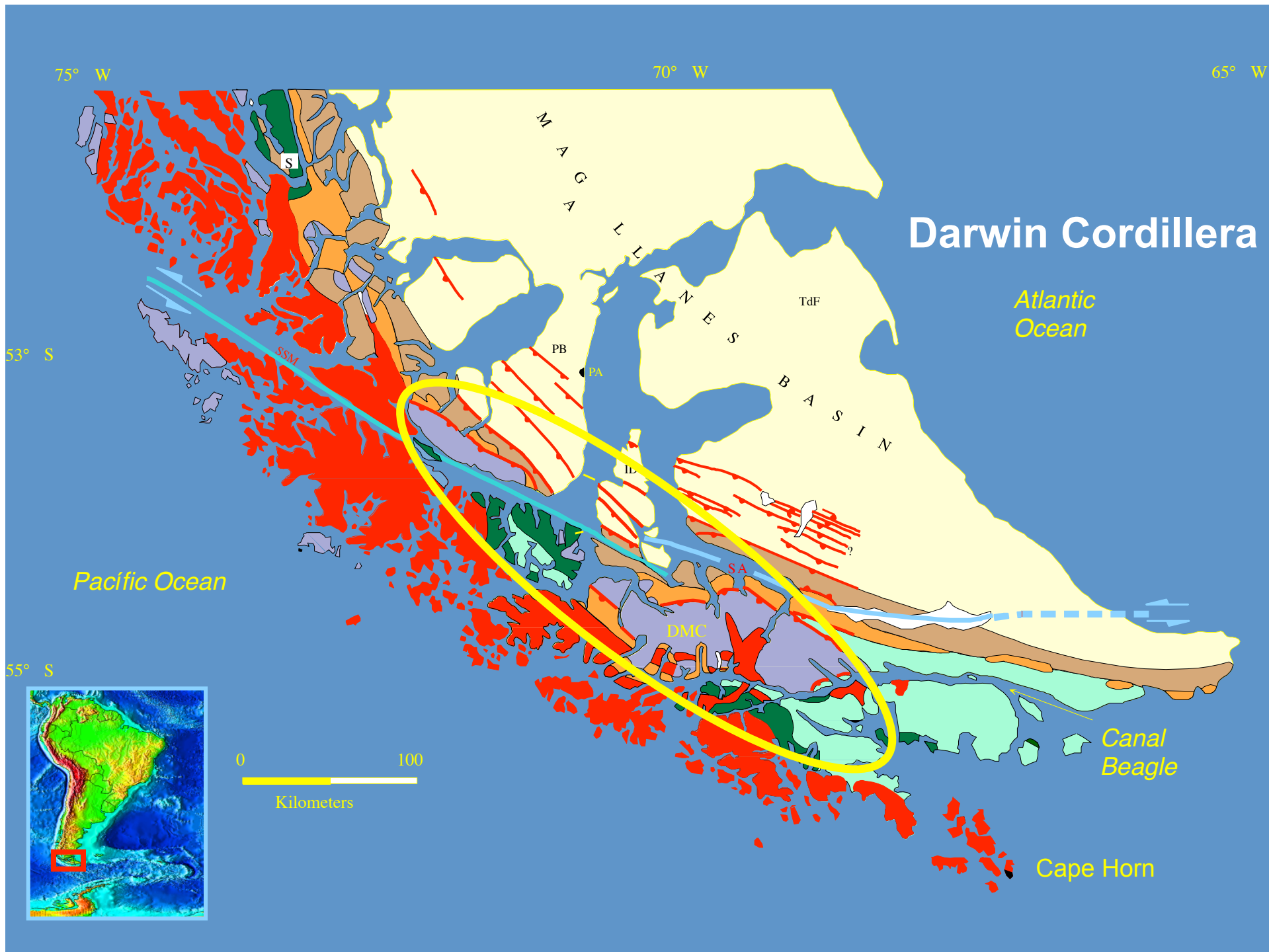
Darwin Cordillera
Parry Fjord

