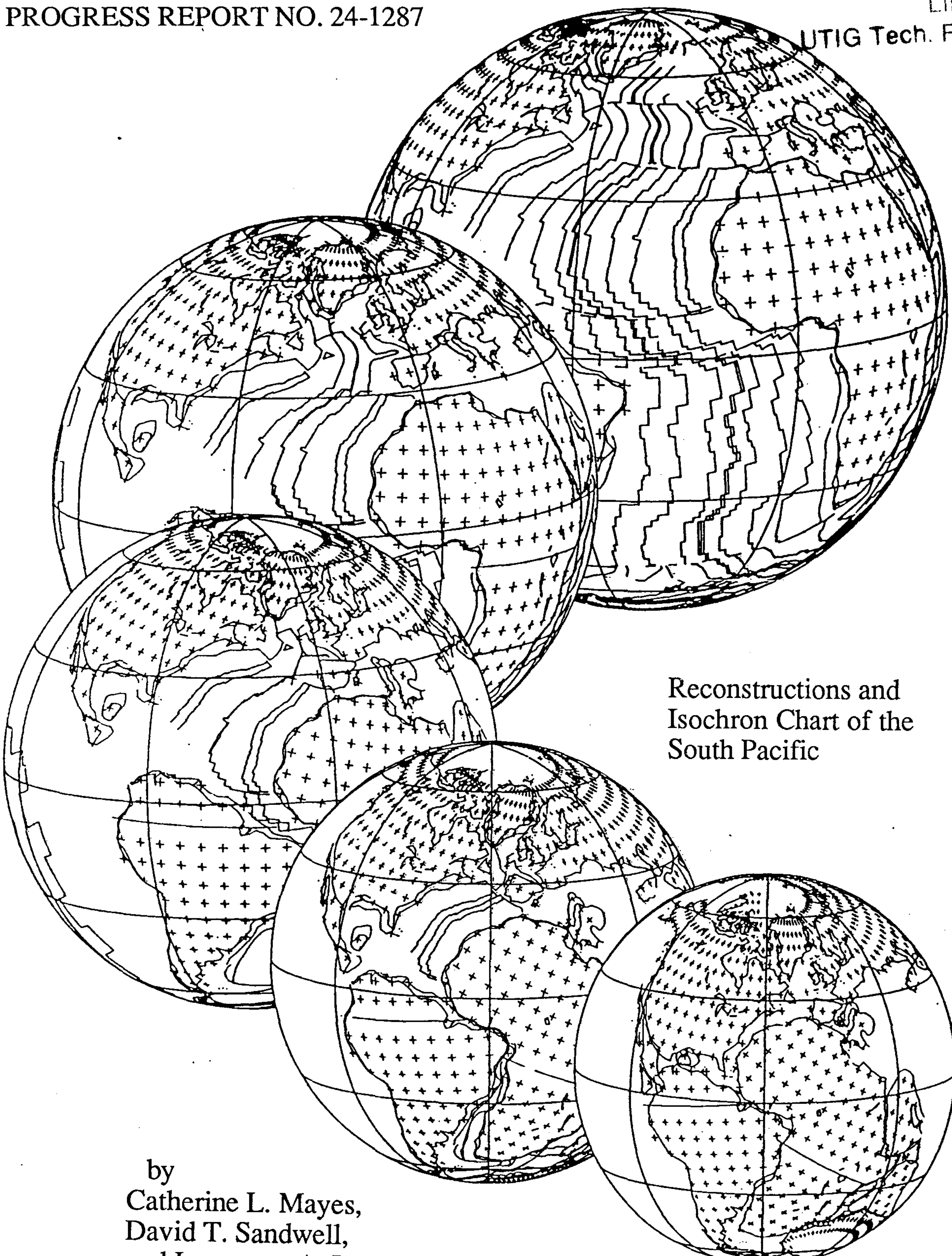
PALEOCEANOGRAPHIC MAPPING PROJECT
PROGRESS REPORT NO. 24-1287



Reconstructions and Isochron Chart of the South Pacific

by
Catherine L. Mayes,
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We have constructed a new isochron chart of the South Pacific ocean. Our new chart is based upon two data sources: a compilation of magnetic anomaly data and a tectonic fabric map. Our magnetics data was digitized from a variety of published sources, each covering a different portion of the South Pacific region (Klitgord and Mammerickx, 1983; Handschumacher, 1976; Herron, 1972; Mammerickx, et al., 1980; Pardo-Casas and Molnar, 1987; Cande et al., 1982; Weissel et al., 1977; Molnar et al., 1975; Cande and Leslie, 1983; Christoffel and Falconer, 1972; Handschumacher, et al., 1981; Barker, 1982) (Fig. 1). After compiling the data, we realized that there was a significant problem with the data set: the number of ship tracks in the South Pacific was so small compared to the size of the region that the sampling of magnetic picks was really quite sparse. Another problem was that the sampling of the fracture zones was also so widely-spaced that we realized that we did not have a good idea about subtle variations in the trends of South Pacific fracture zones.

In order to get a better idea of fracture zone trends, we turned to the Geosat geoid data. With an equatorial track spacing of 164 km (McConathy and Kilgus, 1987), this data set provided a much denser sampling of the fracture zone trends. The Geosat satellite measures changes in the height of the sea surface on the order of 1 m. Since the sea surface, in the absence of waves and tides, is an equipotential surface of the earth's gravitational field, the variations in the sea surface height reflect changes in mass beneath the sea surface. This surface is called the geoid. Large-offset fracture zones, seamounts and trenches are features which cause the sea surface to bulge up or down because they show a change in topography. Since we are looking at relatively high frequency variations in geoid height, we used the slope of the geoid to make our tectonic fabric map. We trace such changes from track to track on a regional basis, interpreting maximum positive geoid slopes with a light line and maximum negative slopes with a heavy line. This gives us a tectonic fabric map of the South Pacific region (Fig. 2).

This tectonic fabric can be used to make improved reconstructions. We drew in the paleo-ridges for each of our selected times (Figs. 3-14, Pacific plate held fixed in all reconstructions). We then compiled the digitized paleo-ridges into an isochron chart (Fig. 15)

A full tectonic history of the South Pacific is being prepared as a thesis by Catherine Mayes, and will be completed during Spring, 1988. The isochrons will then be gridded and used to make a depth-age study of the South Pacific Ocean.

