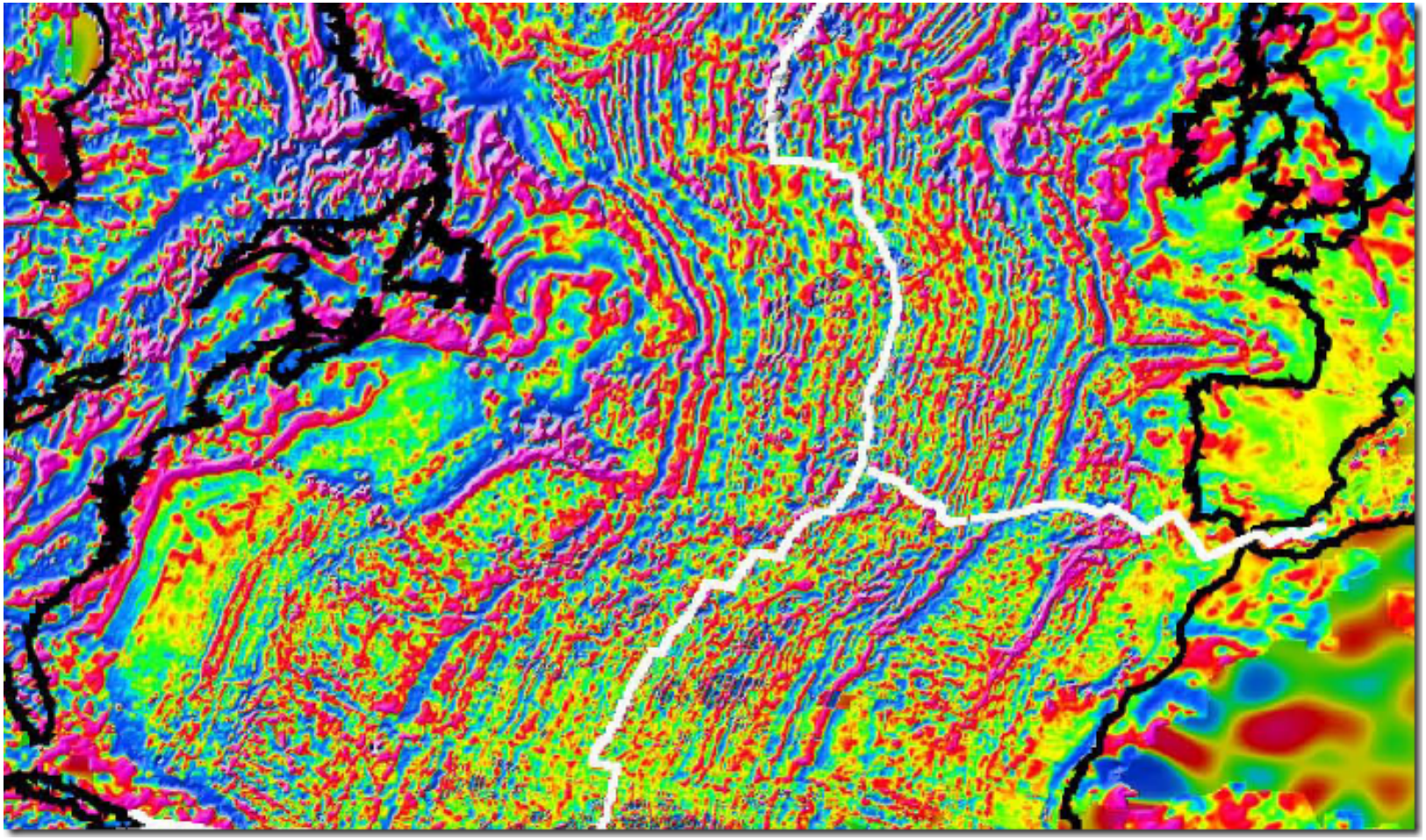
Magnetics 4

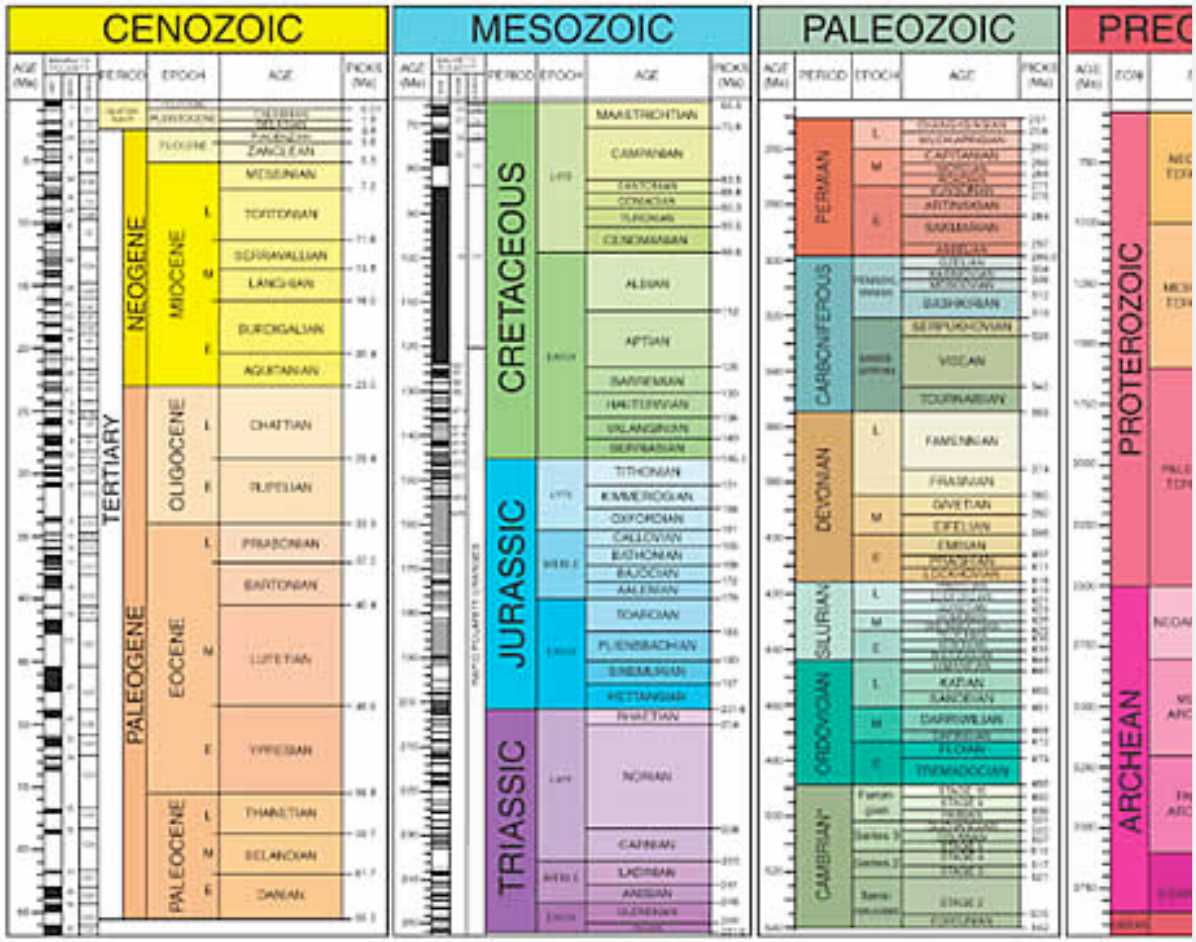
GEOS 602

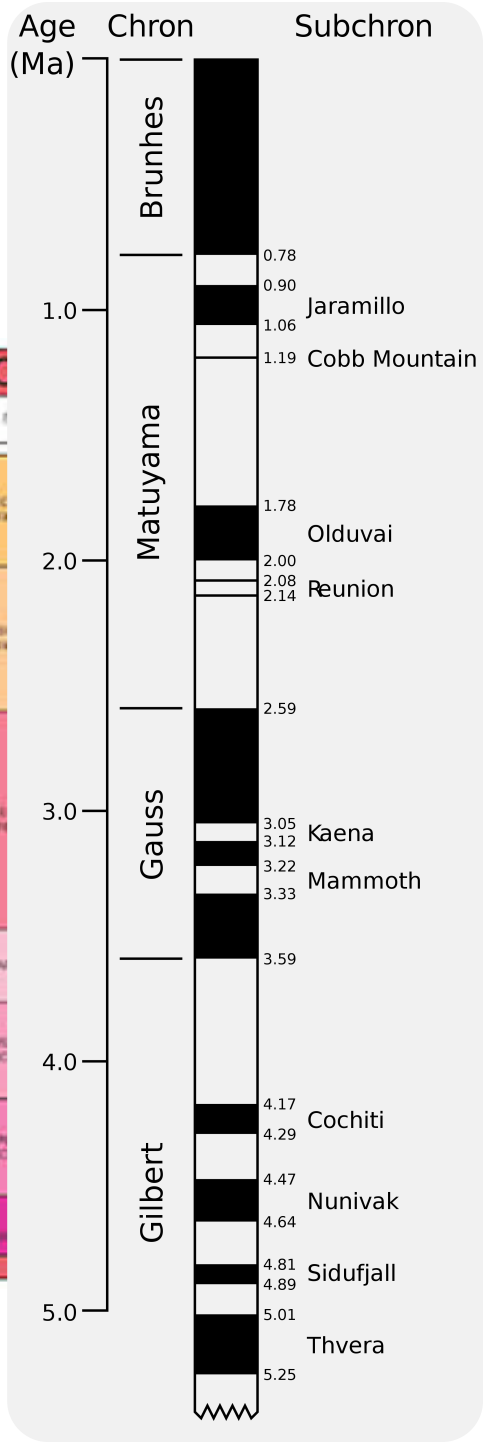
Geophysical Fields

Magnetic Anomalies: Atlantic



Geomagnetic Timesca

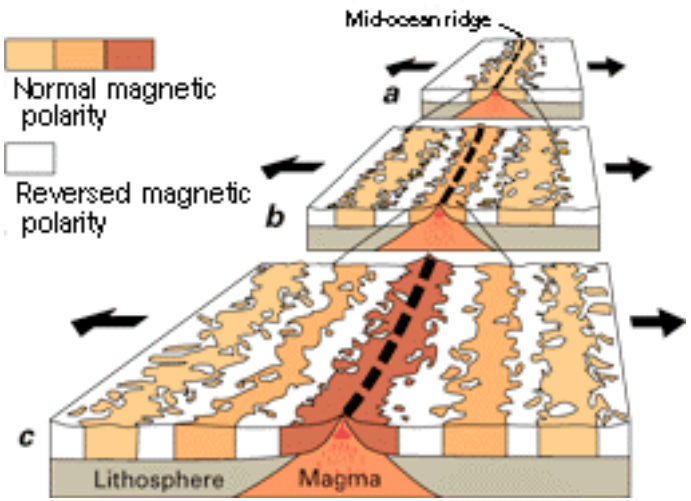


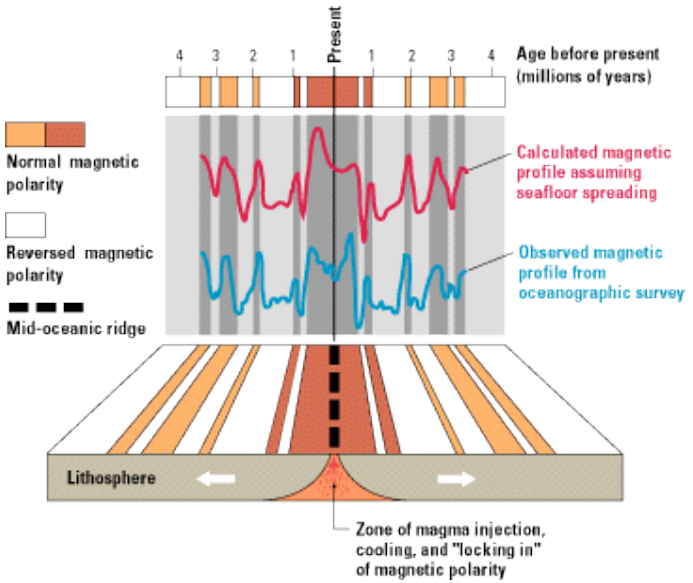


Reversal Pattern

- Rate of reversals has changed over time.
- Have been as frequent as several within 1 million years
- Cretaceous Long Normal Period
  - From 120 to 83 million years, no reversals
- Jurassic Quiet Zone
  - Oldest seafloor, no stripes. No polarity changes, or lost magnetization?
- Kiaman Long Reversed
  - From 316 to 262 million years

