

Propagation Effects Handbook for
Communications On and Around
Mars

Julius Goldhirsh
Applied Physics Laboratory
The Johns Hopkins University
11100 Johns Hopkins Road
Laurel MD 20723-6099

Wolfhard J. Vogel
The University of Texas at Austin
Electrical Engineering Research Laboratory
10100 Burnet Road, Austin, TX 78758

Propagation Effects Handbook for Communications On and Around Mars

Approach

- (a) Complete Literature search
- (b) Identify potential problem
and non-problem areas
 - Atmospheric gases
 - Sandstorms
 - Terrain
- (c) Execute modeling and analytical
simulation
- (d) Suggest and carry out measurement
campaigns on Earth at geographic
locations similar to Martian terrain

Execution of Literature Search

- * Literature search initiated
- * A number of journal publications received
- * Several Texts obtained.
Kieffer et al. (Editors), "MARS,"
University of Arizona Press, 1992
(38 Articles in Text)
- * Web site data retrieved
(Mars Global Surveyor Images)

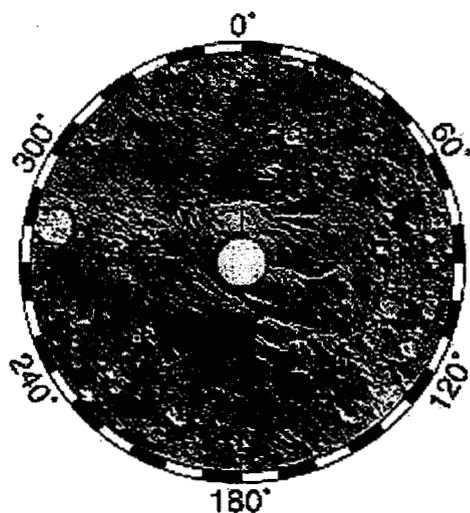
Identify Potential Problem and Non- Problem Areas

Surface of Mars

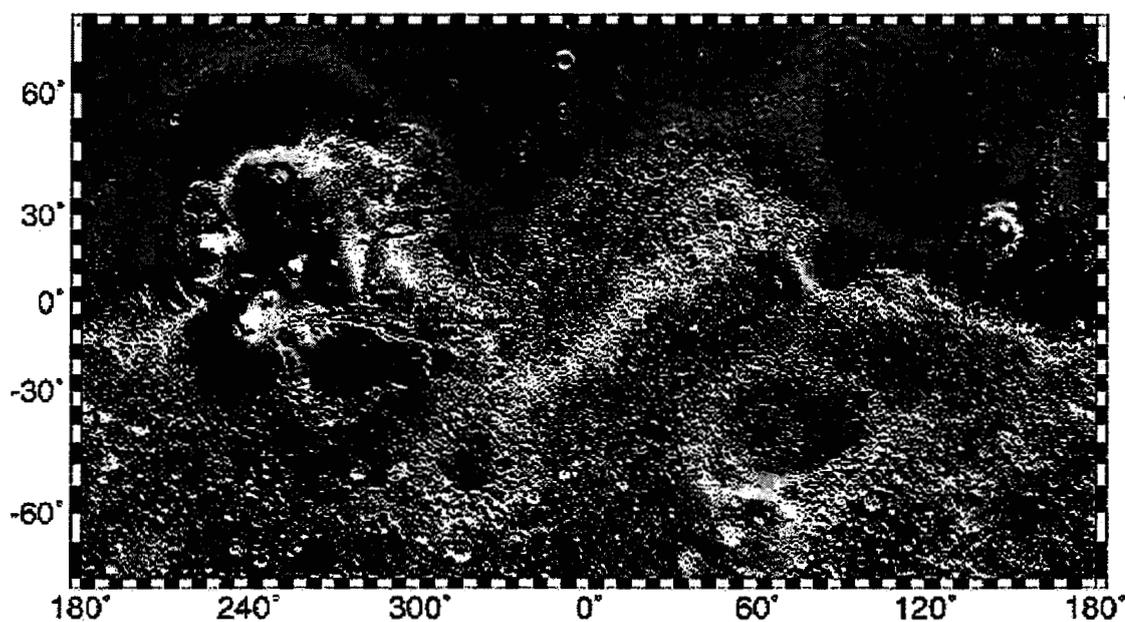
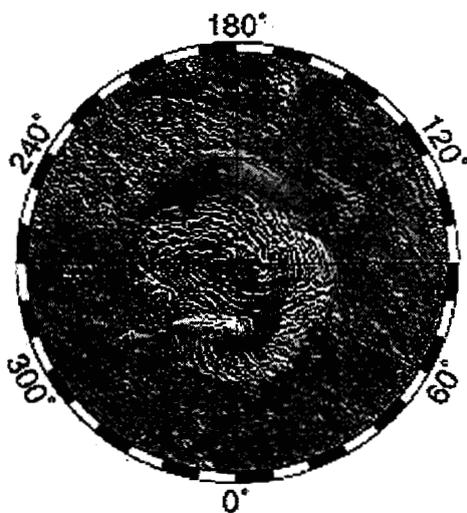
- * Line of sight multipath effects
- * Over-horizon propagation effects
- * Electrical characteristics of the surface
- * Radar backscatter effects