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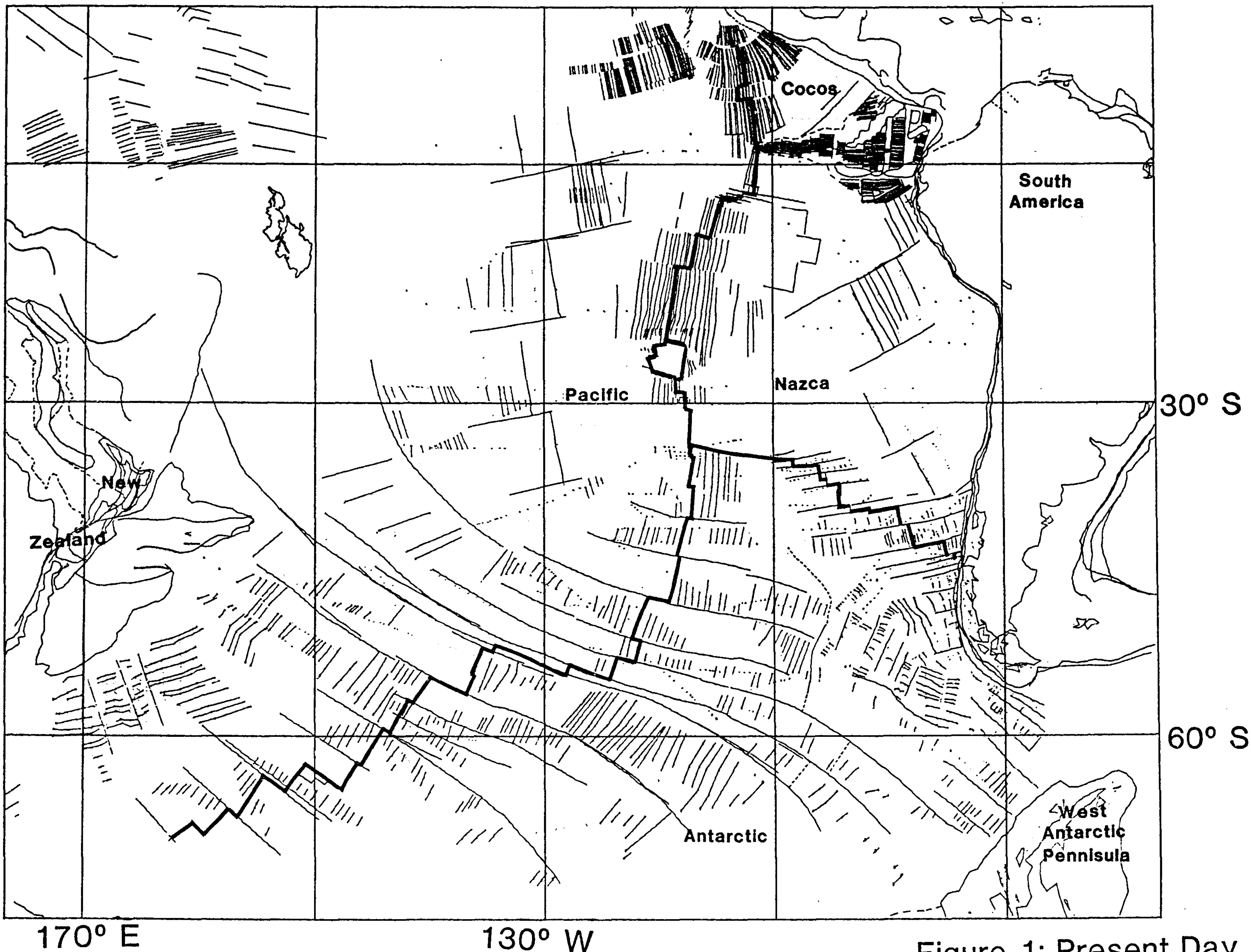

