

A REVISED MARTIAN RELATIVE AGE CHRONOLOGY AND SOME GEOLOGIC IMPLICATIONS. Nadine G. Barlow, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, Texas 77058.

Mariner 9 and Viking spacecraft missions to Mars have revealed a geologically diverse planet. The various geologic terrains show a variety of crater densities, indicating a range of formation ages. A number of relative and absolute chronologies have been proposed for Mars (Ref. 1, 2, 3), but all suffer from a variety of problems, such as small crater statistics, limited spatial problems, and poor stratigraphic information.

I have recently revised the martian relative chronology using the Viking 1:2M photomosaics to divide the entire surface into 23 geologic units and to map every crater ≥ 8 -km diameter across the surface. The crater data was displayed using the relative size/frequency distribution plotting technique, which allows one to determine whether or not a terrain unit dates from the period of heavy bombardment based on the shape and vertical position of the distribution curve (Ref. 4). Three martian periods can be identified based on these size/frequency distribution curves: the period of heavy bombardment, the end of heavy bombardment, and post heavy bombardment. The distribution of these periods are shown in Figure 1.

This revised chronology can be applied to some outstanding geologic problems. One such problem is the cause and timing of the hemispheric dichotomy. Three main hypotheses have been proposed to explain this feature: the crustal foundering model (Ref. 5), the mega-impact model (Ref. 6), and the multiple impact hypothesis (Ref. 7). Of these hypotheses, the first can be dismissed because of inconsistencies with the revised chronology--features interpreted as the basin rim are younger than nearby or interior volcanoes.

The outflow channels appear to have experienced episodes of flooding rather than being formed in a single event. This is suggested by a slight difference in age between the chaotic terrain and the outflow channels when only craters with unmodified ejecta blankets superposed on the outflow channels are studied, but no difference in age exists when craters with slightly modified ejecta blankets are included in the study.

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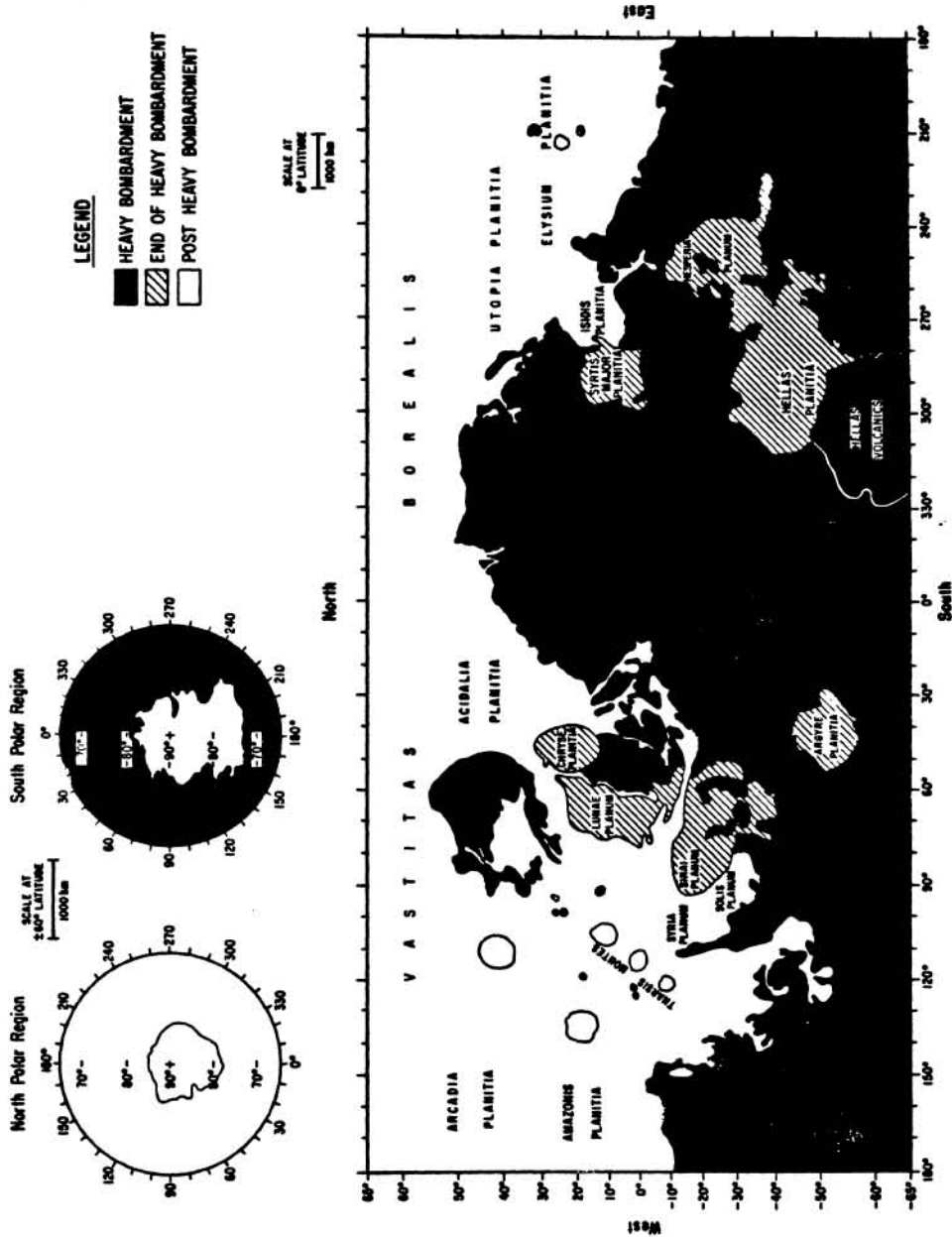


Figure 1