Mars Global Surveyor Images of Mars (Mars Orbiter Laser Altimeter)

South Pole

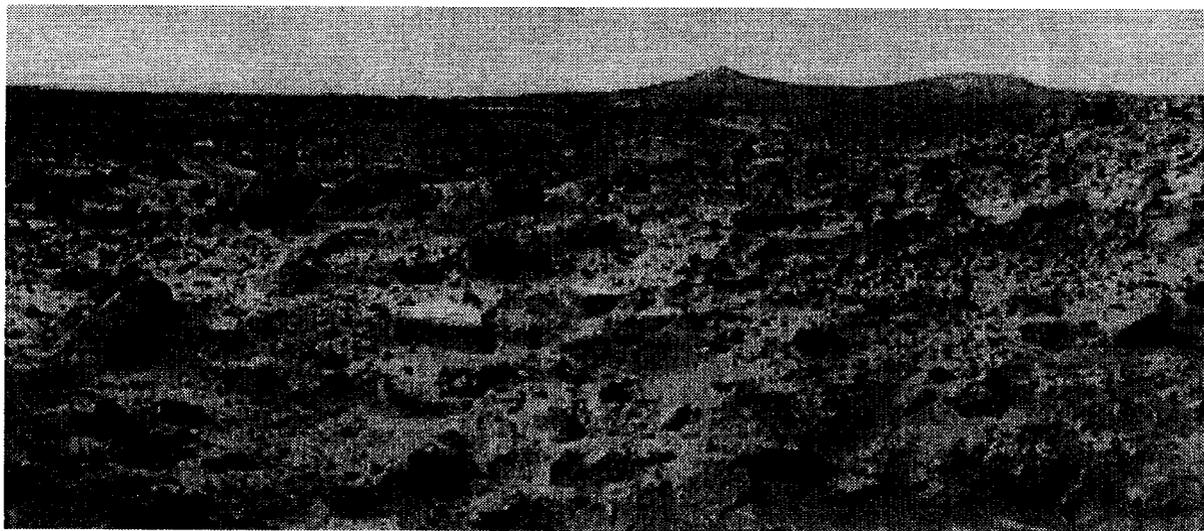


North Pole



Goddard Space Flight Center (5/27/99)

Mars Pathfinder Landing Site Field View



Salient Surface Features

1. Southern hemisphere characterized by giant craters, massive volcanoes, huge gorges.
2. Northern hemisphere is relative smooth.
3. Southern Hemisphere 5 km higher than north (on average).
4. Full range of topography of Mars is 30 km (compared to 20 km for Earth).