26.11.2005

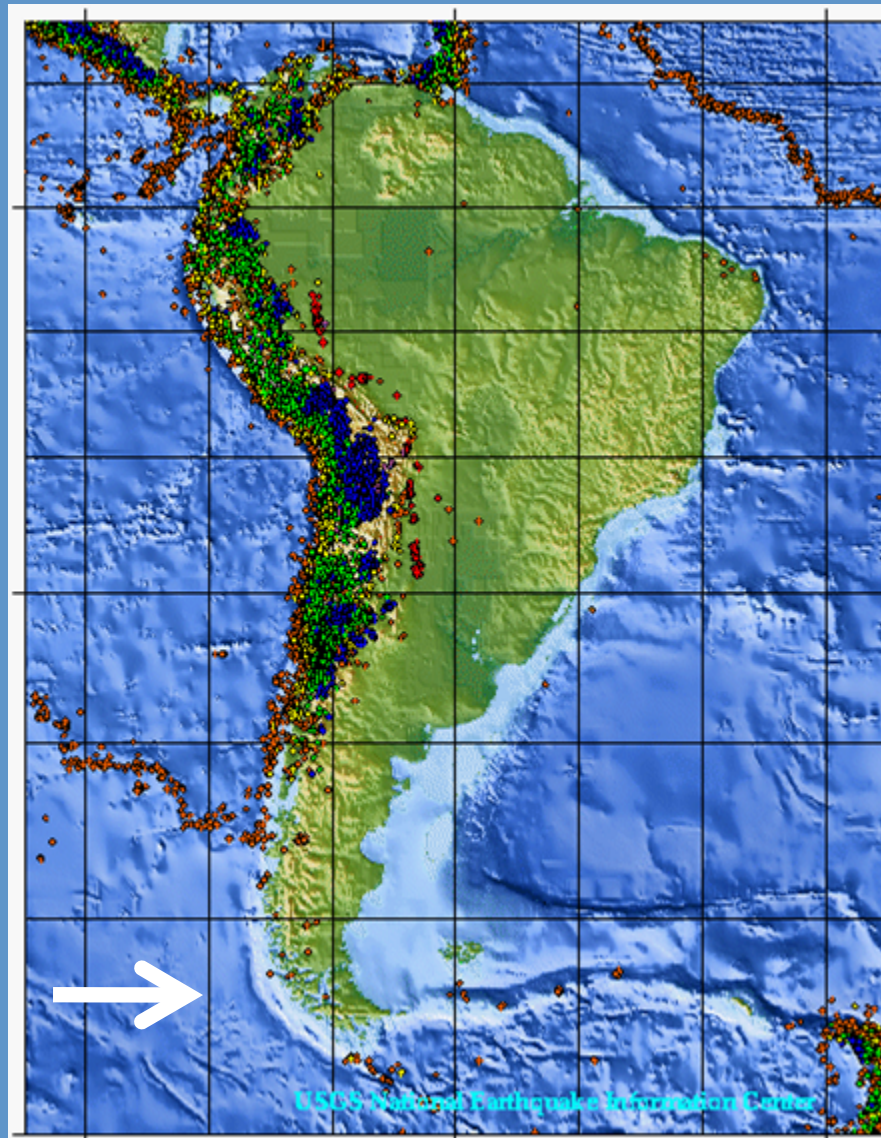


Darwin Cordillera