Geologic Record of Reversals





Rate estimation procedure - objective

- *Observed*

• projected onto ridge-normal

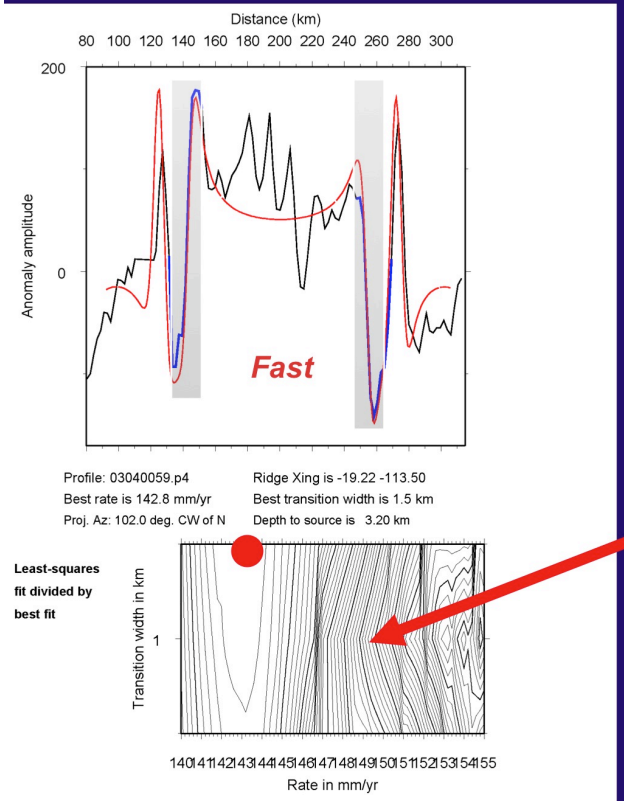
-*Synthetic*

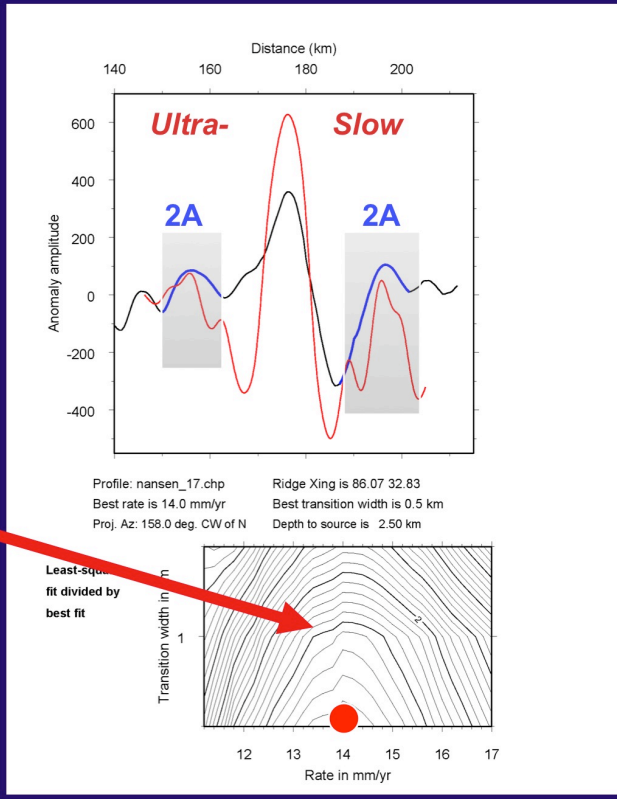
•Auto cross-correlated with observed

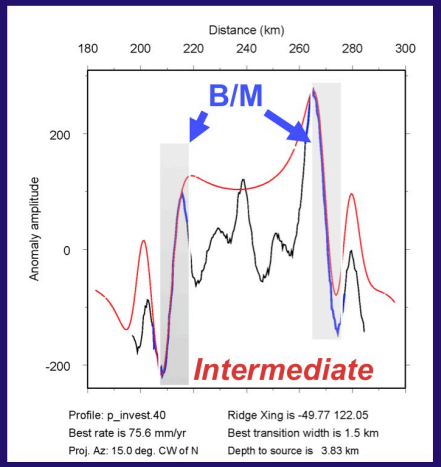
•2-D grid search for rate and reversal transition width to minimize LS misfit

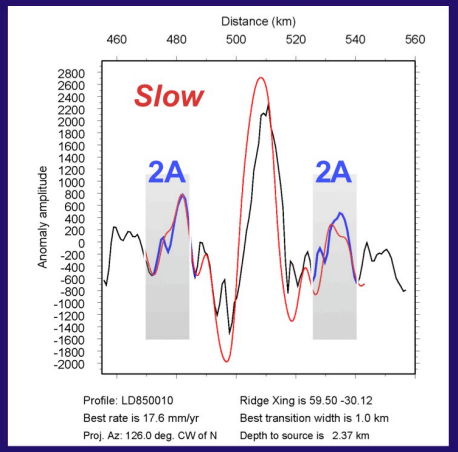
•Uses appropriate ambient and remanent I & D, lineation strike, depth to source.

