

APPENDIX B. THE NORMAL REFRACTIVITY GRADIENT

The $4/3$ earth radius concept used in radio propagation estimates is based on a decrease of refractivity (N) with height of about 39 N-units/km. When one considers a layer of less than one kilometer thickness, however, this decrease (normalized to 1 km) tends to be somewhat more than 39 N-units/km. For 100-m layers the "normal" gradient values are more likely to be -50 or more (i.e., the refractivity decreases at the rate of 50 N-units/km over the 100-m interval).

Median values of the refractivity for most of the stations shown in figure 1 (based on the 100-m layer analyses) were used to prepare figures B-1 and B-2. Figure B-1 shows an annual value of the 100-m gradient, obtained by averaging the four monthly-median values from the distributions (February, May, August, November). Figure B-2 shows the February and August values (Feb./Aug.) to provide some indication of the winter/summer differences. For example, the median values at Barrow, on the Arctic coast of Alaska, are -39 (annual), -43 (February), and -41 (August).

The average of all Northern Hemisphere annual values is -57 N-units/km; the February average is -55 N-units/km and the August average is -61 N-units/km. The median gradient generally tends to be lower in the drier interior of large land masses (at temperate latitudes) than in the coastal regions where humidity is consistently higher. Note the very large values at Dakar, Bahrain, Ft. Lamy, and Niamey; all these locations have high surface dewpoints (absolute humidity) with drier air aloft.

The effect of seasonal changes in low-level moisture are reflected at many interior stations shown in figure B-2. Some of the arctic stations, however, show more intense gradients in winter, probably because of the very strong temperature inversions that persist during the months when the sun is below the horizon.