Figure 1: Present Day

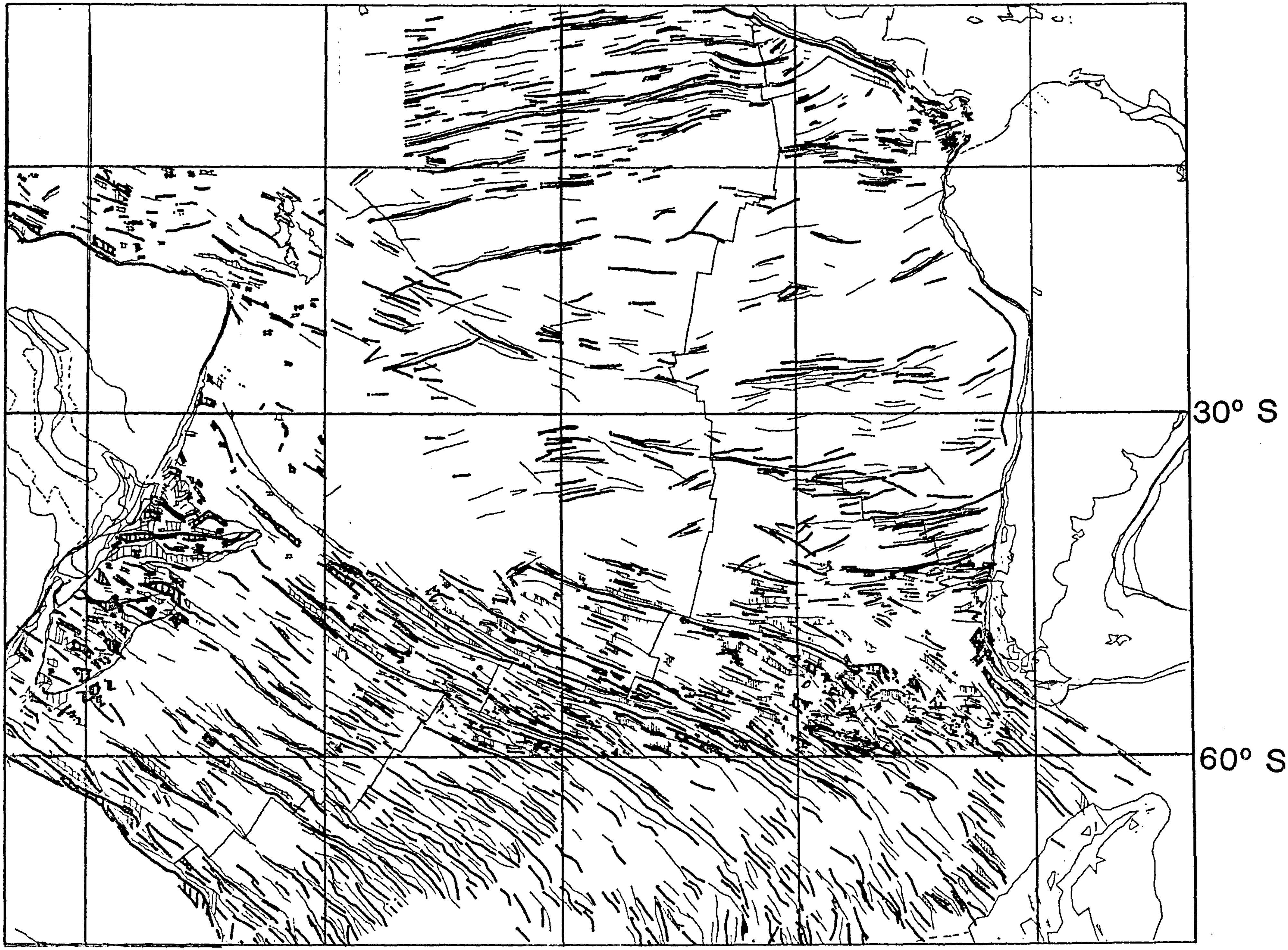

Figure 2: Tectonic Fabric

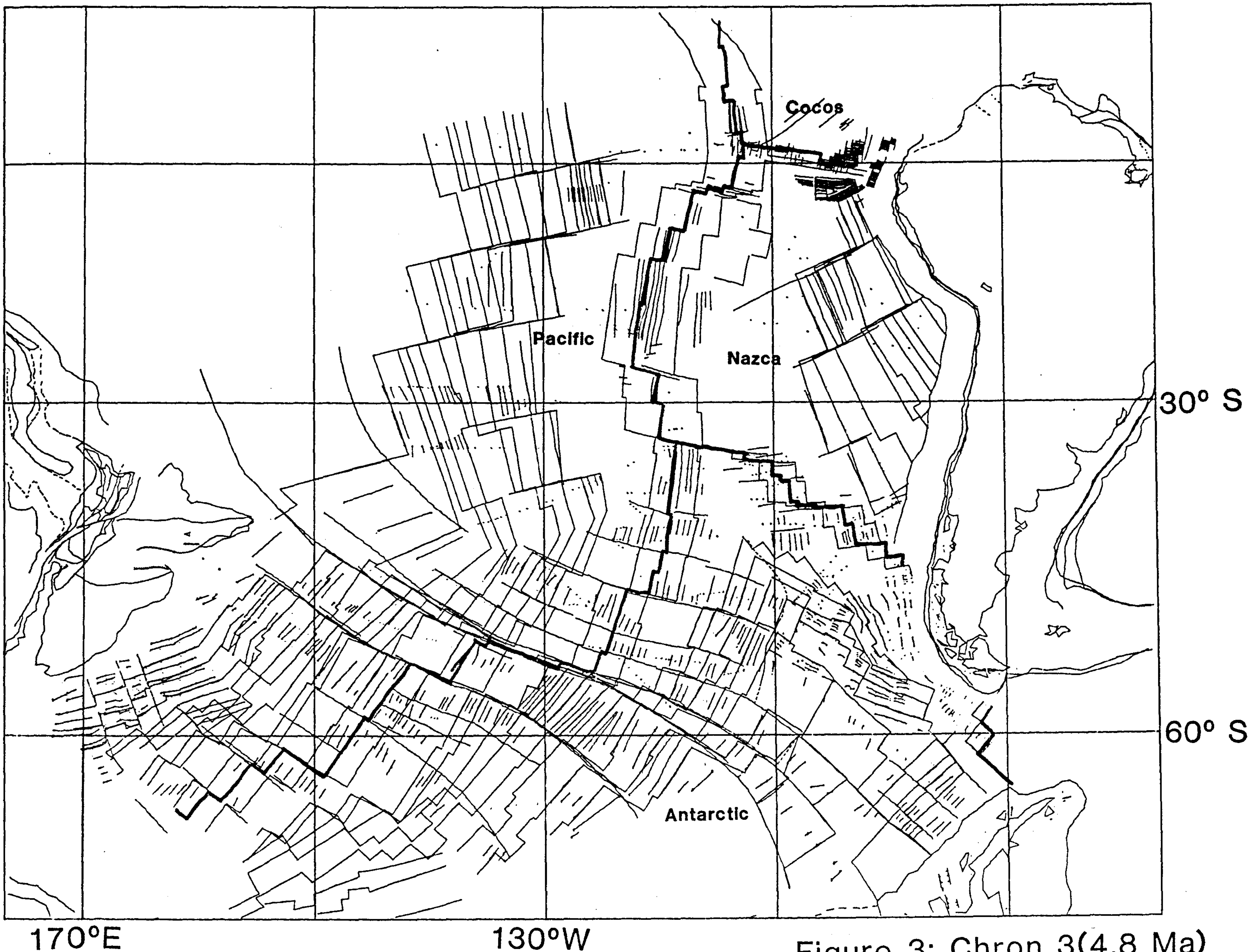

Figure 3: Chron 3(4.8 Ma)

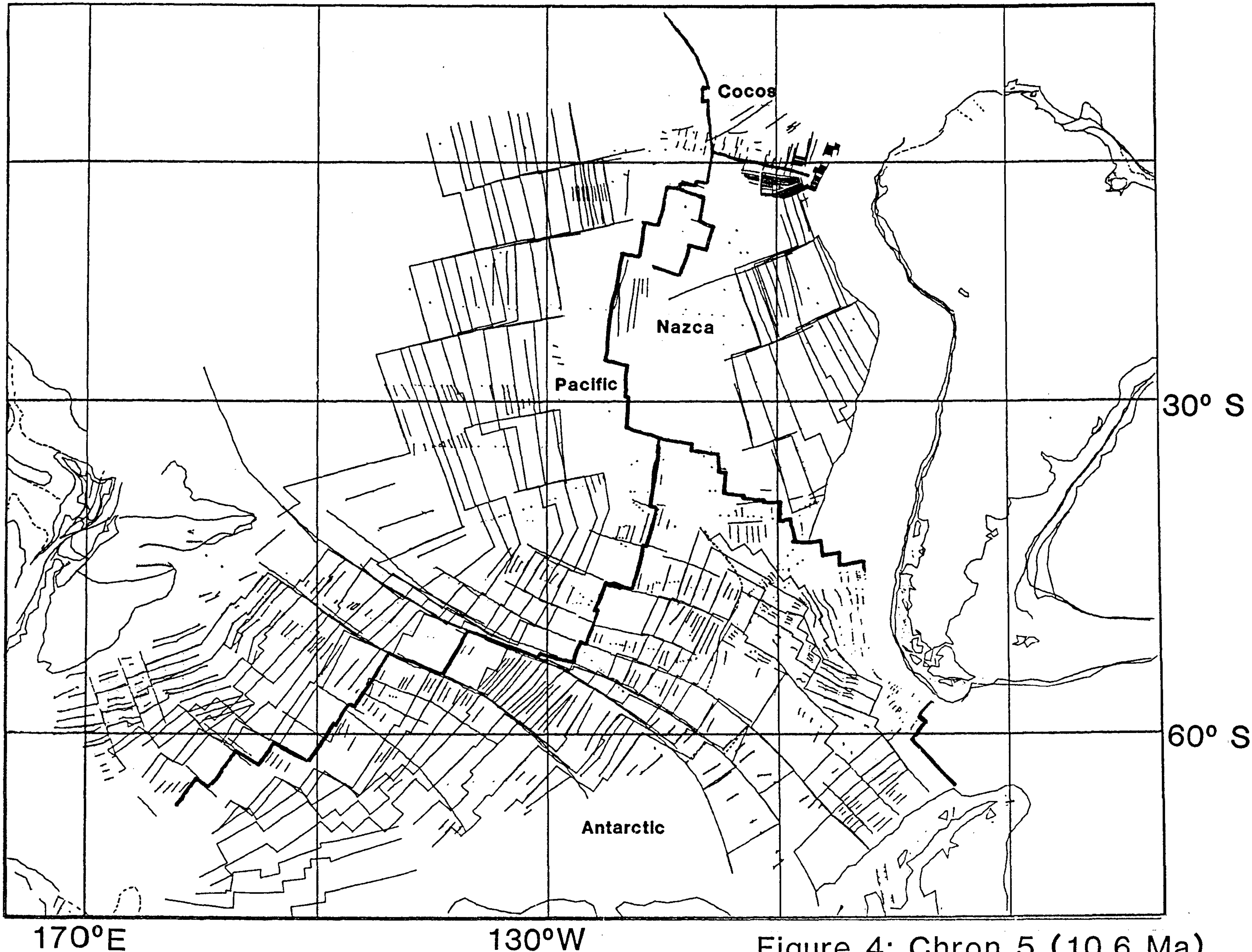

Figure 4: Chron 5 (10.6 Ma)

