Appendix A: K, Φ, and h_{min}

This appendix is included to provide a better idea of the relationships among K, Φ, and h_{min}.

At a given epoch, h_{min} is a single-valued function of K and h_{min}. In fact, any one of the three parameters is a single-valued function of the other two.

Figure 146 and Figure 147 plot contours of h_{min} as a function of $K^{1/2}$ and $\log_{10}\Phi$. Also shown in white in Figure 146 are contours of constant L_m; Figure 147 shows contours of the sine of the equatorial pitch angle α_0. It can be seen that on this scale lines of constant L_m correspond roughly to a constant value of Φ, and lines of constant α_0 correspond roughly to constant K. Note also that K=0 is the magnetic equator and the contour of h_{min}=0 (the upper right contour) defines the loss cone.

Figure 148 plots contours of $\log_{10}\Phi$ as a function of $K^{1/2}$ and h_{min}. Note that h_{min} in this figure extends well beyond the limits of h_{min} as used in AE9/AP9. Here the upper right contour does not define any physical boundary, it is simply the smallest value of Φ (or largest value of L_m) plotted.

Figure 149 and Figure 150 also show contours of $\log_{10}\Phi$ as a function of $K^{1/2}$ and h_{min}, but for a range of h_{min} more representative of the AE9/AP9 grid. Also shown in white in Figure 149 are contours of constant L_m; Figure 150 shows contours of constant $\sin\alpha_0$.

These plots are all for the year 2000. The relation among K, Φ, and h_{min} changes over time due to the Earth's varying internal magnetic field. Figure 151 and Figure 152 show the variation of h_{min} from 1975 to 2015 for several values of $K^{1/2}$ and $\log_{10}\Phi$. Over this period, at a given K/Φ value, the value of h_{min} has decreased by about 8-15 km/year. The rate of decrease is highest at smaller values of both K and Φ.

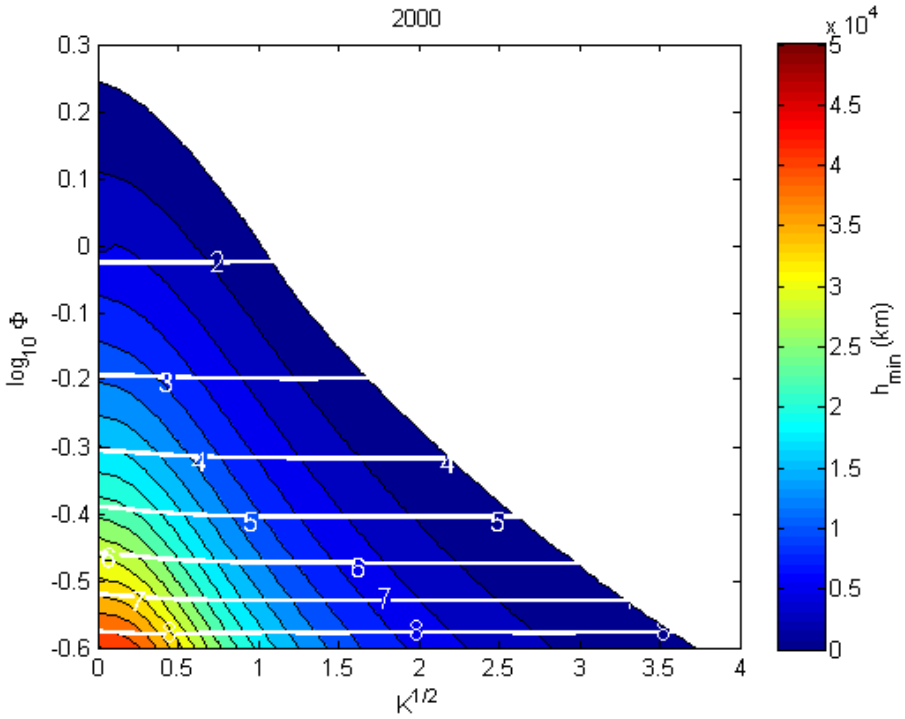

Figure 146. Contours of h_{min} (color code) vs. $K^{1/2}$ and $\log_{10}\Phi$. Contours of constant L_m shown in white.

