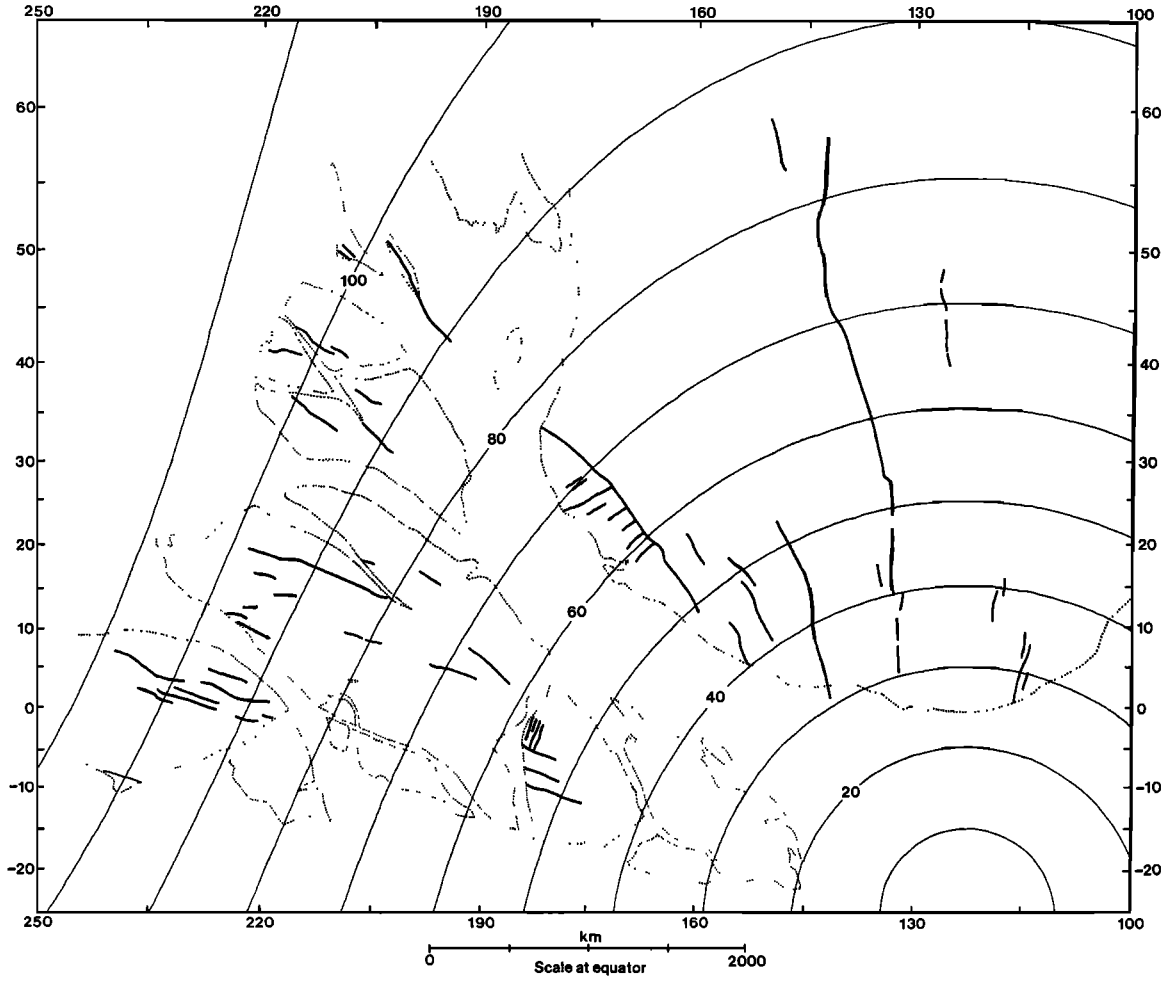

Fig. 17. Mercator map of system II furrows. Curved lines are small circles located at 10° intervals and centered on the center of the system. Fine dotted lines are light terrain-dark terrain contacts.

the two satellites' sizes and masses. Comparison of the two satellites' dark terrain somewhat clarifies the character of this "dichotomy." The most plausible origin of the vast majority of Ganymede's dark terrain tectonic structures, furrows belonging to systems I and III, was found to be reactivation of impact-generated, multiringed structures by dark material volcanism and endogenic, global extension. Callisto's only known nonimpact structures are large multiring systems such as that surrounding Valhalla. In the earlier discussion of the geology of the Valhalla system, we noted evidence that it also is an impact-generated, multiringed structure that has been modified by endogenic activity (volcanism). The difference in the early geologic activity of Ganymede and Callisto is thus interpreted to have been one of intensity rather than one of style. This interpretation implies that the Ganymede-Callisto "dichotomy" did not develop until the end of dark terrain formation, probably at least at 3.8-4.0 Ga, when reticulate terrain, light terrain, and grooved terrain began to form on Ganymede.

Evolution of Dark Terrain Lithosphere

Thickness of dark terrain. The diameter ranges of craters depleted on different dark material surface units give some indication of the thicknesses of the resurfacing that formed these units, with typical values in the range of several hundred meters. The average total thickness of dark terrain resurfacing in selected areaa will now be estimated using these results and the stratigraphy and mapped extents of different dark material deposits.

Stratigraphic relations of dark furrowed and dark smooth materials, together with the materials' calculated crater ages, indicate that southeastern Nicholson Regio and northwestern Marius Regio are among the oldest dark terrain surfaces. The deposit on which furrows formed in southeastern Nicholson Regio essentially obliterated older topography, and so is interpreted to be at least 600 m to 2 km thick. The resurfacing which buried adjacent northwestern Nicholson Regio was interpreted earlier to be 300-800 m thick; if it buries a deposit like that exposed in southeastern Nicholson Regio, then the cumulative thickness of the dark materials would be 1-3 km. Northwestern Marius Regio was interpreted to have been resurfaced by 300-800 m of dark material shortly before furrow formation. As was mentioned earlier this area contains no segmented remnants of system III furrows, even though it is at a lesser distance from the center of system III curvature than is the distal part of Nicholson Regio, where such furrows are observed. If northwestern Marius Regio is underlain by a Nicholson-like surface containing system III furrows, then the cumulative thicknesses of the dark material deposits would be