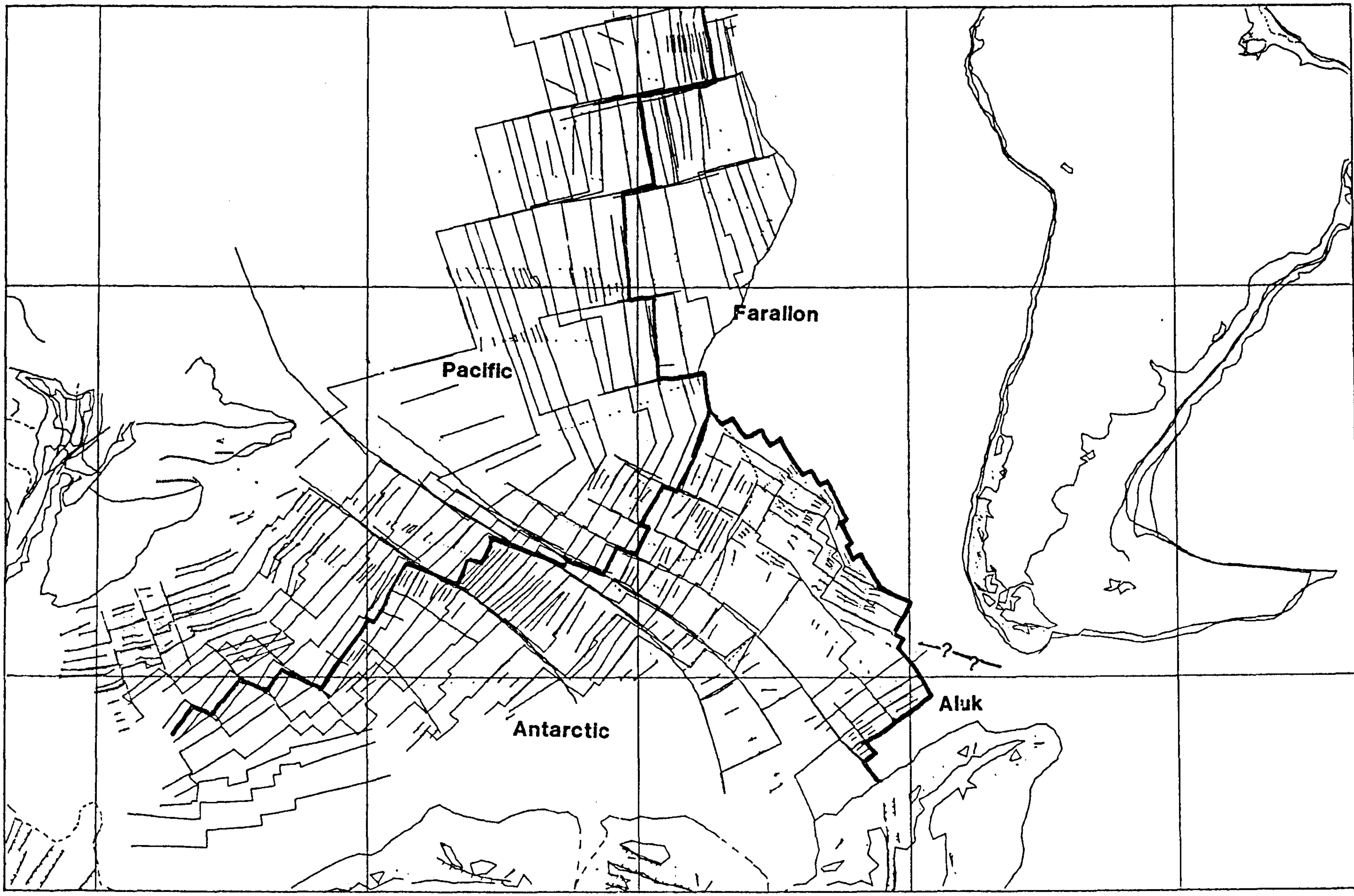

Figure 5: Chron 7 (26.0 Ma)

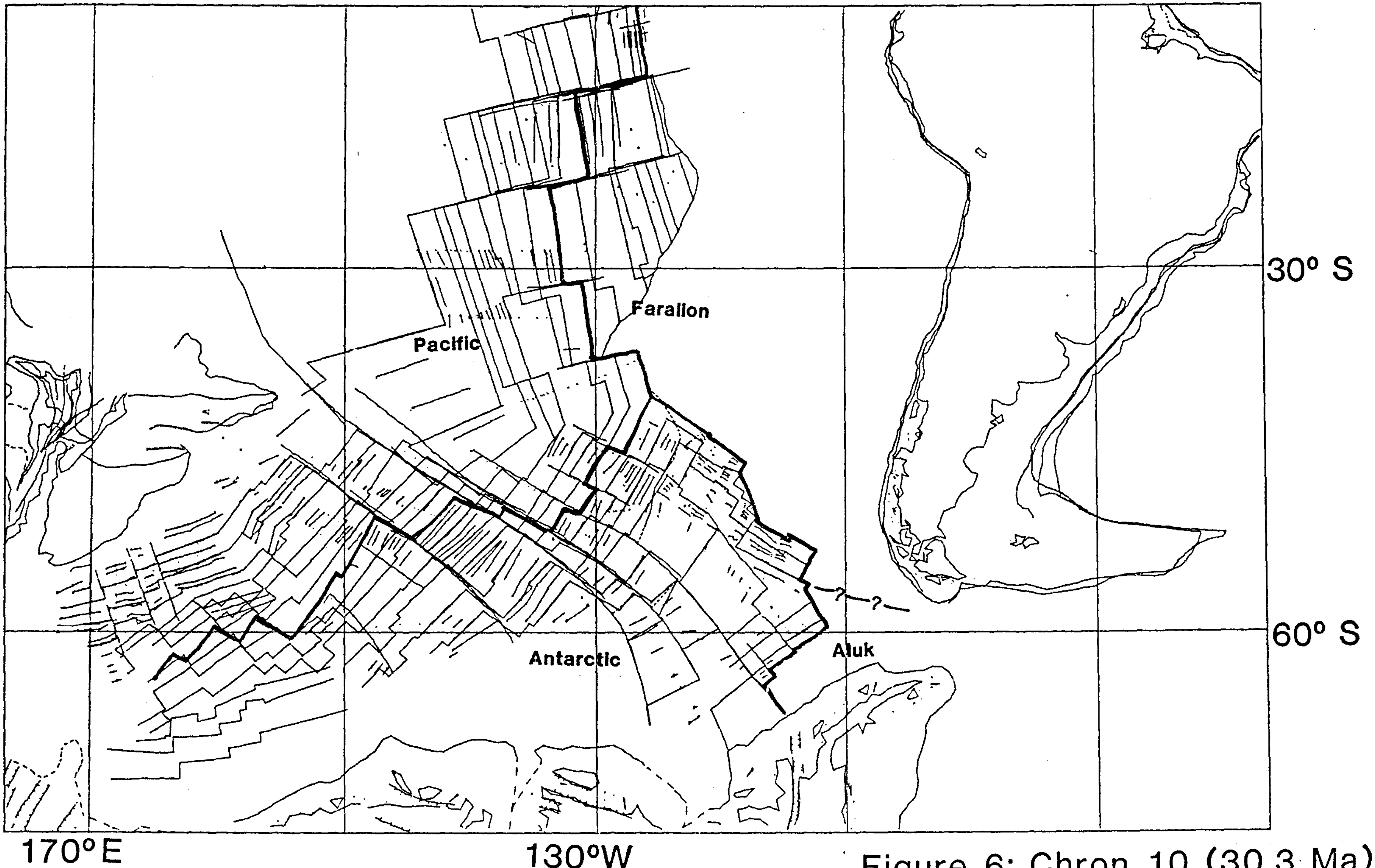

Figure 6: Chron 10 (30.3 Ma)

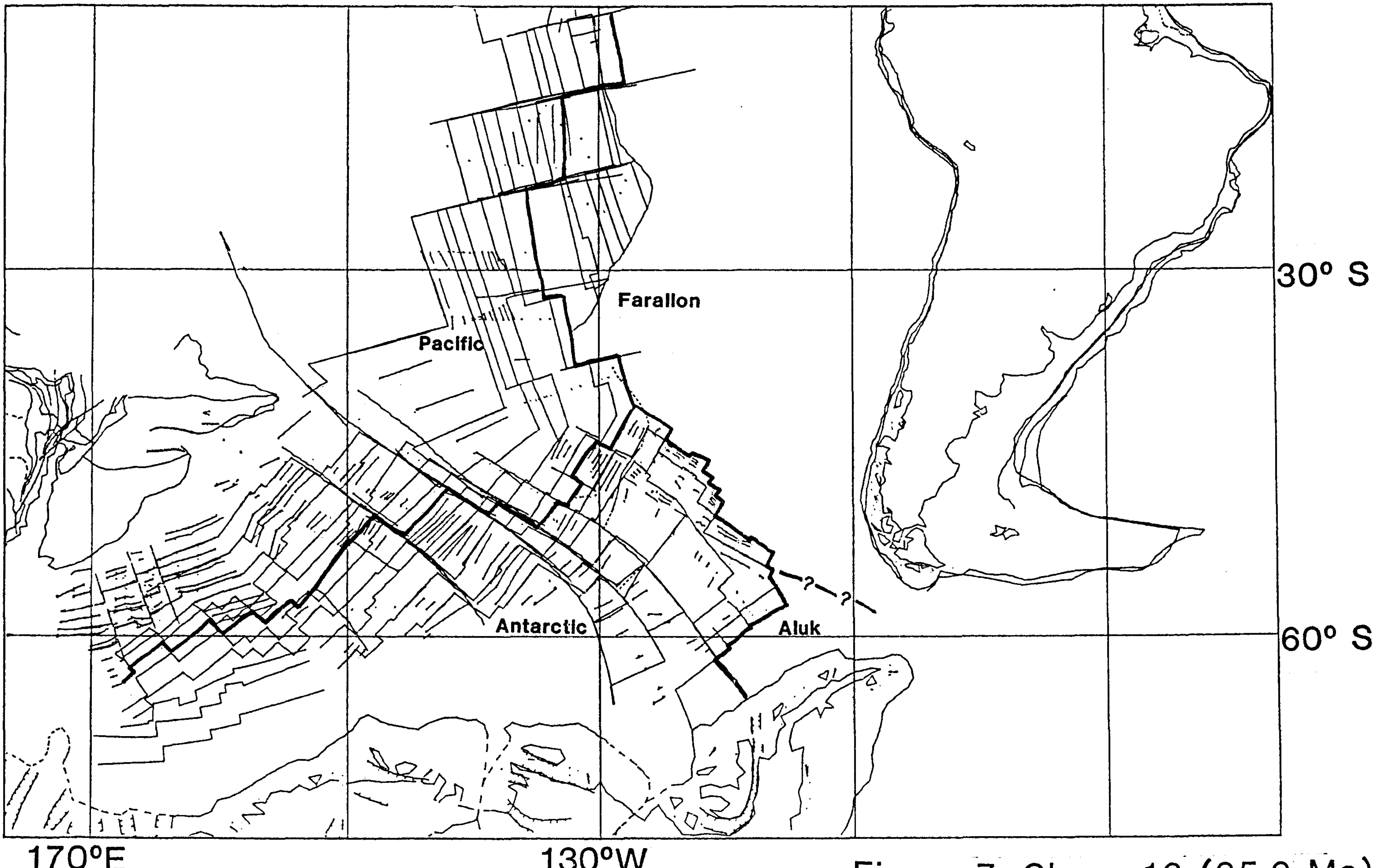

Figure 7: Chron 13 (35.9 Ma)

