decrease in backscatter cross section and increased atmospheric absorption. Twenty-five "looks" (estimates of the backscatter cross section) were averaged to form the images. This area was chosen for the initial data reduction and analysis because its latitude range, 12°N to 45°N, overlapped the southern edge of the coverage from the Venera 15/16 spacecraft by about 10° (*3*) and extended the coverage another 23° toward the equator. It also provides overlap with earlier lower resolution Earth-based radar studies (*4*) and with Pioneer Venus radar images (*5*).

The data cover an area extending from just west of Beta Regio (270° longitude) across Guinevere Planitia to the eastern extent of western Eisila Regio (10°) and include the central part of Guinevere Planitia and, north of Eisila, the southern part of Sedna Planitia (Fig. 1). Beta and Eisila Regiones, rising up to several kilometers above mean planetary radius, form part of the equatorial highlands (*6*) that stretch almost completely around the circumference of Venus (7). The lowlands of Guinevere Planitia, lying below mean planetary radius, are the only major zone of lowlands disrupting the generally continuous equatorial highlands (Fig. 1).

Beta Regio is a large topographic rise that is characterized by the convergence of several rift zones, the most distinctive of which, Devana Chasma, is oriented generally north-south (Fig. 1). Geologic relations indicate that thermal uplift, rifting, and associated volcanism are prominent in this area (*8–10*) and that it is similar to several other regions identified as tectonic junctions in the equatorial highlands (*11*). Earlier analyses have suggested that rifting and volcanism are intimately interrelated (*8*). In the case of Rhea Mons, volcanic construction appears to have predated the major rifting, whereas for Theia Mons, volcanism largely followed rifting, forming a large construct along the western edge of the rift and filling in the rift zone (*8–10*). The new images reveal that Theia Mons is located where three or more major rift zones intersect (Fig. 2, A and B) and that extensive faulting cuts the central part of the volcano in a zone 60 to 100 km wide and oriented about N10°E. The orientation of this fault zone is different from the generally N30°-40°E trend of the braided lineaments of Devana Chasma just north of Theia, and the fault zone generally bisects the trend of the two southern arms of the rift zone. This relation may indicate that extension on the various rift arms has not been synchronous, but rather that it occurred in different parts of the rift, with different orientations, at different times. The shape of the dark, central caldera-like structure is apparently controlled by this zone of faulting. We intrepret the central dark deposits to be relatively smoother or lower reflectivity summit lava flows that have erupted in and adjacent to the caldera and flowed along structurally controlled fault zones to produce this elongate deposit parallel to the general fault zone.

The detailed configuration of the Theia Mons deposits and their relation to the rift zones are also clear. A broad, generally circular bright deposit 300 to 400 km in diameter surrounds the irregularly shaped central dark structure. It is centered on the butterfly-shaped flanking deposits that are arranged bilaterally about the strike of the rift zone. The stratigraphic relations for Theia Mons can be seen in terms of the map patterns of the deposits: the broad butterfly shape of the deposits to the northwest and southeast represent volcanic material emplaced on the flanks of the rift zone, but where the flanks of Theia slope into the rift zones, a more complex relation is seen. The gentle slopes strongly suggest that lava from the volcano has been emplaced in this area, but much of the surface is dominated by younger faults. In several places, particularly to the northeast of Theia, zones of flows from Theia can be seen to be superposed on the more intensely faulted rift interior (A in Fig. 2B). On the basis of these relations, we conclude that volcanism and rifting are intimately interrelated in the evolution of the volcano and the interior of the rift zone and that extension was a continuous process throughout the evolution of Beta Regio.

Eisila Regio is a prominent linear highland 1000 to 3000 km wide trending generally west-northwest, extending some 10,000 km west from Aphrodite Terra, and rising up to about 1.5 km above mean planetary radius. Classified as an upland rise (*5, 11*), Eisila Regio generally lacks the distinctive rift zones characteristic of Aphrodite to the east and Beta to the west; it is characterized by a series of mountains (Sif, Gula, Sappho, and others) situated on or near the summits of the broad rises (*5*). The data show that Sif Mons, in westernmost Eisila Regio, is a central volcano whose deposits form a 400- to 600-km-wide edifice, rising some 1.5 km above Eisila Regio (Figs. 1 and 2, C and D).

Sif Mons is characterized by a classical shield volcanic form in plan view, with a central circular feature about 50 km in diameter from which radiate a series of radar-bright, elongate, lobate features interpreted to be lava flows or flow complexes. These flow units are generally 20 to 30 km wide and 100 to 150 km in length, but some are up to 400 to 600 km long. Their orientation is in many cases controlled by topographic slope (for example, flow unit A in Fig. 2, C and D).

Although the tectonic structure in this upland rise (*5, 11, 12*) is not nearly as well developed as that in Beta, there is evidence for some structural control of deposits. For example, there is a northwest to southeast

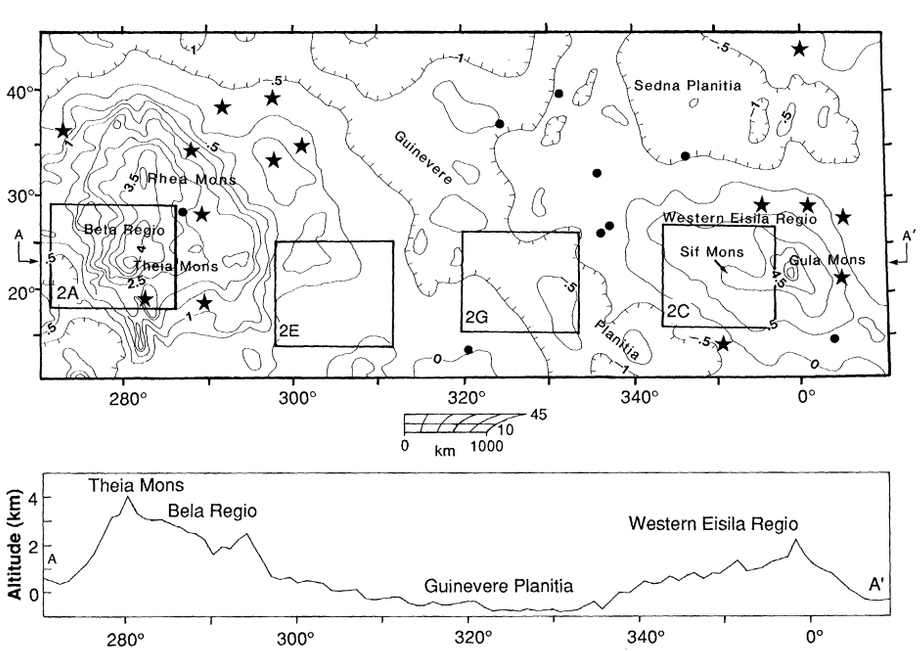

Fig. 1. Location and contour map of the Beta Regio–Western Eisila Regio area. Contours are derived from Pioneer Venus altimetry data (*5*) and are at 0.5-km intervals. Boxes show locations of areas of detailed analysis illustrated in Fig. 2. Topographic profile (A-A′) across region is shown at the base. Location of circular features of probable impact origin (stars) and possible impact origin (filled circles) are shown.