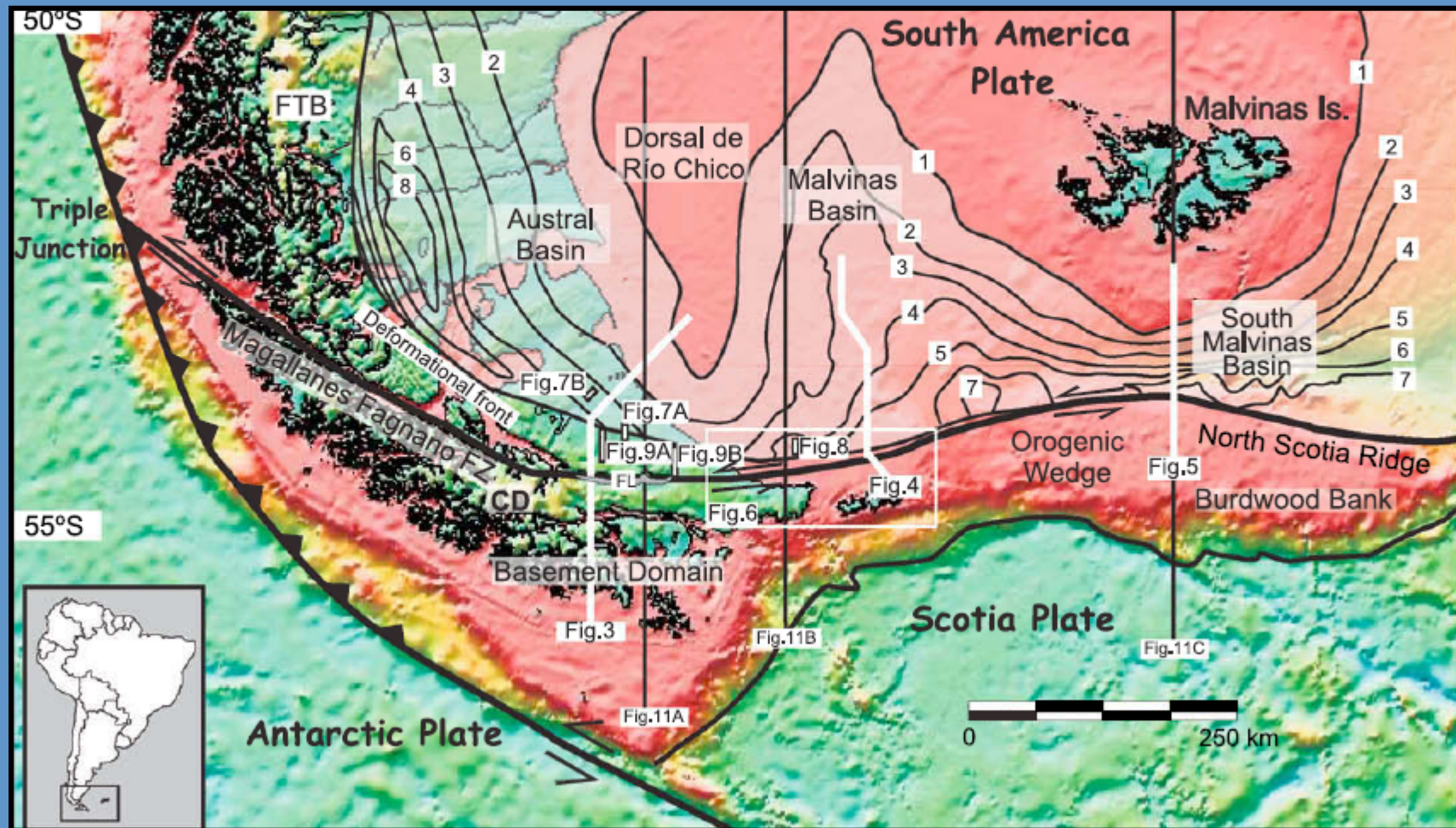




South America Earthquakes (1990-2010)