•Astronomically-tuned reversal ages

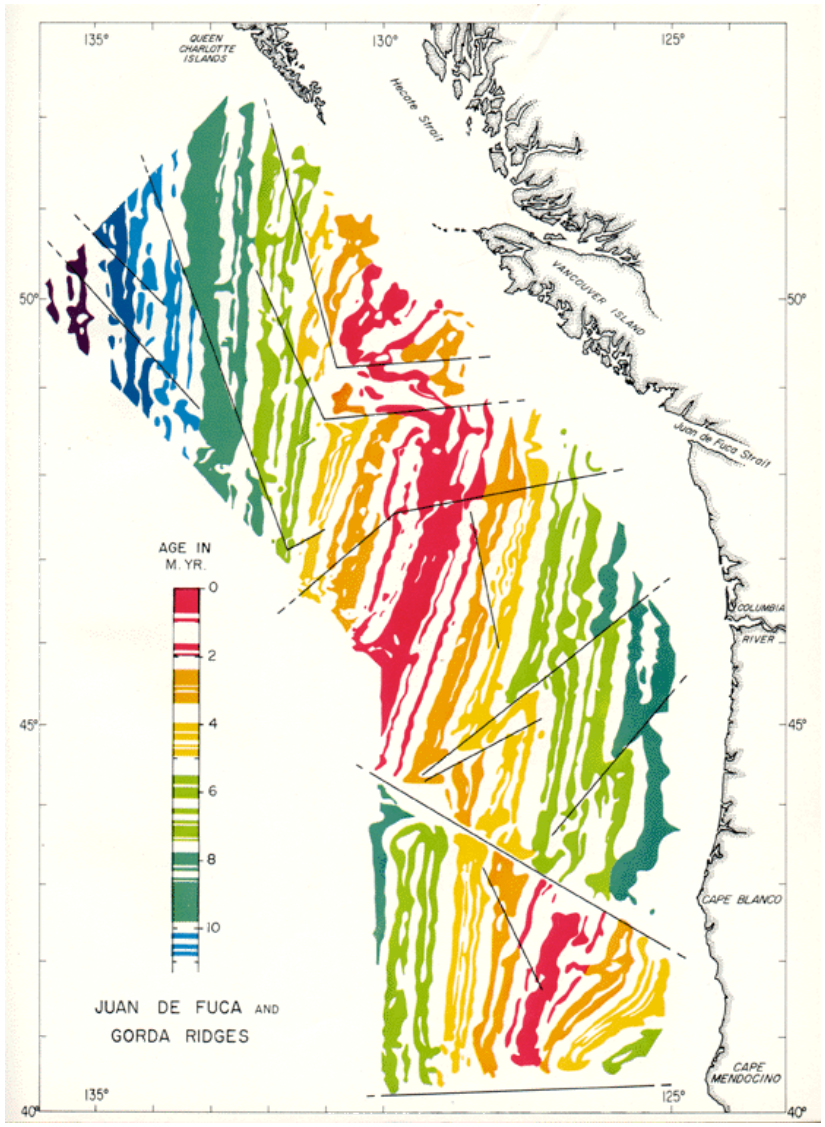






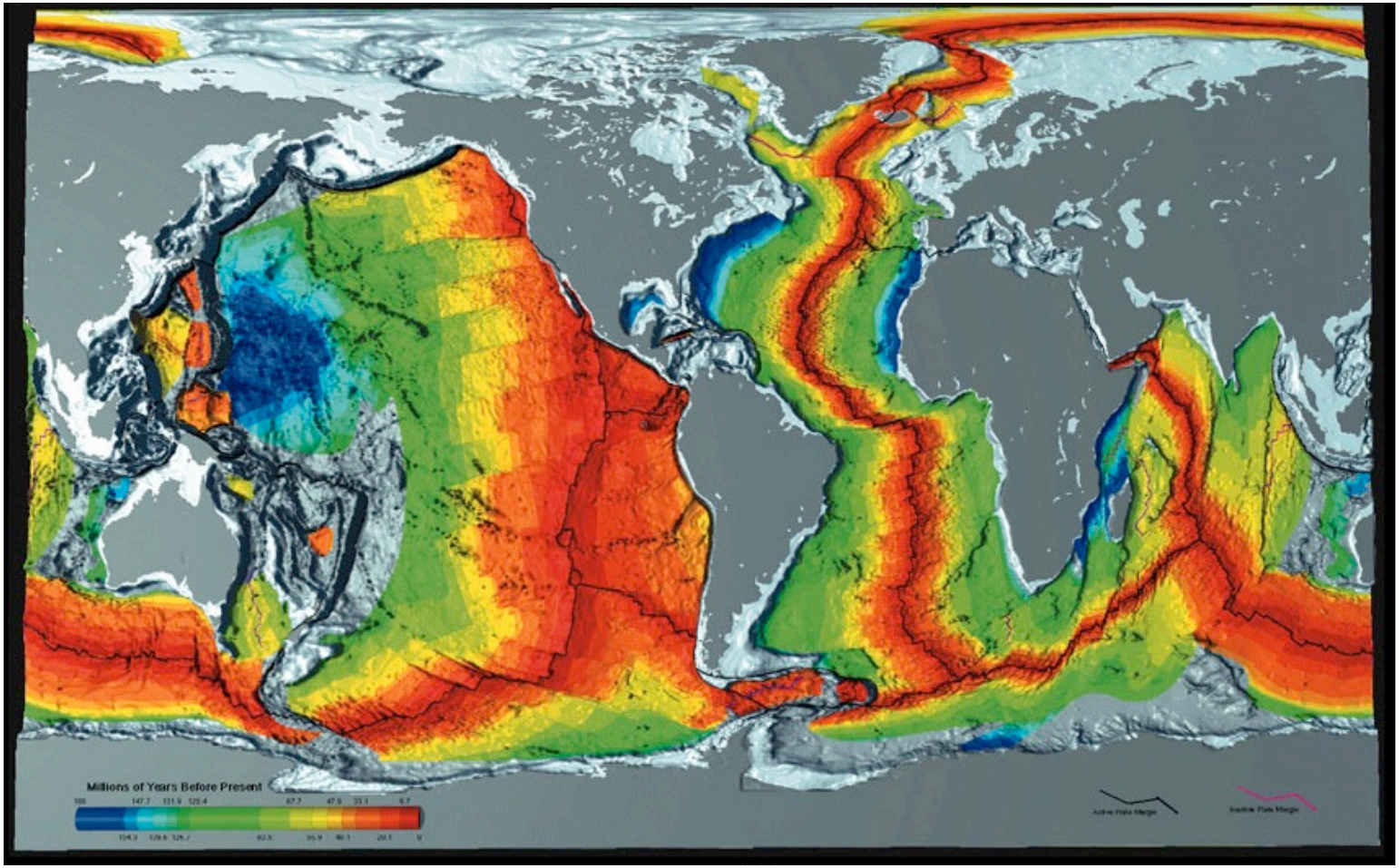


Cascadia Anomalies

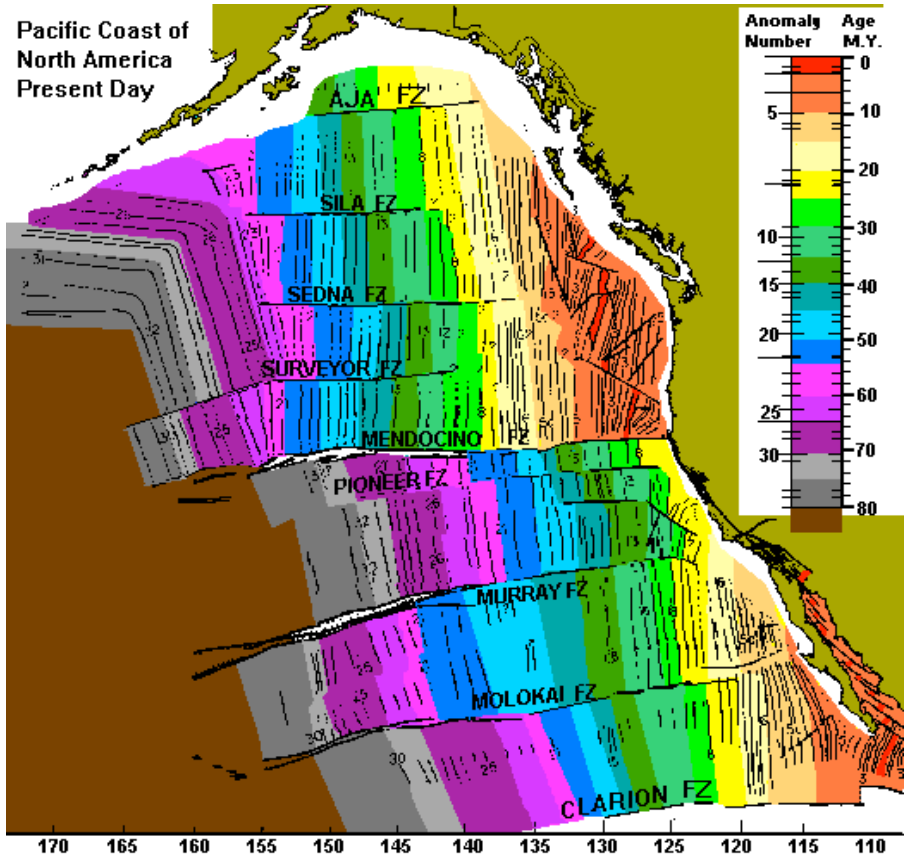