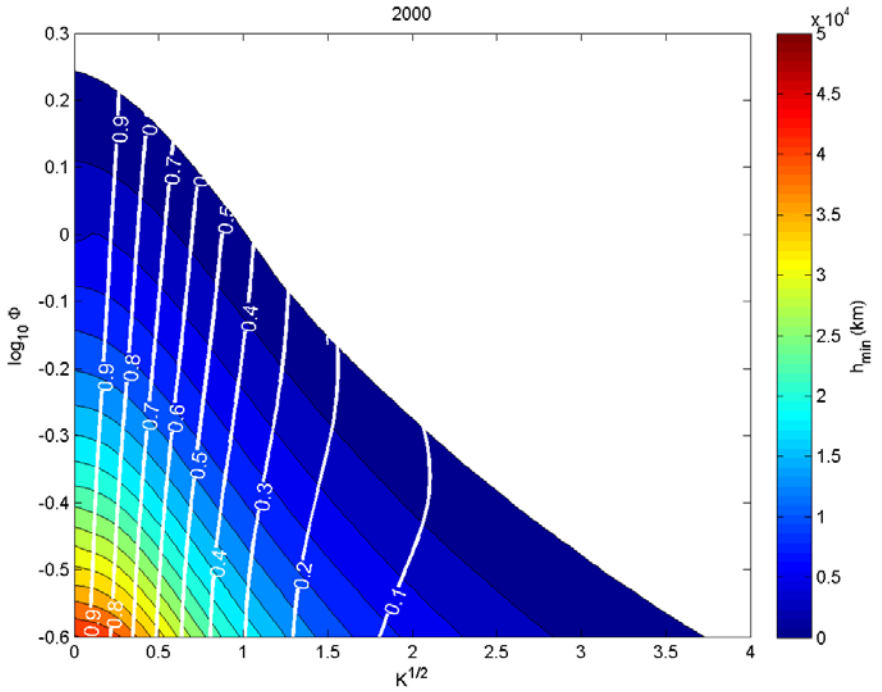

Figure 147. Same as previous figure, but showing contours of constant $\sin(\alpha_0)$.

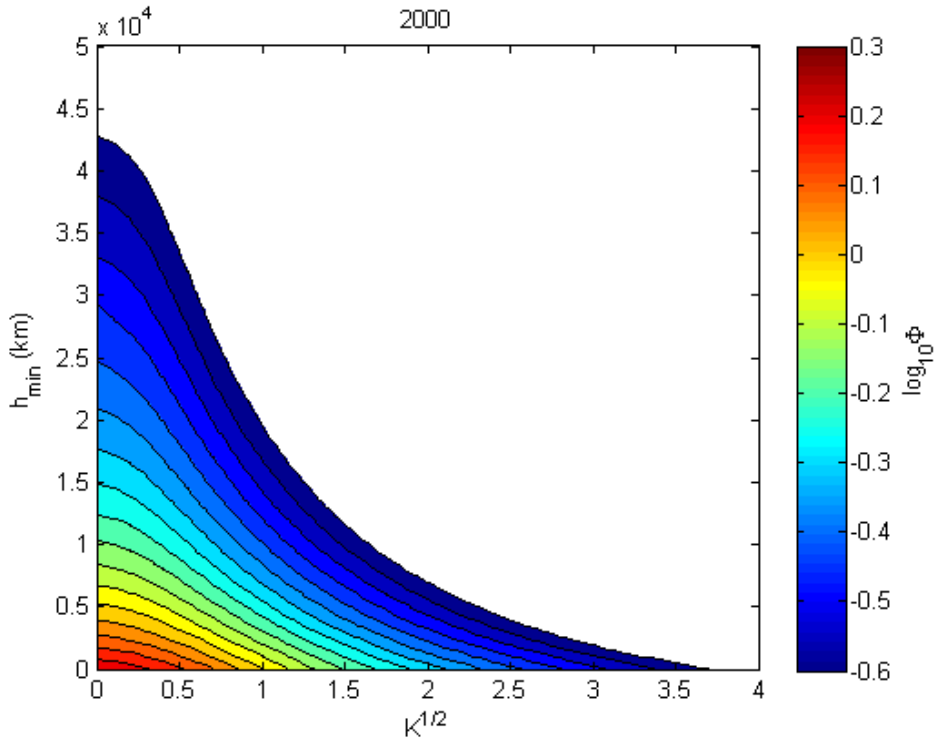

Figure 148. Contours of constant $\log_{10}\Phi$ vs. K and h_{min}.