Southernmost Tierra del Fuego



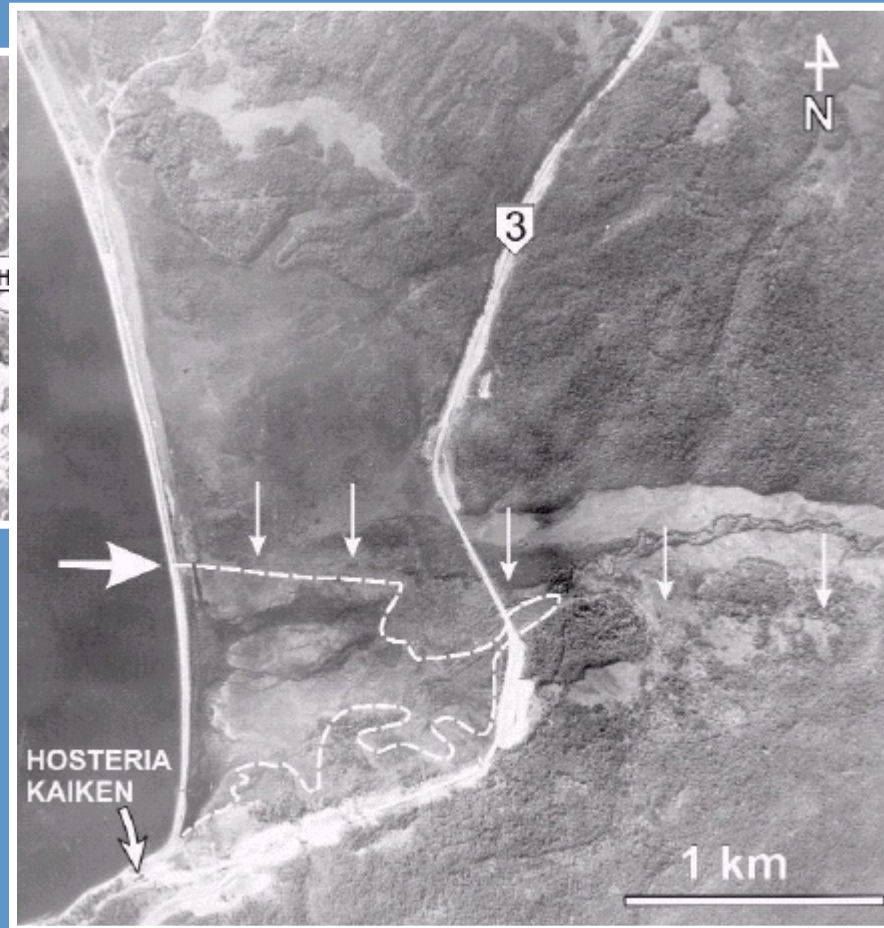
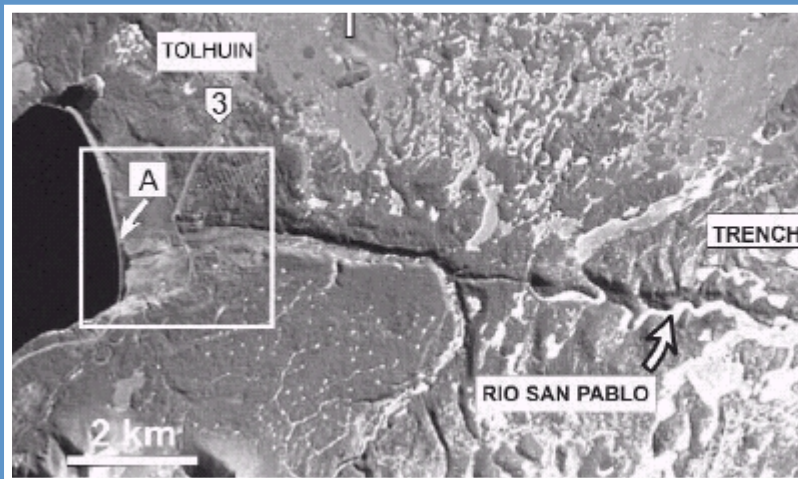
A succession of basement blocks are spitted away from the continent.