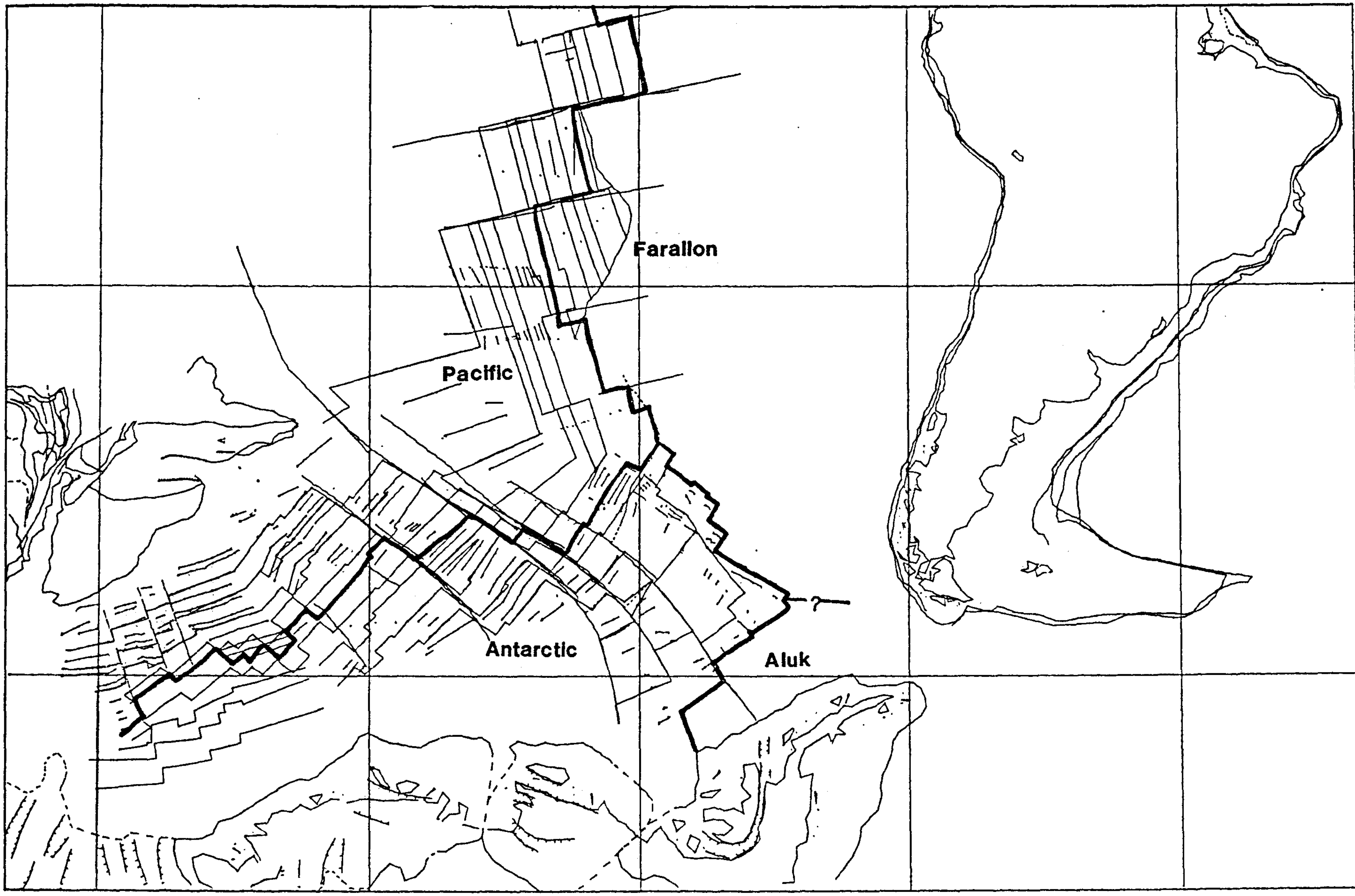

Figure 8: Chron 18 (42.7 Ma)

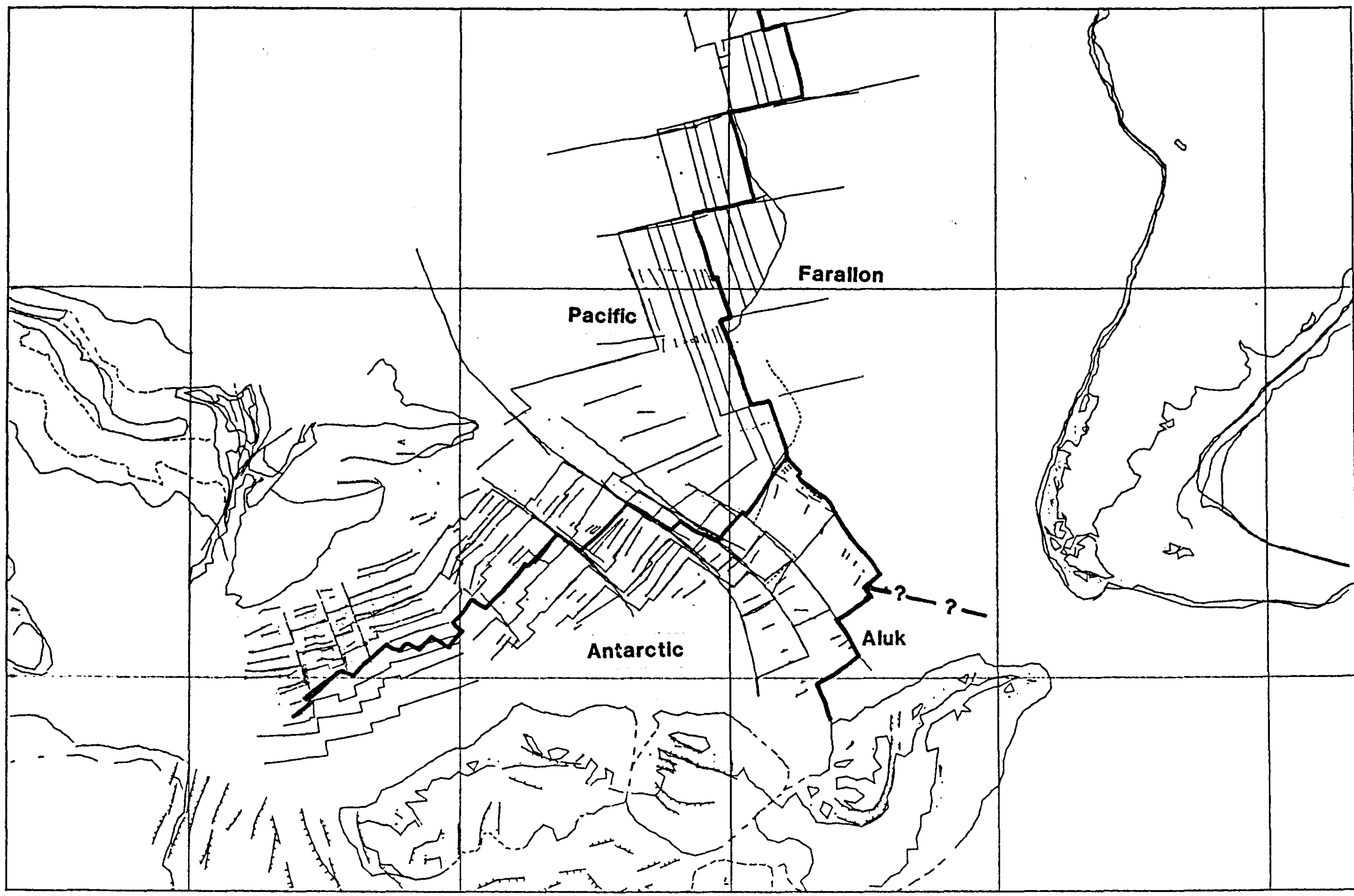

Figure 9: Chron 21 (50.3 Ma)

