DIVERGENT PLATE BOUNDARIES AND THE HISTORY OF NORTHERN ATLANTIC SEA-FLOOR SPREADING

You are provided with a map of magnetic anomalies in the north Atlantic region, and a copy of the magnetic anomaly time scale. On the map each individual anomaly, that is, each reversal of the earth's magnetic field, is given a consecutive number increasing back from the present and is represented as a single line. The age of each numbered anomaly is shown on the geologic time scale. Your goal is interpret the magnetic anomaly pattern in terms of the history of divergent plate motion between the North American and European plates across the mid-Atlantic ridge. Remember that anomalies are parallel to the ridge that made them, and are symmetric about the ridge that made them.

1) First, study the anomaly pattern between Nova Scotia and Spain (south of the "Charlie Gibbs Fault Zone"). All the anomalies in this region are parallel to the present mid-Atlantic ridge, demonstrating that there has been continuous production of magnetic anomalies (and thus ocean crust) along this segment of the plate boundary since Anomaly 33 time (the oldest anomaly identified in this region. How long a time period has that been in millions of years?

2) Now consider the North Atlantic in the area between Labrador, Greenland, Iceland, and England, north of the "Charlie Gibbs Fault Zone". Use the distribution of magnetic anomalies to reconstruct the history of the divergent plate boundaries at which those anomalies were made.

a) Locate the modern divergent boundary north of the Charlie Gibbs transform and south of Iceland by drawing a colored line along the boundary. What is the number of the oldest anomaly produced by that spreading center? (That is, what is the oldest anomaly that is parallel to the present ridge on both the east and the west sides of the ridge?)

What plate is Greenland on today?
b) Trace out the position of all Anomalies 20 and 24 with lines of a new color. This will show the location and shape of divergent boundaries during that time period. Does this differ from the location and shape of divergent boundaries active in the area today?

How many divergent boundaries were present? List each divergent boundary by listing the pair of plates on either side of that boundary.

What plate was Greenland on in Anomaly 24 time?

c) Now determine what plate boundary or boundaries were active north of the Charlie Gibbs transform from Anomaly 31 time to Anomaly 25 time. Again, trace out all positions of Anomaly 31 with colored lines to see where the divergent plate boundary would have been at that time.

How many divergent boundaries were present at Anomaly 31 time? List each divergent boundary by listing the pair of plates on either side of that boundary.

What plate was Greenland on from Anomaly 31 to Anomaly 25 time?

3) Contrast your answers for Anomaly 31 time to those for Anomaly 24 time and for the present. Have the number of divergent plate boundaries and their location changed during the life of the North Atlantic Ocean?