Southernmost Tierra del Fuego

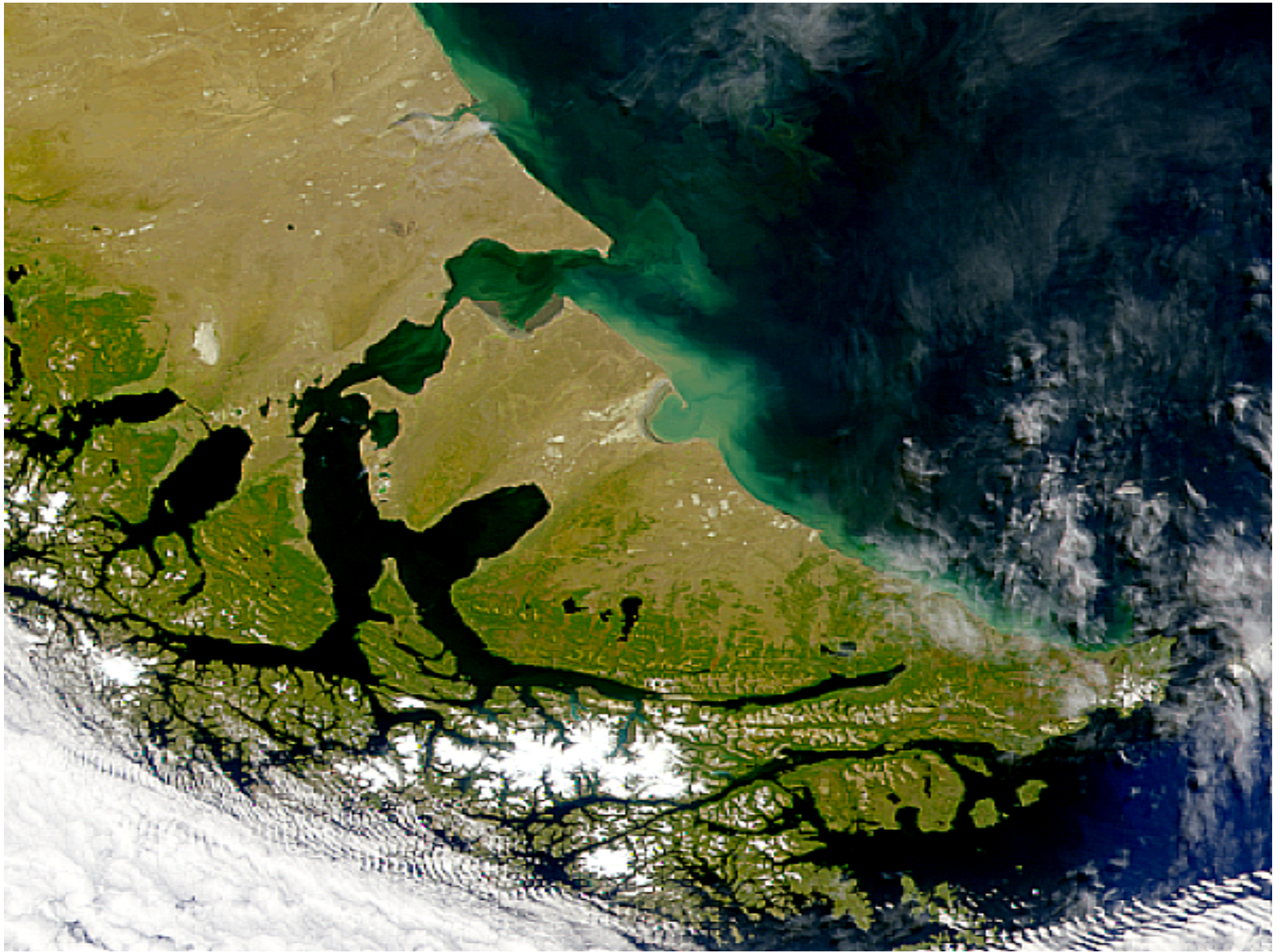


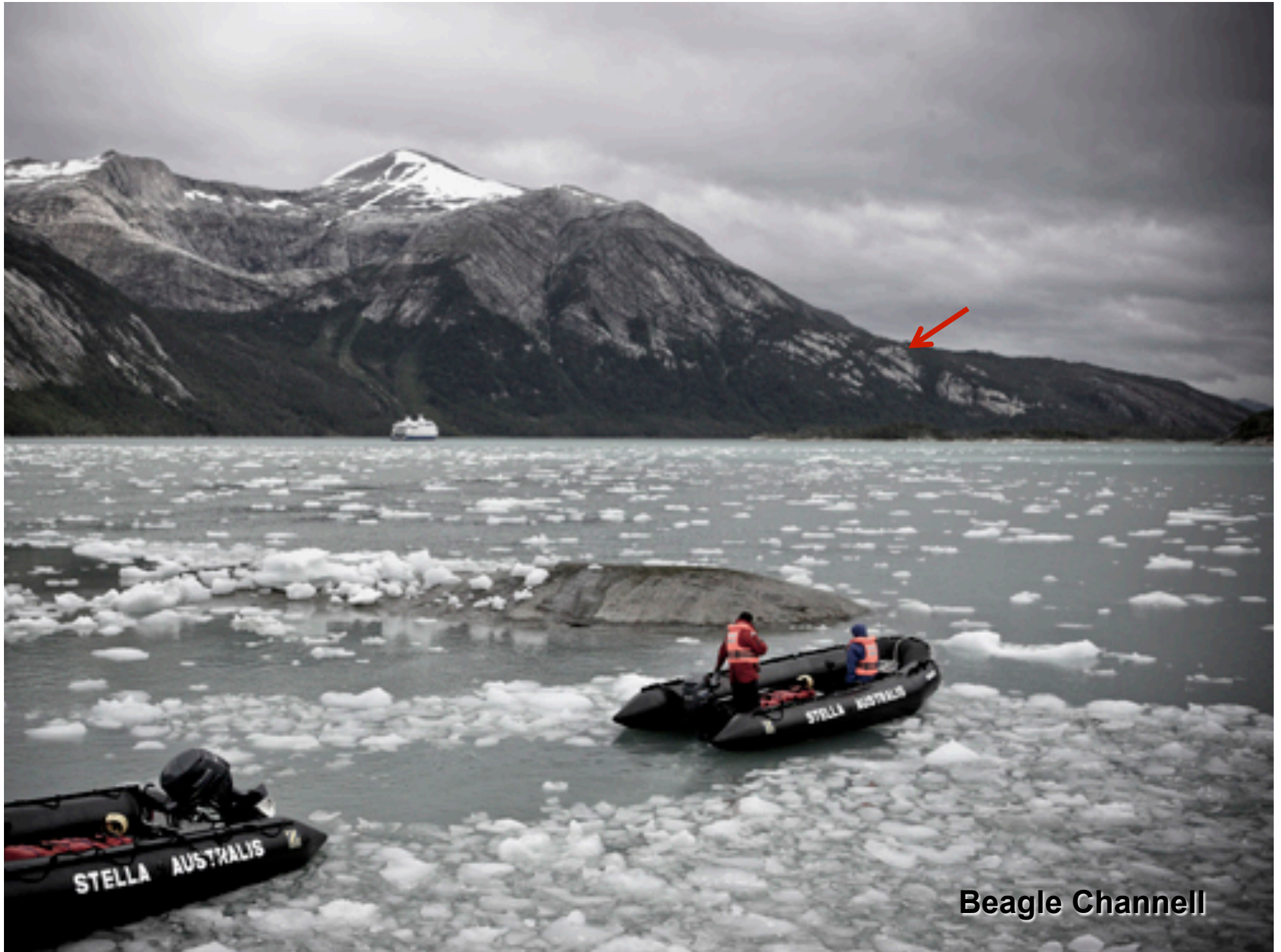
Two large earthquakes in 1949 indicate important seismic activity along the fault.