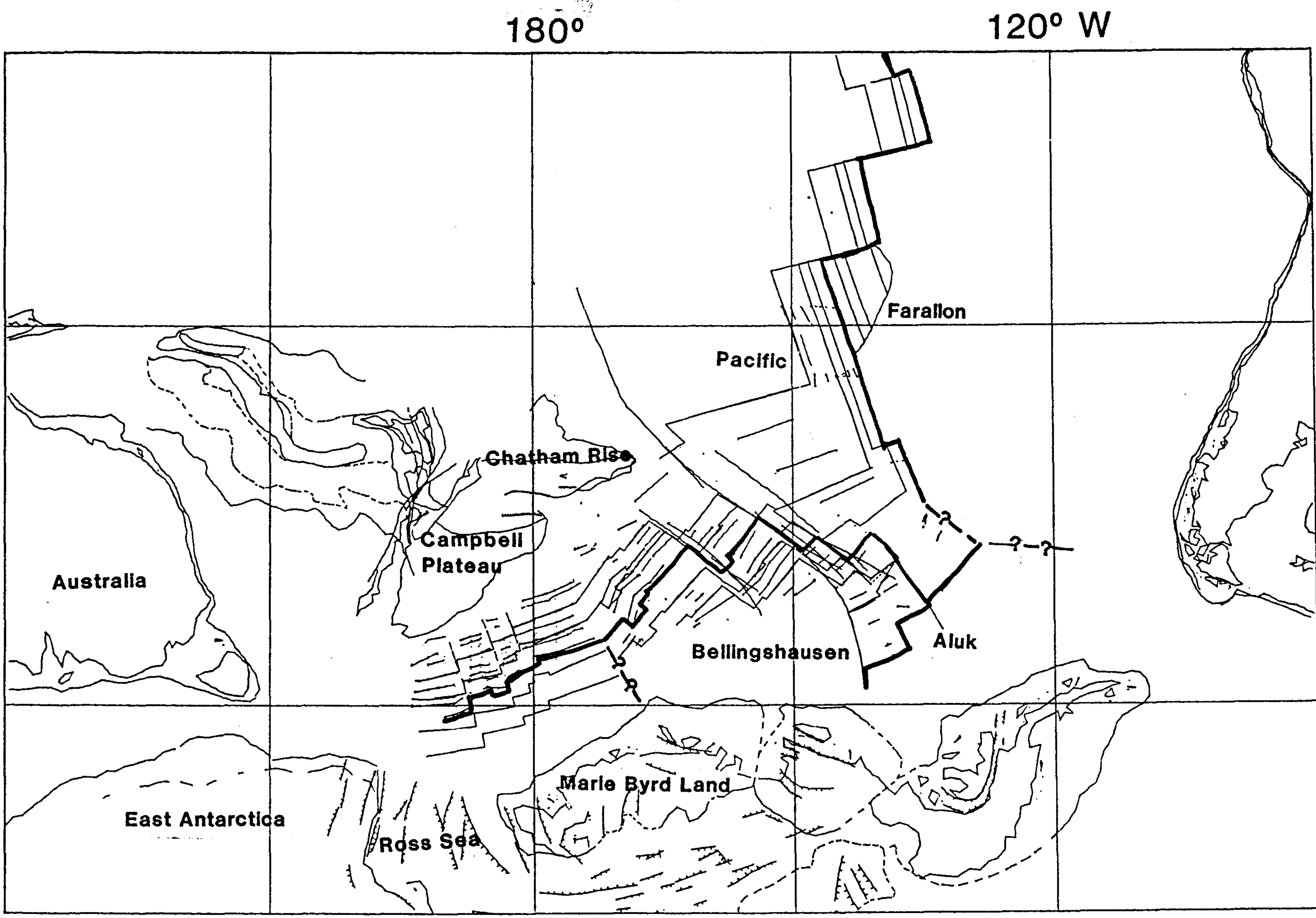

Figure 10: Chron 25 (59.2 Ma

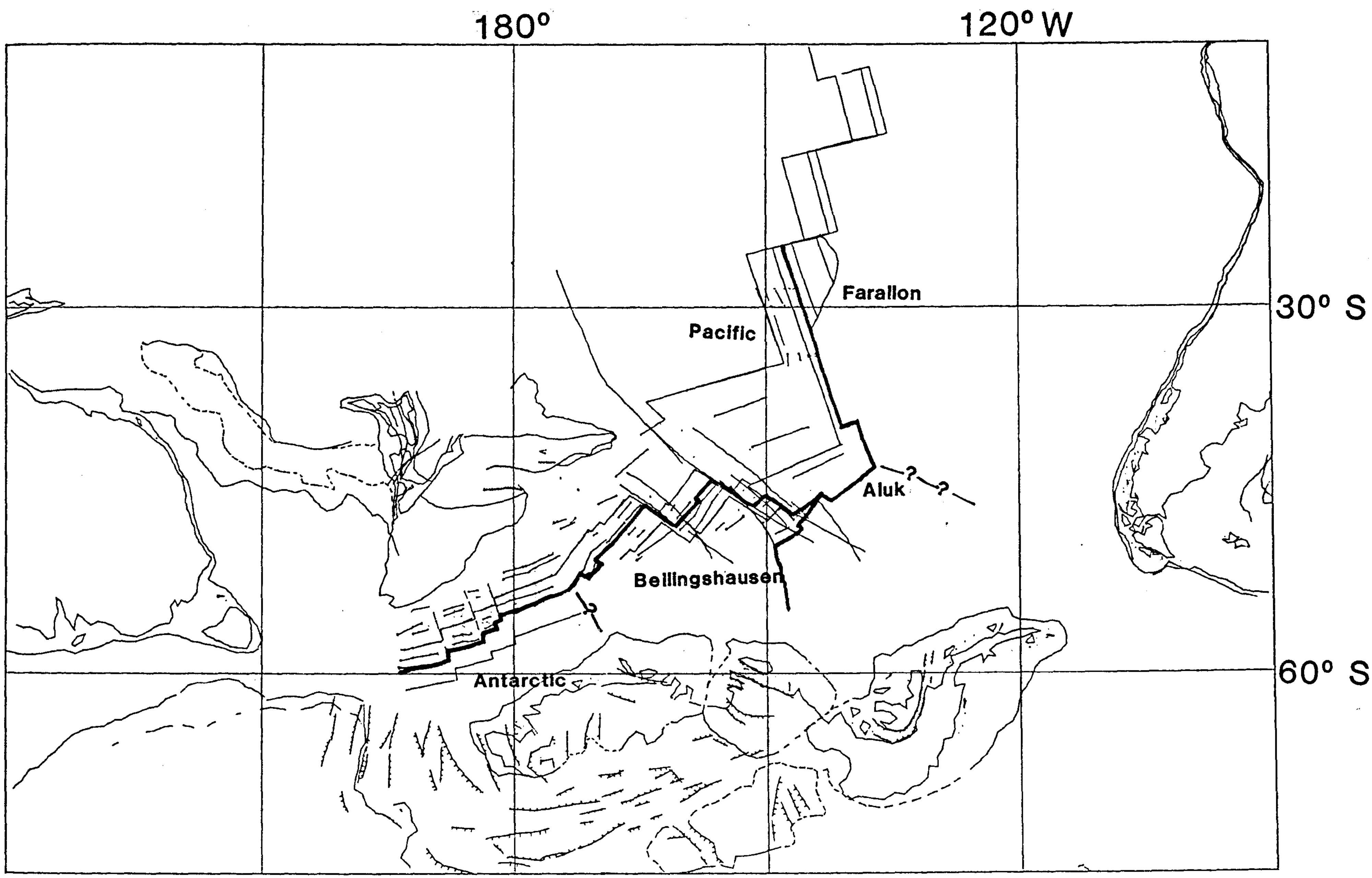

Figure 11: Chron 28 (65.1 Ma)

