PRELIMINARY MAGELLAN RESULTS: THE VENUS SPIN VECTOR AND CONTROL NETWORK; M.E. Davies, T.R. Colvin, and P.G. Rogers, The RAND Corporation

A Venusian control network is being computed based on Magellan navigation data and measurements of surface points on full resolution radar images. Points must be measured on two or more radar strips; hence the starting area was chosen to be north of 80° latitude for maximum overlap. This permits solving for the direction of the Venus spin axis and rotational period, for selected orbital parameters, and for the latitude, longitude, and radius of measured points (Colvin, 1990). However, because there are few external constraints, only a small set of parameters are permitted to vary in a particular solution.

In early January 1991 the computations contained 948 measurements of 130 points on 88 orbits. These even-numbered orbits, 376 to 576, cover about 40° of longitude. The solution for the direction of the spin axis was R.A. 272°.89 ± 0°.10 and Dec. 67°.15 ± 0°.04 in J2000 coordinates. This solution for the direction of the spin axis locates the north pole about 8.5 km from that adopted by the Magellan project.

Three computations were made to test the stability of the solution. The first did not modify the navigation and solved for the direction of the spin axis, the latitudes and longitudes of points and radii of those points north of 85° latitude. The radii of points south of 85° latitude were given values derived from the Magellan altimetry experiment of Gordon Pettengill, Peter Ford, and Fang Liu at M.I.T. The second and third computations allowed the time of periapsis and the argument of periapsis of selected orbits to vary while holding others fixed. All parameters of the first computation were simultaneously determined. The adopted rotation period was 243.025 days retrograde.

Navigation solutions are computed approximately once a day--about every 8 orbits (only 4 orbits cover the polar area). The primary data sources for these solutions are 2-way difference Doppler measurements, and they incorporate a new Venus harmonic gravity field complete to degree and order 21 based on Doppler tracking data from the Pioneer Venus Orbiter (PVO) spacecraft (McNamee, et al., 1990). Mid-orbits are thought to be more accurate than daily end orbits. For the second and third control network solutions, one mid-orbit per day is held fixed, and the other orbits are permitted to vary. The fixed orbits are different for the second and third solutions. Results of these computations were:

Solution	Right Ascension (degrees)	Declination (degrees)	RMS Residuals of Measurements (75 m pixels)
1	272.91	67.15	2.813
2	272.88	67.15	1.658
3	272.89	67.15	1.817
Magellan Project	272.69	67.17	

REFERENCES

Colvin, T.R., "Radargrammetric Algorithms and Software for use with Data from Magellan," The RAND Corporation, N-3221-JPL, 1990.

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