

THE CONTROL NETWORK OF MARS: OCTOBER 1986

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The control network of Mars is composed of Mariner 9 frames which essentially give full coverage of the planet at low resolution. Superimposed and tied to this network are strips of Viking mapping frames (resolution 100-250 m per pixel) which encircle the equator and 60° north latitude and multiple longitude ties between these latitude strips. There are multiple ties between these strips and the Viking 1 lander site. In the future another strip will be established at 60° south latitude.

Because the Viking 1 lander site has been accurately located, the coordinates of points in its vicinity can be determined with an error of less than 100 m relative to an inertial coordinate system. The 0° meridian on Mars is defined by the small crater Airy-0 and the error in longitude of points near Airy-0 is less than 40 m. Within the Viking mapping strips, the standard error of the coordinates of the control points is estimated to be less than 3 km and in the Mariner 9 region, the errors might be as large as 10 km.

The horizontal coordinates of the control points on Mars have been updated with a single-block planetwide analytical triangulation computed in September 1982 (Davies and Katayama, 1983). The computation contained 47,524 measurements of 6,853 points on 1811 pictures. These comprised 1054 Mariner 9 and 757 Viking frames. The overdetermination factor was 2.48 and 19,139 normal equations were solved. The standard error of measurement was 18.06 μm . Since that time additional Viking pictures and points have been added to the data set; included were some high resolution frames near Airy-0.

Recently the effort has been to convert the entire data set to J2000; this has gone slower than expected. The J2000 network now contains 28,004 measurements of 4,591 points on 1213 pictures. These comprised 1052 Mariner 9 and 161 Viking frames. The overdetermination factor was 2.18 and 12,821 normal equations were solved. The standard error of measurement was 12.96 μm . The longitude of the Viking 1 lander site was 48°045 and the latitude 22°480.

References

Davies, M. E., and F. Y. Katayama, "The 1982 Control Network of Mars," J. Geophys. Res., Vol. 88, No. 89, September 10, 1983, pp. 7503-7504.