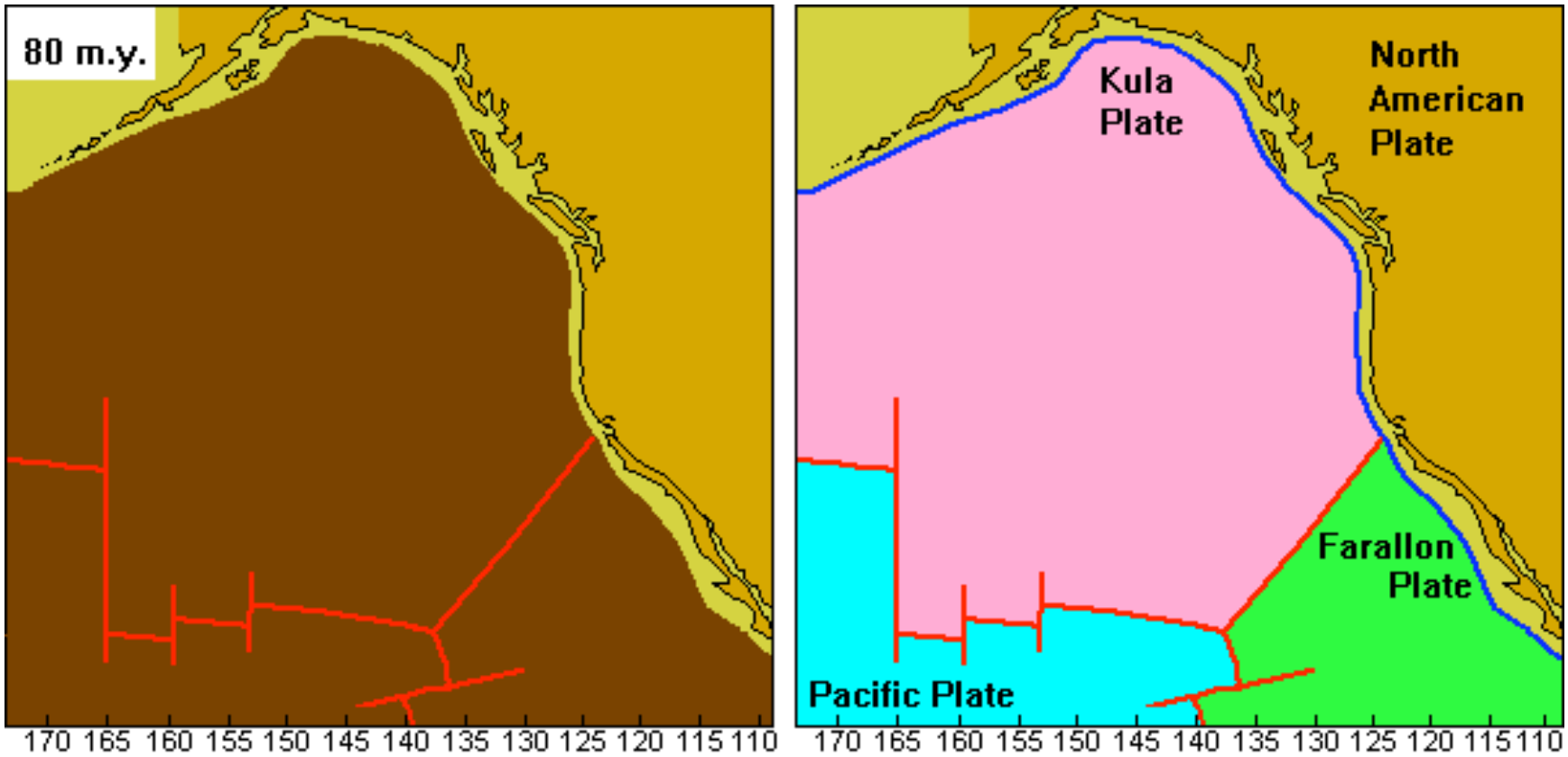
- Given the magnetic timescale, you can count anomalies back in time and determine the age of the seafloor.
- Anomalies are color-coded by age of seafloor.