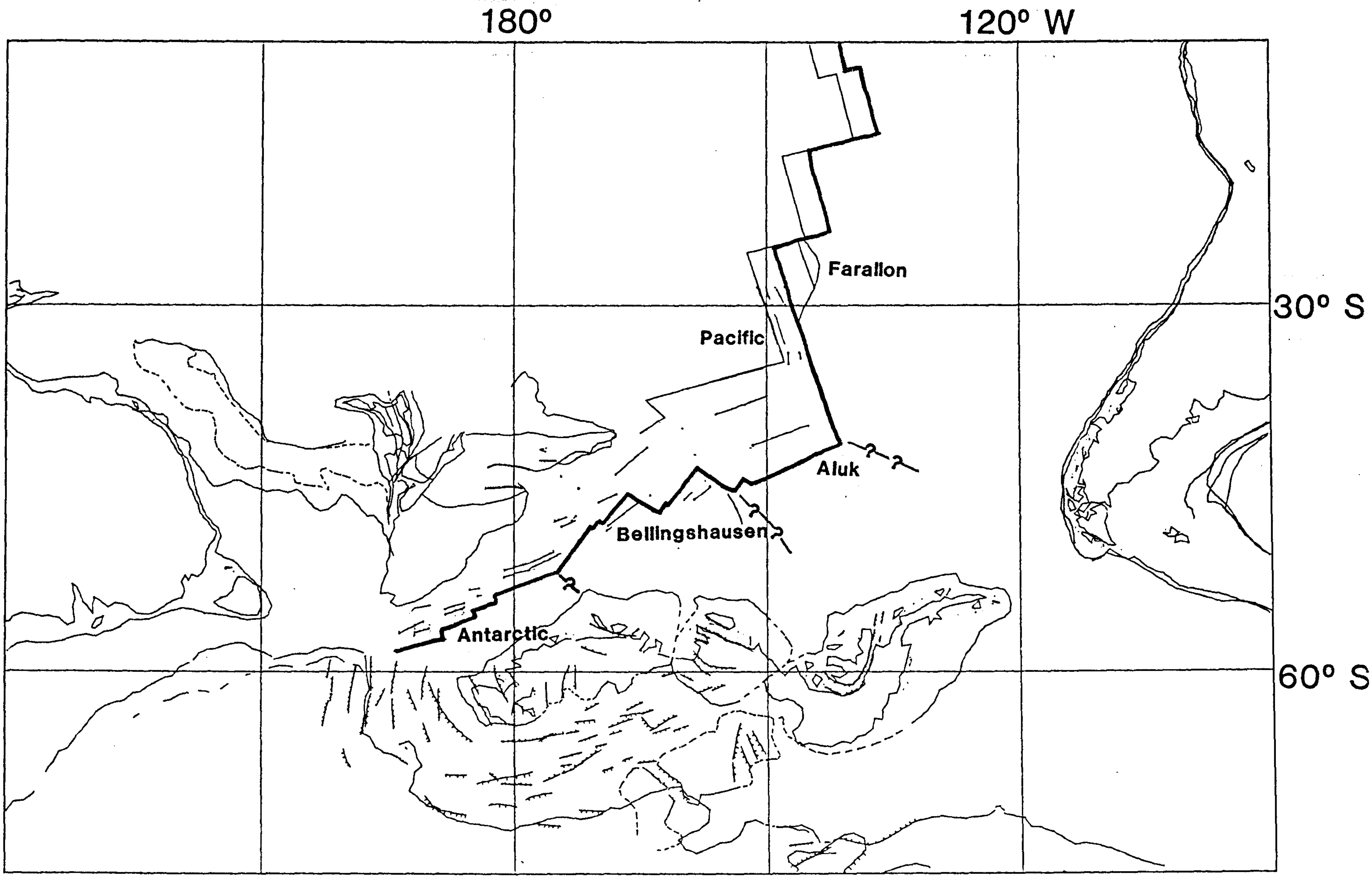

Figure 12: Chron 31 (69.4 Ma)

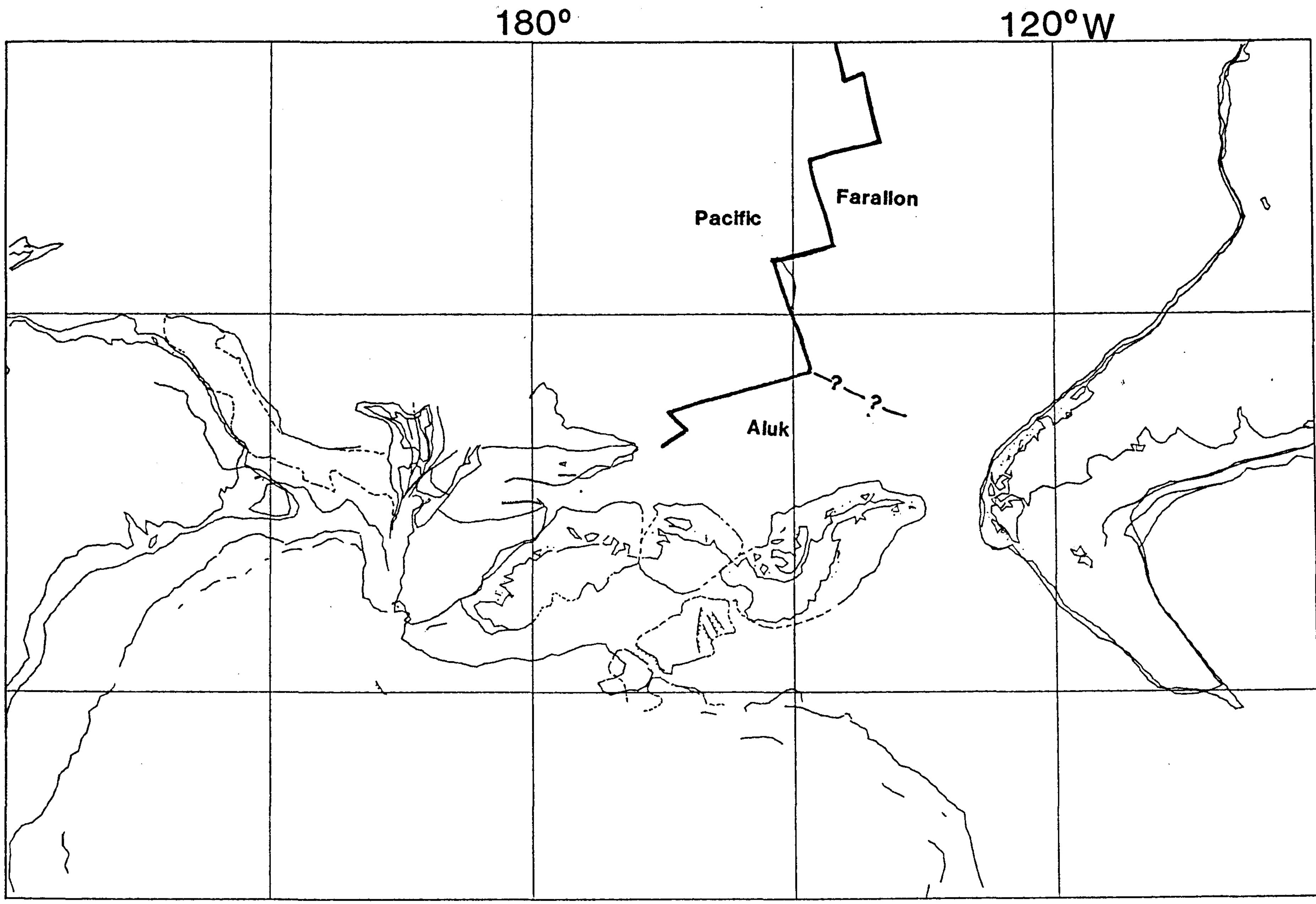

Figure 13: Chron 34 (84.0 Ma)

