4. RECOMMENDATIONS AND CONCLUSIONS

The numerical evaluation of an integral equation for the propagation of radio waves over irregular, inhomogeneous terrain is demonstrated for several examples. Some of the examples provide a realistic picture of the attenuation of a radio wave when it encounters a terrain anomaly, such as a large conducting ridge. The Gaussian-Hill example at 1 MHz yields physical insight into a focusing phenomenon of the field just before the crest of a hill that cannot be predicted on the basis of simple diffraction theory, but is in fact predicted by the numerical solution of the integral equation. However, ray theory in a concave region with multiple reflections may work.

It appears that the results discussed in this report represent a useful tool for analyzing the attenuation loss of a radio wave as it encounters terrain anomalies such as hills, valleys, land-sea interfaces, etc. The computer program for this analysis is listed in appendix C. However, there are improvements that should be studied. They are listed below in an order not necessarily representing their relative importance.

1) A three-dimensional model of the terrain. It should be determined if the energy follows a geodesic and if the effects of transverse curvature are important or not.

2) Since the solution represented by the integral equations does in fact represent a solution of the wave equation plus boundary conditions, it applies to VHF frequencies as well as HF frequencies. Consequently, numerical techniques should be studied so that the program will handle VHF frequencies efficiently.

3) Real antennas rather than an idealized point source with an arbitrary pattern factor should be investigated; especially when a large diffracting obstacle is within the first Fresnel zone of the antenna.

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