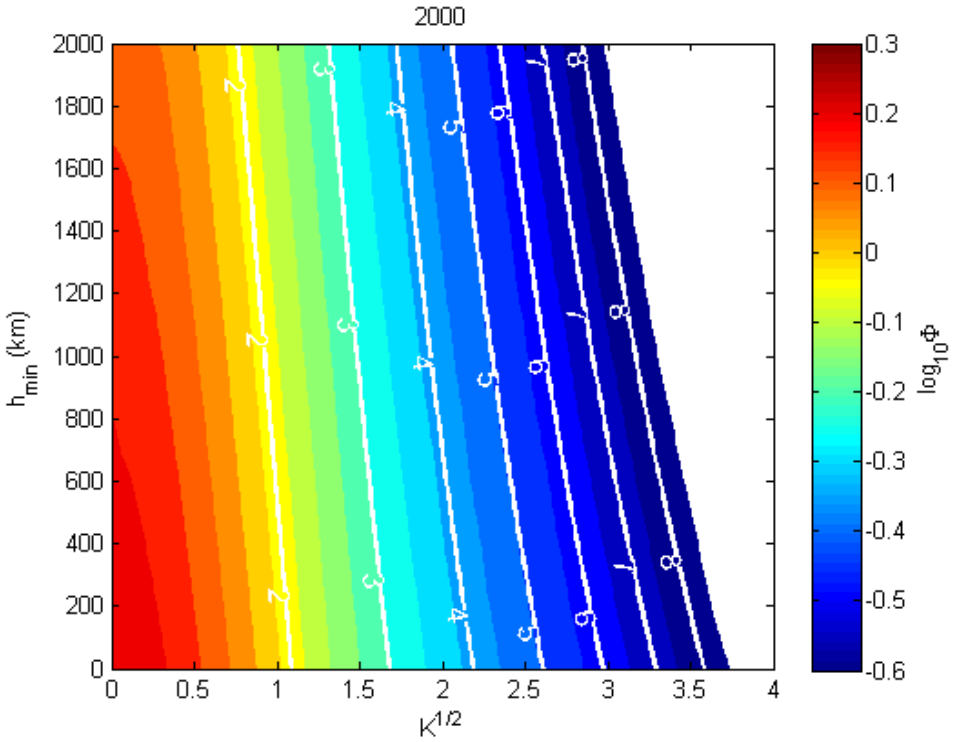

Figure 149. Contours of constant $\log_{10}\Phi$ vs. K and h_{min}, but only showing h_{min} up to 2000 km. Contours of constant L_m shown in white.

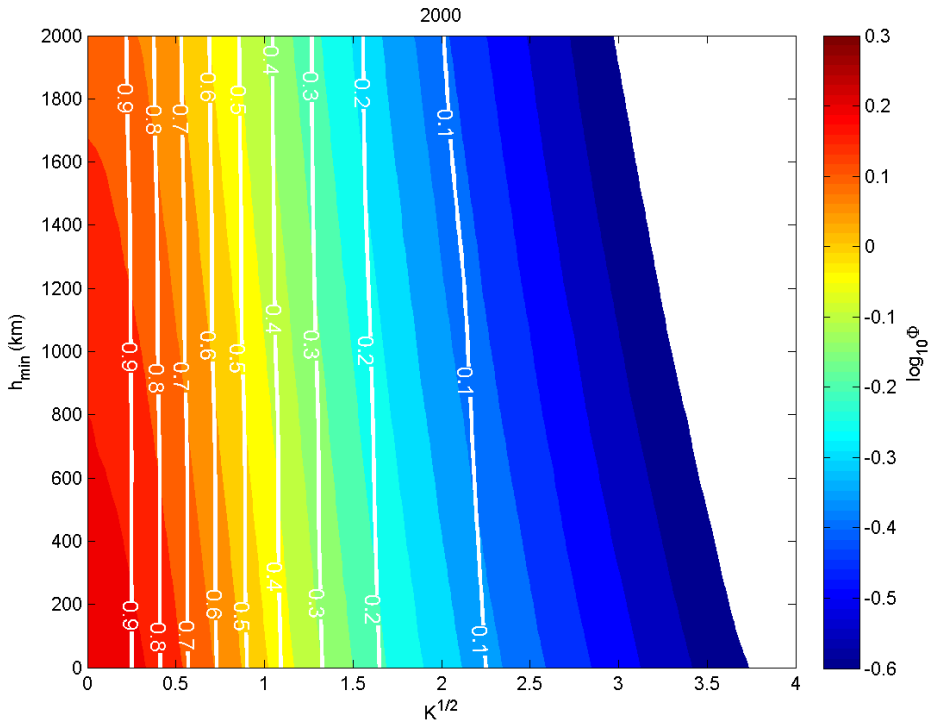

Figure 150. Same as Figure A4, but showing contours of constant sin(α_0).