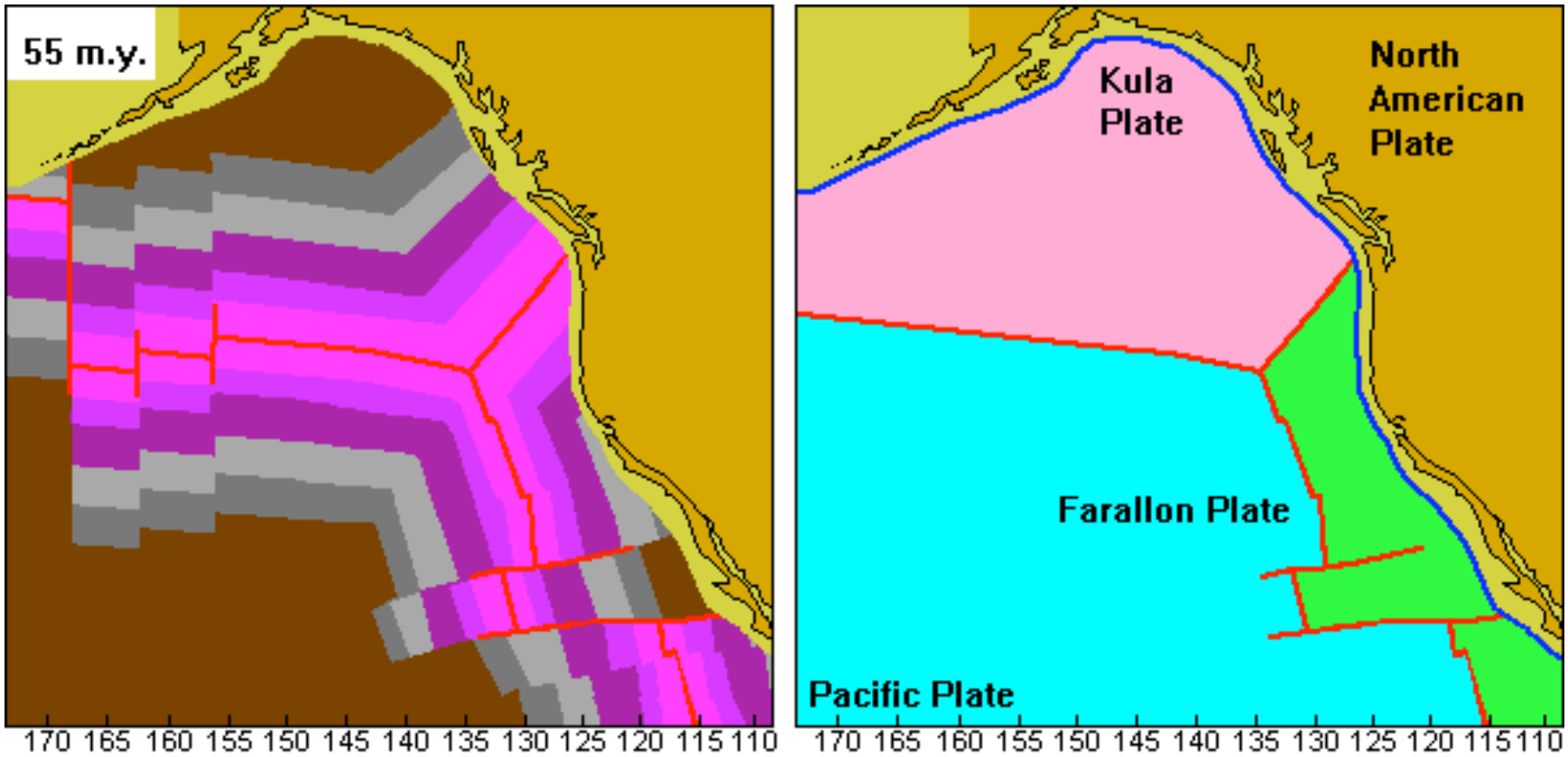
Age of Seafloor

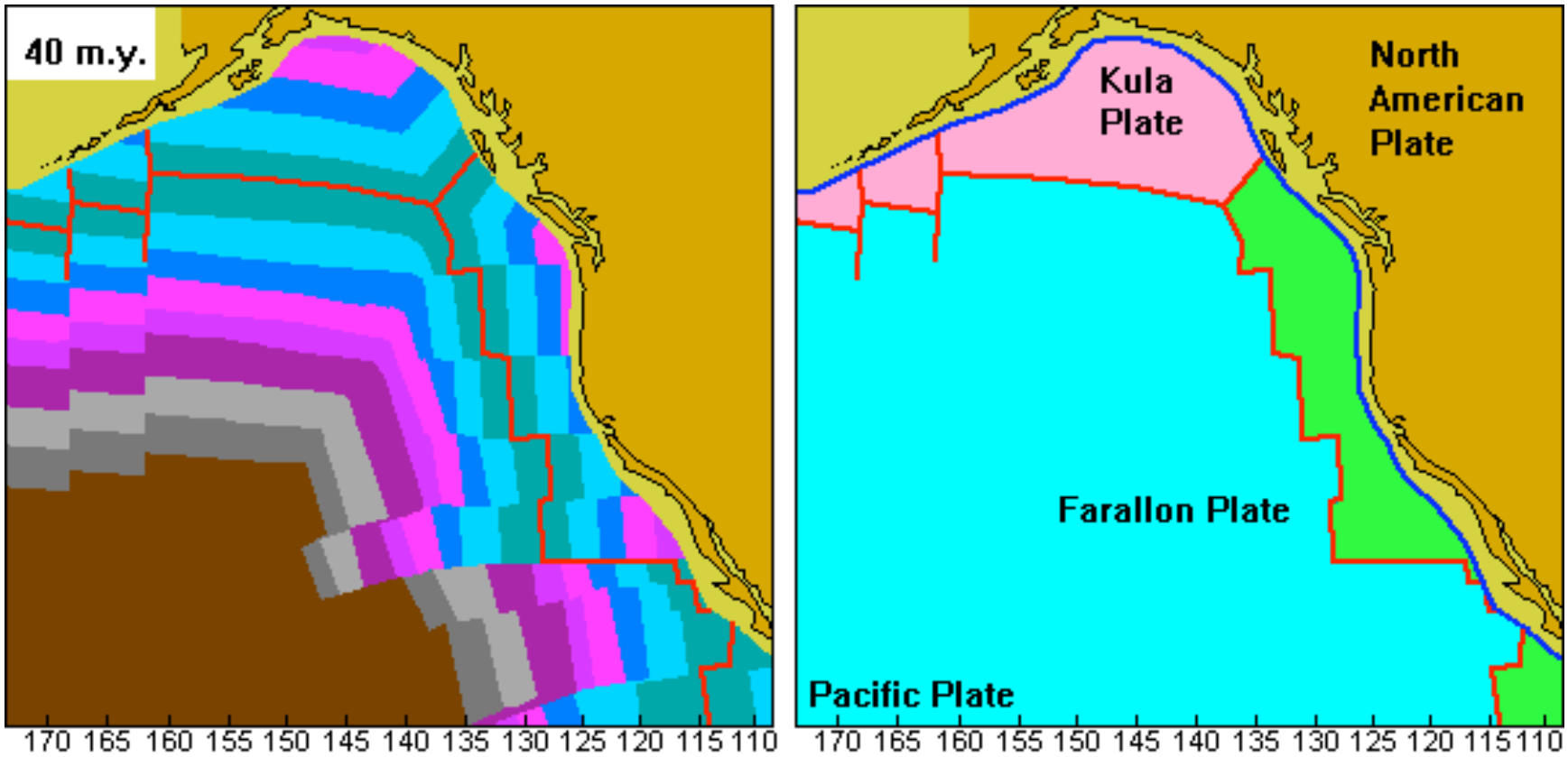


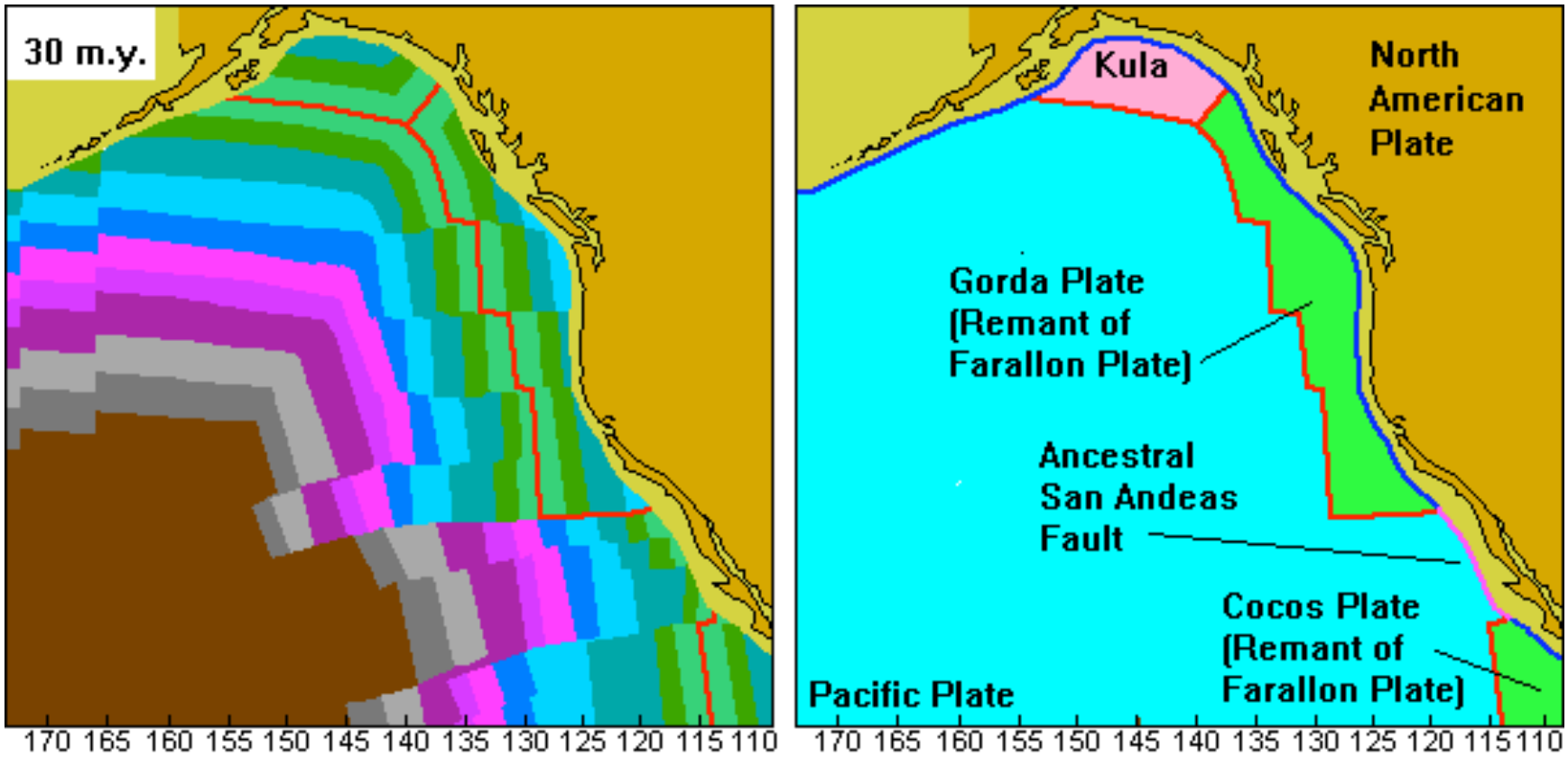
NE Pacific

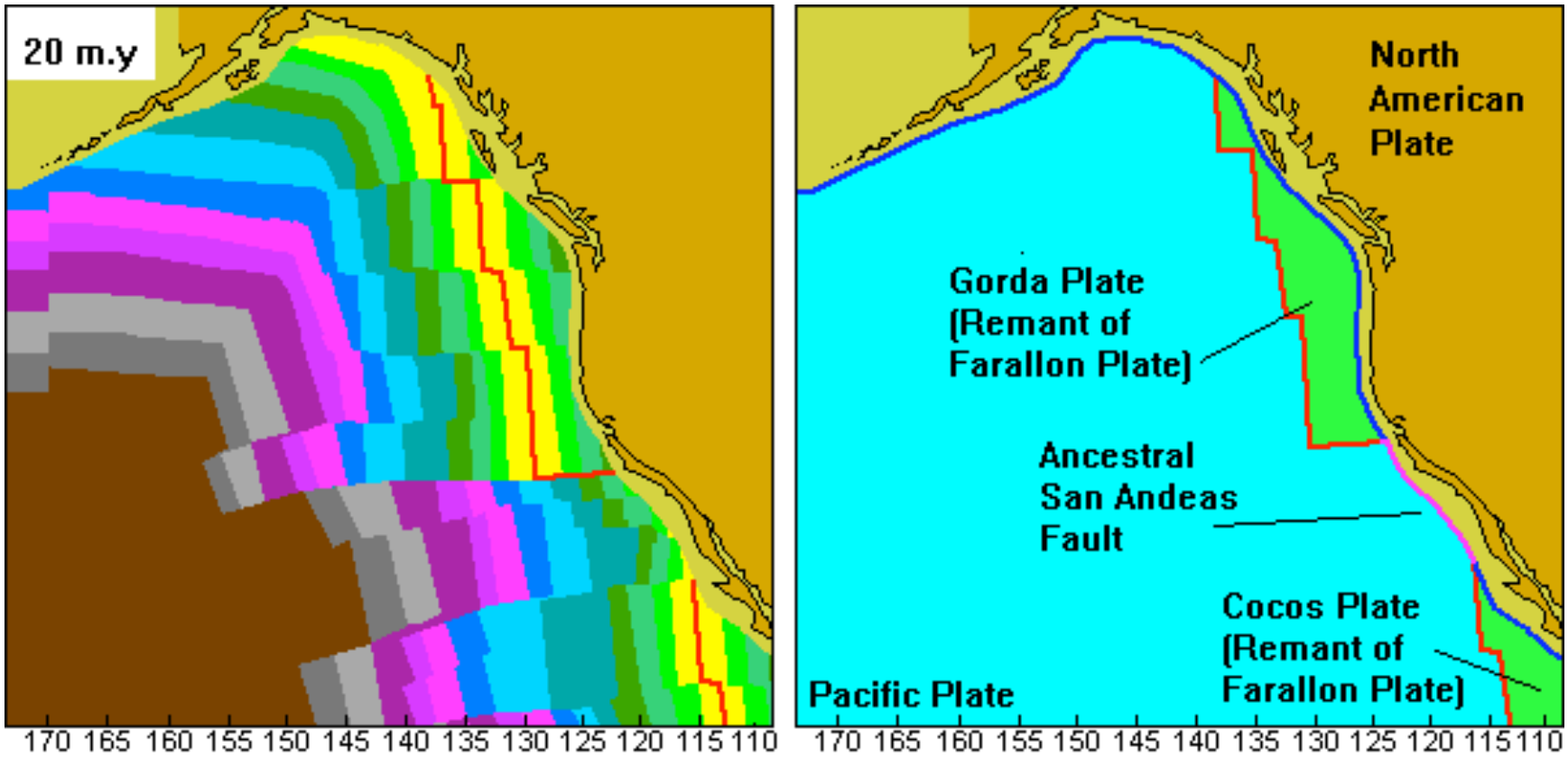

Pacific Coast of
North America
Present Day
AJA FZ
SILA FZ
SEDNA FZ
SURVEYOR FZ
MENDOCINO FZ
PIONEER FZ
MURRAY FZ
MOLOKAI FZ
CLARION FZ
Anomaly Number
Age M.Y.
0
5
10
15
20
25
30
10
20
30
40
50
60
70
80
170
165
160
155
150
145
140
135
130
125
120
115
110

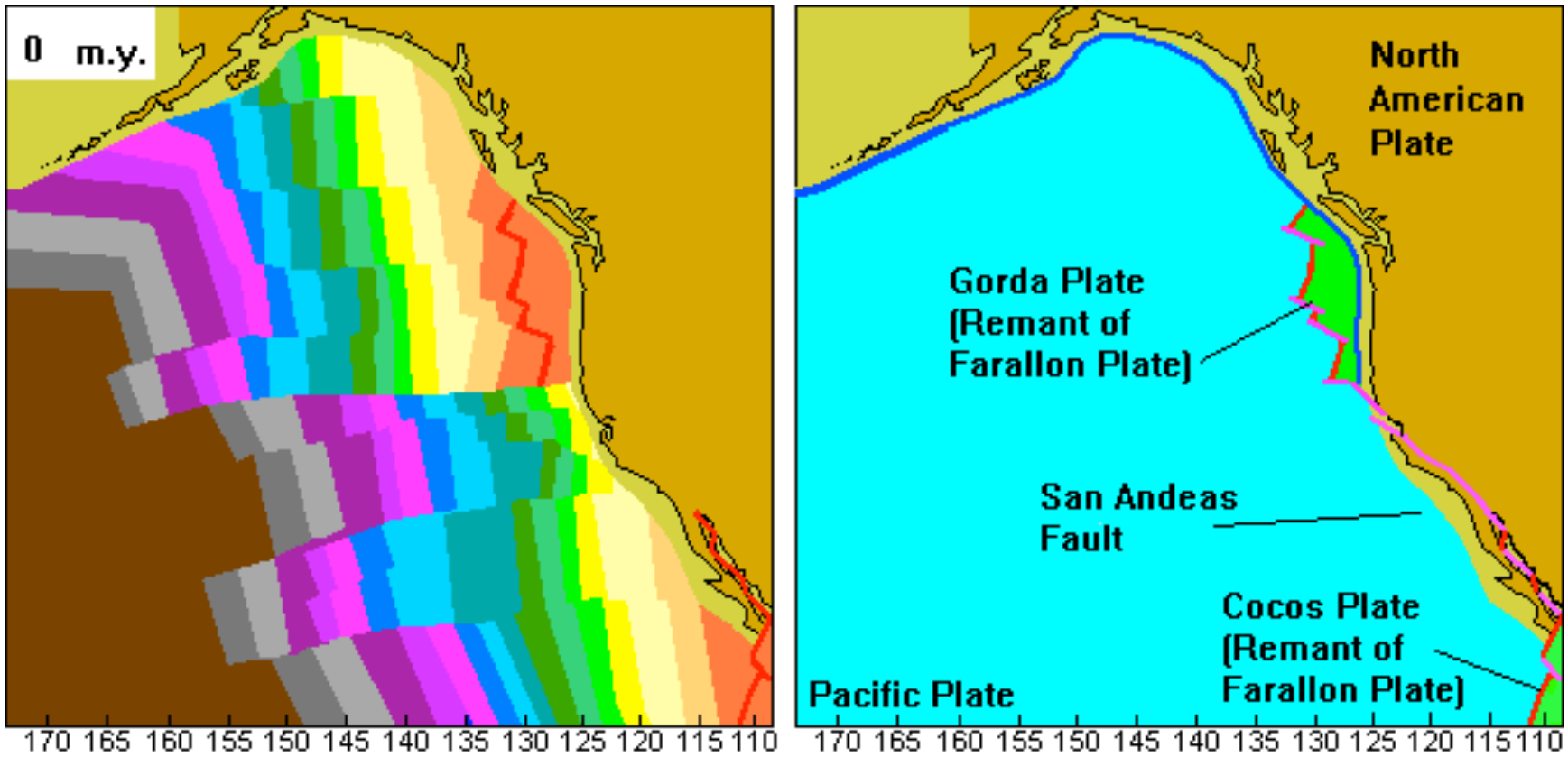

80 m.y.
Kula
Plate
North
American
Plate
Farallon
Plate
Pacific Plate
170 165 160 155 150 145 140 135 130 125 120 115 110