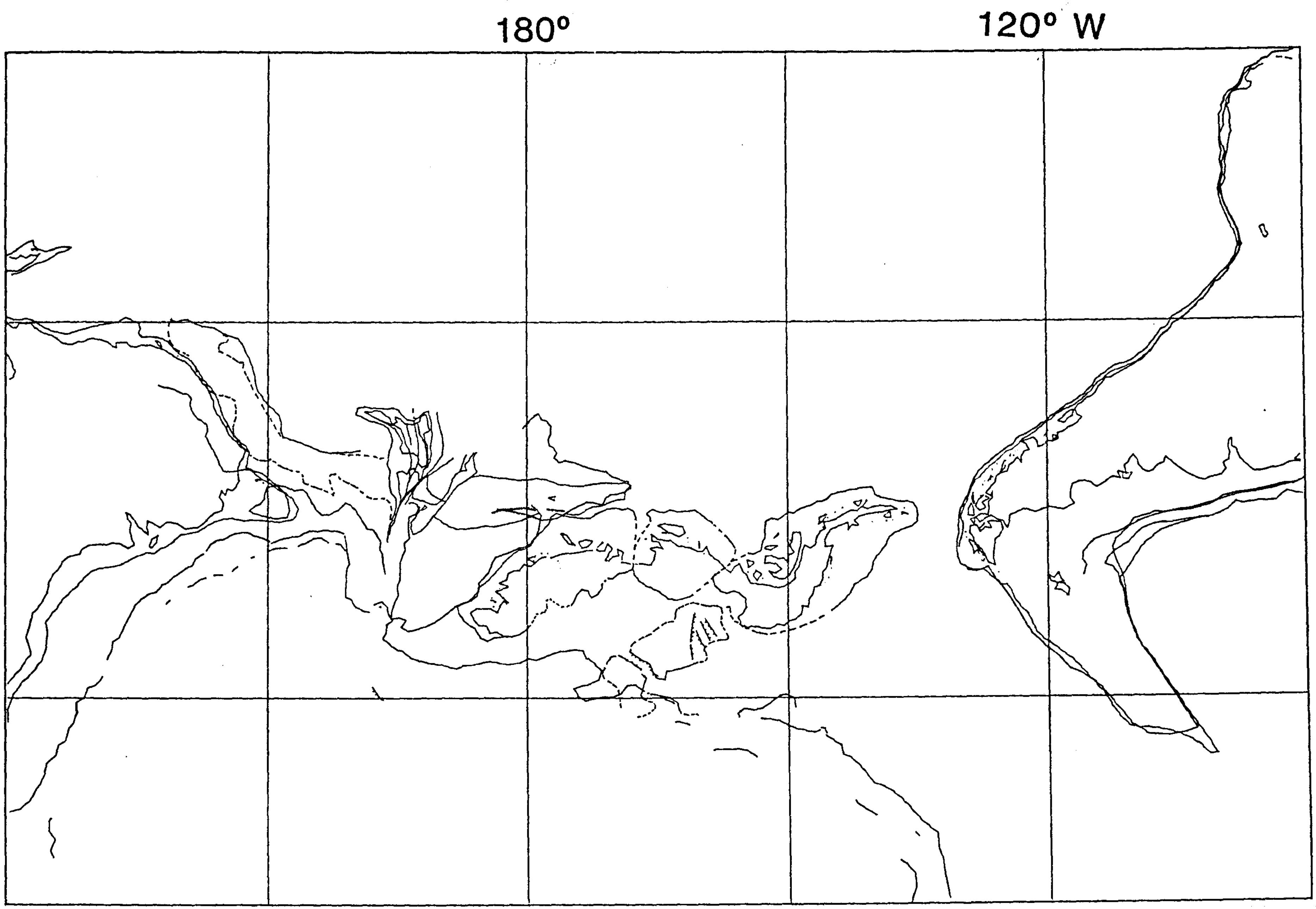

Figure 14: Fit (90.0 Ma)

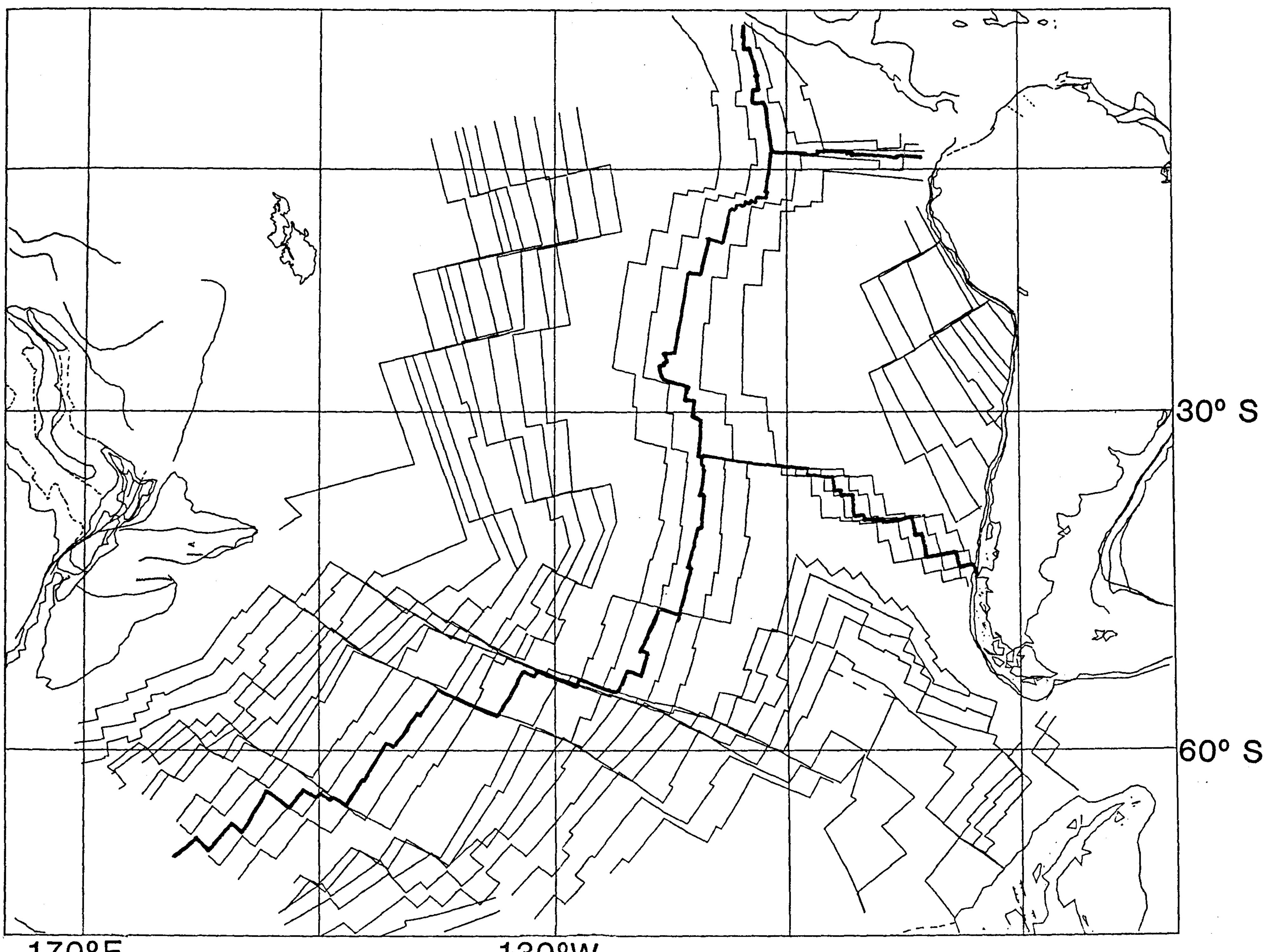

Figure 15: Isochrons