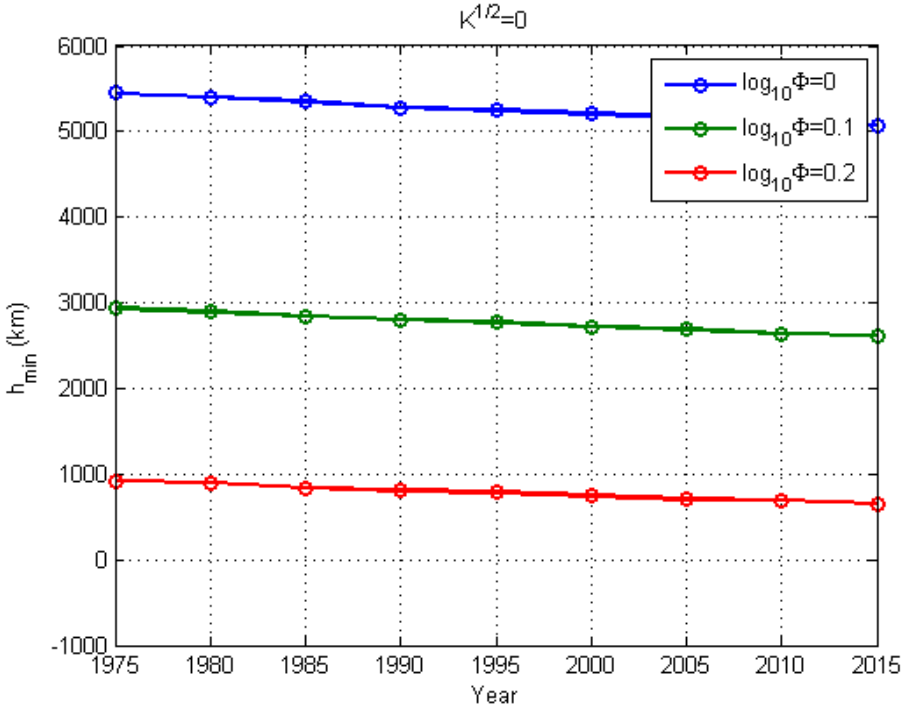

Figure 151. Variation of h_{min} over time for several values of $\log_{10}\Phi$ at the magnetic equator (K=0).

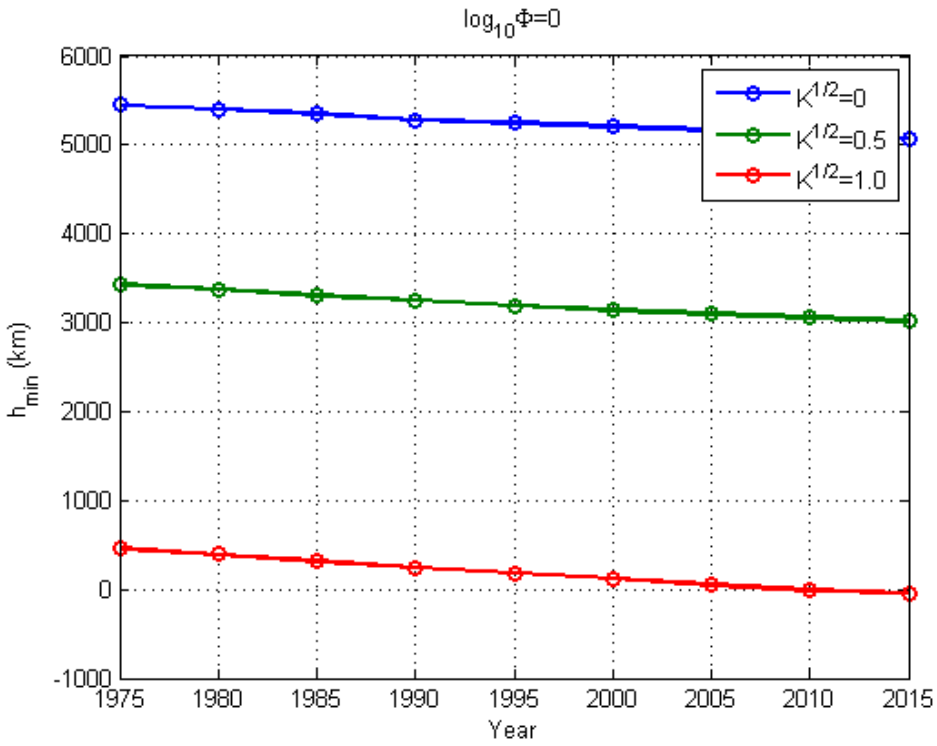

Figure 152. Variation of h_{min} over time at various values of K for $\log_{10}\Phi=0$.