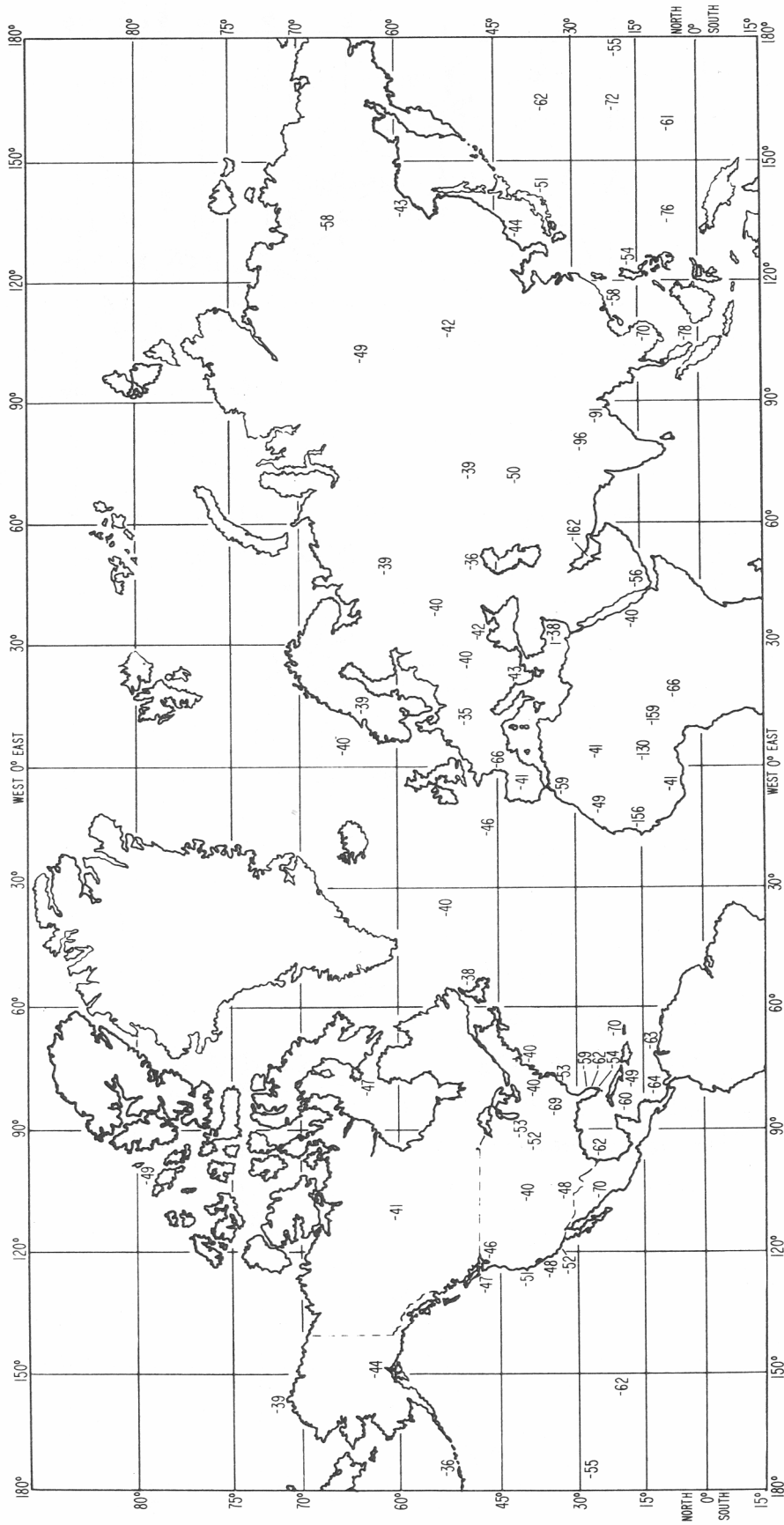


Figure B-1. Annual median 100-m refractivity gradient (average of seasonal medians).

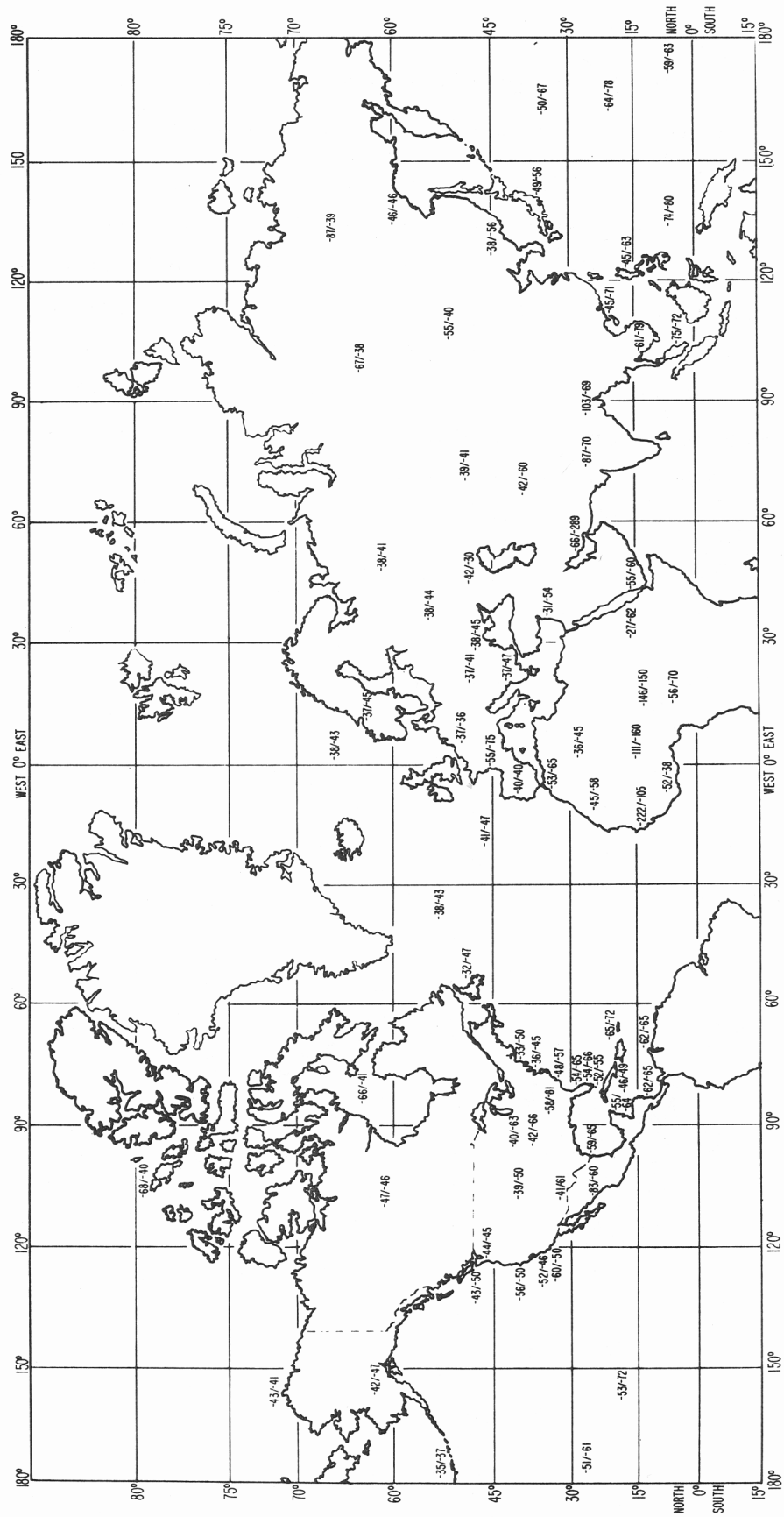


Figure B-2. February and August median values of 100-m refractivity gradient (Feb./Aug.).