Southernmost Tierra del Fuego

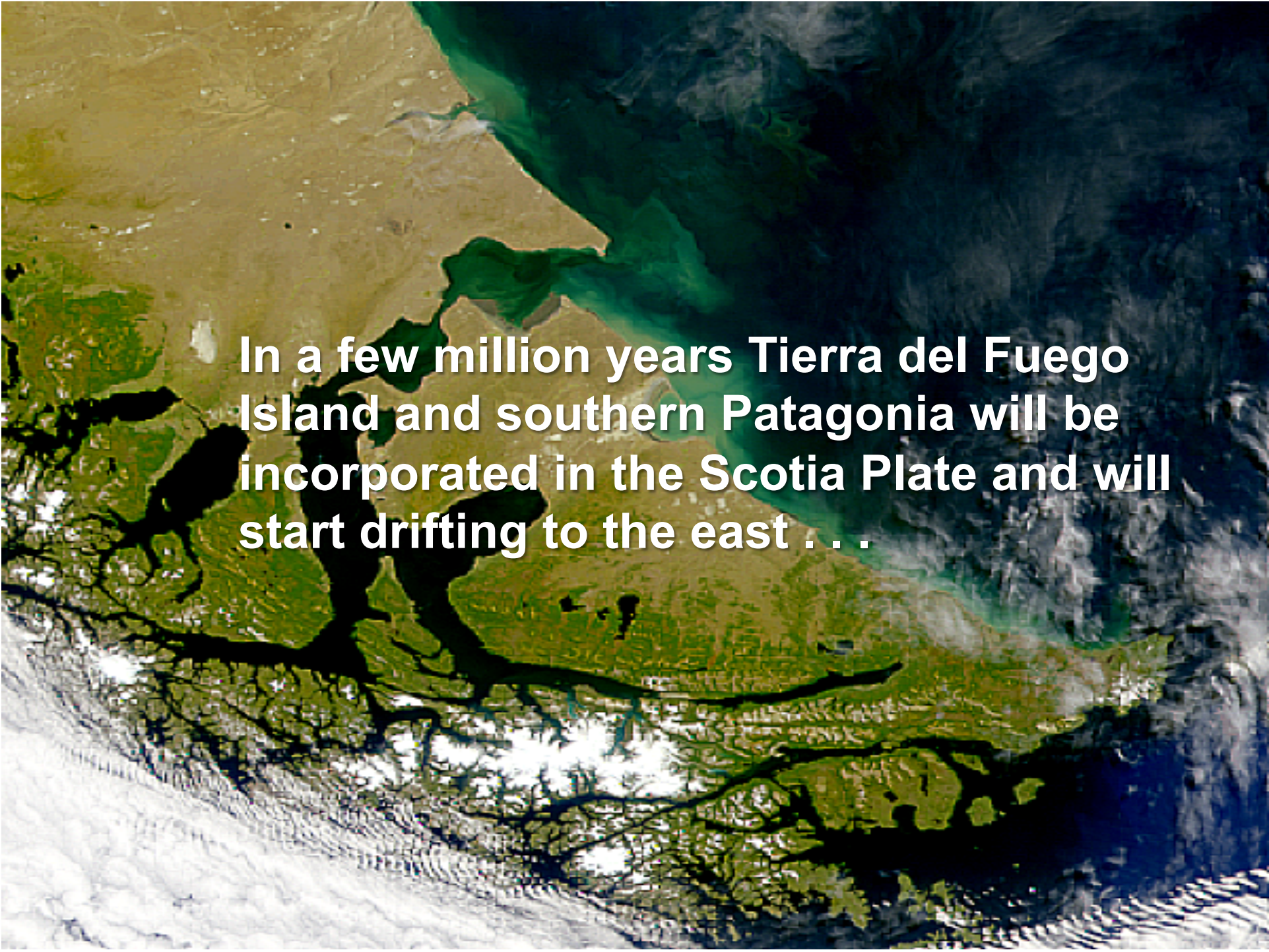


Two large earthquakes in 1949 indicate important seismic activity along the fault.





Beagle Channell

A satellite image showing the southern tip of South America, specifically Tierra del Fuego and the southern part of Patagonia. The land is depicted in shades of green and brown, indicating vegetation and terrain. The surrounding ocean is dark blue, and white clouds are visible over the water and parts of the land. The text is overlaid in the center of the image.

In a few million years Tierra del Fuego Island and southern Patagonia will be incorporated in the Scotia Plate and will start drifting to the east . . .