model value of the phase space density at gridpoint (i, j) in M-L space with the corresponding interpolated data, $f_{data}$, at the same point, and $\sigma$ is the weighting associated with $\log(f_{data})$.

To handle the nonrandom scatter of the data, we have incorporated two "robust" techniques [*Press et al.*, 1986], a truncation ceiling for the evaluation of single point $\chi^2$, and a constant $\sigma$. Even with a smoothed $\beta$ spline interpolation with zero tension [*Bartels et al.*, 1983], it is possible for the model to deviate so markedly from the data in certain regions that these regions dominate $\chi^2$. Thus we also allow restricting the fit domain in $M$-$L$ space.

*Reference Fits (1-4)*

Since electric diffusion dominates below 1 keV/nT, and because the data above 1 keV/nT is also above $L$=6 where losses are too small to constrain the fit, we did not adjust the magnetic diffusion coefficient, setting it to nominal values, $D_{LL}^{M} = 2.3 \times 10^{-15}\ R_E^2/s$ (SSF). Thus we began by fitting the reference model, allowing only the amplitude of the electric diffusion coefficient, $D_{LL}^{E}$, to vary, fixing $D_{LL}^{M}$, and setting the domain to subsets of the entire data set as summarized in Table 3. Single point $\chi^2$ values were truncated at 10 (a 3 order of magnitude deviation in log space). Fit 1 over $H^+$, $He^+$, and $He^{++}$ is shown in Plate 1 with the data in the first column, the fit in the second column and the ratio of data to fit in the third column. The logarithmic scale extends from $10^{-1}$ (blue)

the data correspond to 1 and 300 keV/$e$ constant energy boundarie The black lines indicate the domain of the data used in the fit. Th entire region is modeled (so that the ratio exists wherever the dat exist), but modeled phase space contours for $f < 10^{-1}$ are no shown for the sake of clarity.

The data and the reference model agree in the $L$>5, $M$>0. keV/nT region. The upper boundary at $L$=7.5 agrees perfectl since the data were the boundary condition for the model. Sinc the qualitative behavior of $H^+$ is similar to that of both $He^+$ an $He^{++}$, we will discuss $H^+$ in detail and refer to helium only whe it differs. The $H^+$ with $M$>1 keV/nT diffuse to lower $L$ shells wit comparatively little loss since they are above the peak of the charg exchange cross section, $E$~60 keV (Appendix B on microfiche Eventually Coulomb drag sweeps the penetrating particles to lowe energy below $L$~5. The spectral peak seen just to the left of th black line at $M$<0.02 keV/nT, $L$<4.5 is not an artifact, but relate to convection electric field transport.

*Convective Transport*

In the first column of Plate 2 we illustrate the convective tran port of ions into the ring current using a dipole magnetic field and Volland-Stern [*Volland*, 1973; *Stern*, 1973] convection electric fiel model (including corotation) with a *Maynard and Chen* [1975] an

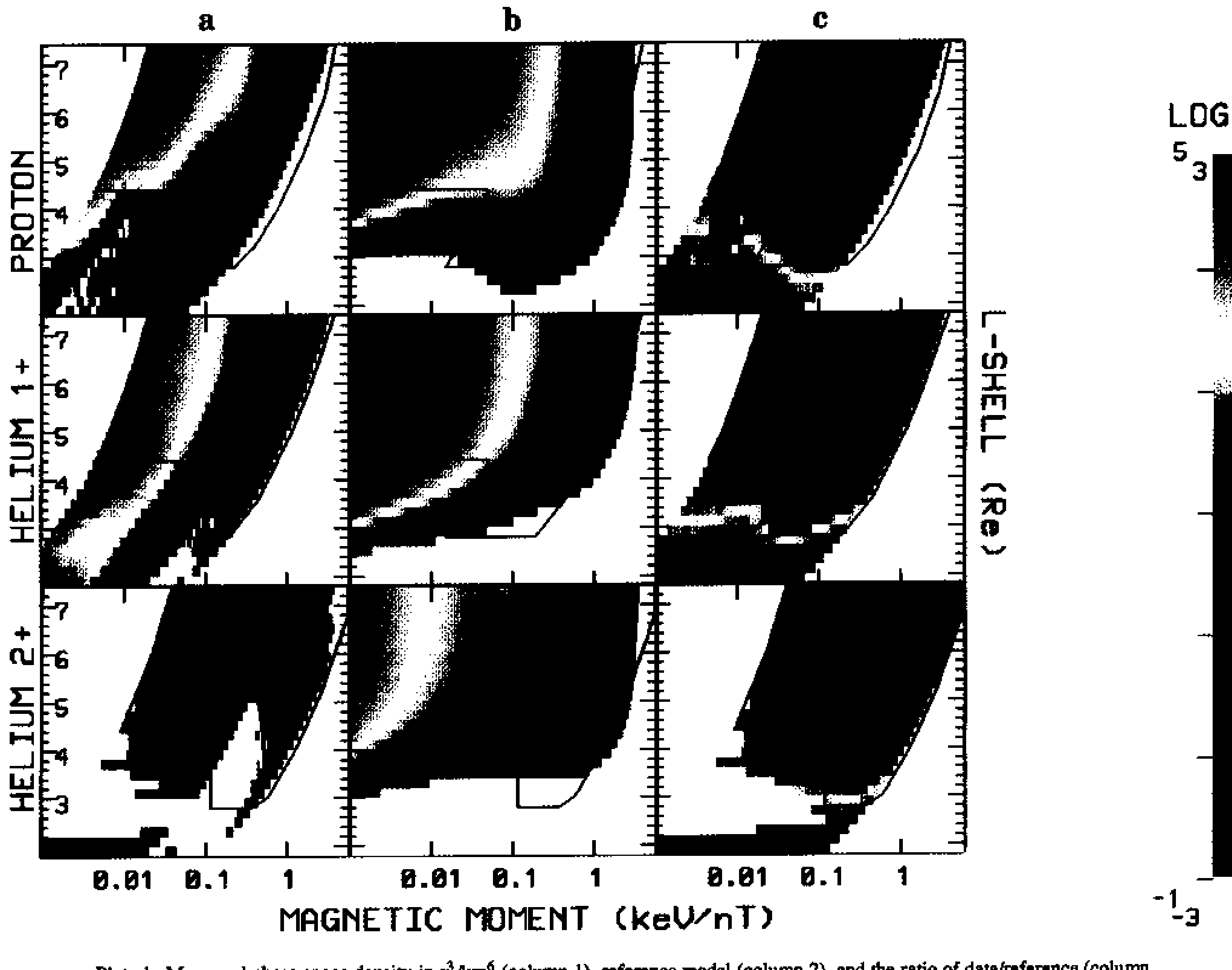


Plate 1. Measured phase space density in s$^3$/km$^6$ (column 1), reference model (column 2), and the ratio of data/reference (column 3). The range of intensities displayed is logarithmic from -1 (blue) to 5 (red) for columns 1 and 2, and from -3 to 3 for column 3.