170 165 160 155 150 145 140 135 130 125 120 115 110


55 m.y.
Kula
Plate
North
American
Plate
Farallon Plate
Pacific Plate
170 165 160 155 150 145 140 135 130 125 120 115 110
170 165 160 155 150 145 140 135 130 125 120 115 110


40 m.y.
Kula
Plate
North
American
Plate
Farallon Plate
Pacific Plate
170 165 160 155 150 145 140 135 130 125 120 115 110
170 165 160 155 150 145 140 135 130 125 120 115 110


30 m.y.
Kula
North
American
Plate
Gorda Plate
(Remant of
Farallon Plate)
Ancestral
San Andeas
Fault
Cocos Plate
(Remant of
Farallon Plate)
Pacific Plate
170 165 160 155 150 145 140 135 130 125 120 115 110
170 165 160 155 150 145 140 135 130 125 120 115 110


20 m.y
North
American
Plate
Gorda Plate
(Remant of
Farallon Plate)
Ancestral
San Andeas
Fault
Cocos Plate
(Remant of
Farallon Plate)
Pacific Plate
170 165 160 155 150 145 140 135 130 125 120 115 110
170 165 160 155 150 145 140 135 130 125 120 115 110


0 m.y.
North American Plate
Gorda Plate (Remant of Farallon Plate)
San Andeas Fault
Cocos Plate (Remant of Farallon Plate)
Pacific Plate
170 165 160 155 150 145 140 135 130 125 120 115 110
170 165 160 155 150 145 140 135 130 125 120 115 110