JOURNAL OF GEOPHYSICAL RESEARCH: SPACE PHYSICS, VOL. 118, 839–842, doi:10.1002/jgra.50154, 2013

Correction to "Resonant scattering of plasma sheet electrons leading to diffuse auroral precipitation: 1. Evaluation for electrostatic electron cyclotron harmonic waves," "Resonant scattering of plasma sheet electrons leading to diffuse auroral precipitation: 2. Evaluation for whistler mode chorus waves," and "Evolution of pitch angle distributions following injection from the plasma sheet"

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Received 14 January 2013; revised 24 January 2013; accepted 25 January 2013; published 25 February 2013.

Citation: Thorne, R. M., B. Ni, X. Tao, L. Chen, W. Li, N. P. Meredith, R. B. Horne, and Y. Y. Shprits (2013), Correction to "Resonant scattering of plasma sheet electrons leading to diffuse auroral precipitation: 1. Evaluation for electrostatic electron cyclotron harmonic waves," "Resonant scattering of plasma sheet electrons leading to diffuse auroral precipitation: 2. Evaluation for whistler mode chorus waves," and "Evolution of pitch angle distributions following injection from the plasma sheet", *J. Geophys. Res. Space Physics*, *118*, 839–842, doi:10.1002/jgra.50154.

[1] In three previously published papers:

> [2] "Resonant scattering of plasma sheet electrons leading to diffuse auroral precipitation: 1. Evaluation for electrostatic electron cyclotron harmonic waves," by Ni et al. (*Journal of Geophysical Research*, *116*, A04218, doi:10.1029/2010JA016232, 2011a), "Resonant scattering of plasma sheet electrons leading to diffuse auroral precipitation: 2. Evaluation for whistler mode chorus waves," by *Ni et al. (Journal of Geophysical Research*, *116*, A04219, doi:10.1029/2010JA016233, 2011b), and "Evolution of electron pitch angle distributions following injection from the plasma sheet," by Tao et al. (*Journal of Geophysical Research*, *116*, A04229, doi:10.1029/2010JA016245, 2011), we regret that an error was introduced in applying the Gaussian fitting to the wave spectral intensity. This error resulted in the reported wave amplitudes being too high by a factor of $(2\pi)^{1/2}$. The error does affect multiple calculations, figures, and data in tables. It does not alter the principal conclusion on the dominance of chorus scattering in producing the diffuse aurora. It does, however, affect the overall rates of pitch angle and momentum diffusion, and the resultant temporal evolution of electron phase space density in our subsequent 2D Fokker-Planck simulations.

[3] The specifics of how the error manifested itself in the papers are listed below.

[4] The recent analysis of the scattering of plasma sheet electrons [*Ni et al.*, 2011a, 2011b] employed CRRES wave data obtained from the 0000 to 0600 MLT range [*Meredith et al.*, 2009] to construct a statistical model for the average spectral intensity of both electrostatic electron cyclotron harmonic (ECH) waves, and upper band ($f > f_{ce}/2$) and lower band ($f < f_{ce}/2$) chorus emissions in the inner magnetosphere over the spatial region where diffuse auroral precipitation is most intense [*Newell et al.*, 2009]. The wave model was subsequently used to evaluate the scattering of plasma sheet electrons from 30 eV to 100 keV under different levels of geomagnetic activity. To evaluate electron pitch angle and momentum diffusion rates, a least square Gaussian fit was applied to the frequency distribution of wave spectral intensity [e.g., *Glauert and Horne*, 2005]. The key parameters obtained for the chorus Gaussian distribution included magnetic field wave amplitude (B_w), normalized peak frequency ($\overline{f_m} = f_m/f_{ce}$), and normalized bandwidth ($\overline{\Delta f} = \Delta f/f_{ce}$). To evaluate resonant diffusion rates of plasma sheet electrons, the model Gaussian parameters (B_w, $\overline{f_m}$, $\overline{\Delta f}$) were averaged over the range $L = 5.8$ to $L = 6.2$, to establish a representative frequency spectrum for both lower band and upper band chorus at $L = 6$. A similar procedure was also applied to the CRRES ECH wave data, but for the electric field wave amplitude. However, in applying the Gaussian fitting, an error was introduced, which resulted in the reported wave amplitudes being too high by a factor of $(2\pi)^{1/2}$. The correct wave

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2169-9380/13/10.1002/jgra.50154

amplitudes for chorus emissions are consistent with data obtained from an independent analysis of THEMIS search coil data [*Li et al.*, 2011]. Because of the error, the resultant diffusion rates shown in Figures 5–12 in the original paper [*Ni et al.*, 2011b] were all too high by a factor of 2π. Fortunately, this error does not alter the principal conclusion on the dominance of chorus scattering in producing the diffuse aurora [*Thorne et al.*, 2010], since the same error was also made in the amplitude of ECH waves [*Ni et al.*, 2011a]. It does, however, affect the overall rates of pitch angle and momentum diffusion, and the resultant temporal evolution of electron phase space density in our subsequent 2D Fokker-Planck simulations [*Tao et al.*, 2011].

[5] Because of the general interest in using these computed diffusion coefficients to model both the dynamical changes in the plasma sheet electron population following injection into the inner magnetosphere [*Jordanova et al.*, 2012], and to model the global distribution of diffuse auroral precipitation during periods of geomagnetic activity [*Chen and Schulz*, 2001], revised calculations are provided of electron pitch angle scattering rates at $L = 6$ during both moderate ($100\,\mathrm{nT} < AE^* < 300\,\mathrm{nT}$; Figure 1) and active ($AE^* > 300\,\mathrm{nT}$; Figure 2) geomagnetic conditions, where AE^* is the maximum AE in the previous 3 h. In each case, the scattering rates are compared with the limit of strong diffusion [*Schulz*, 1974]. Clearly, at $L = 6$ the scattering by a combination of upper band and lower band chorus is far more effective than ECH waves for causing diffuse auroral precipitation into the loss cone. Furthermore, for active conditions (i.e., geomagnetic storms or intense substorms), the revised scattering rates near the edge of the loss cone are comparable to or within a factor of 3 of the limit of strong diffusion over a broad range of energies between 0.3 and 10 keV, which contains the dominant portion of injected plasma sheet electrons. Consequently, under geomagnetically active conditions, the loss cone should be substantially filled and the precipitation flux should be comparable to the trapped flux as measured by low altitude spacecraft. However, for moderate conditions the scattering rates fall substantially (typically more than an order of magnitude) below the strong diffusion level, the loss cone will only be partially filled and the diffuse auroral precipitation flux should fall below the limit of strong diffusion as indicated by previous modeling [*Chen and Schulz*, 2001].

[6] The revised diffusion rates have also been used to simulate the 2D evolution of electron phase space density following their injection into the nightside inner magnetosphere using the method described by *Tao et al.* [2011]. For moderate geomagnetic conditions (Figure 3), the Fokker-Planck simulations indicate that the characteristically observed pancake distributions [e.g., *Meredith et al.*, 2000], which are strongly peaked around 90° pitch angle, develop from a quasi-isotropic low energy population (less than few keV)

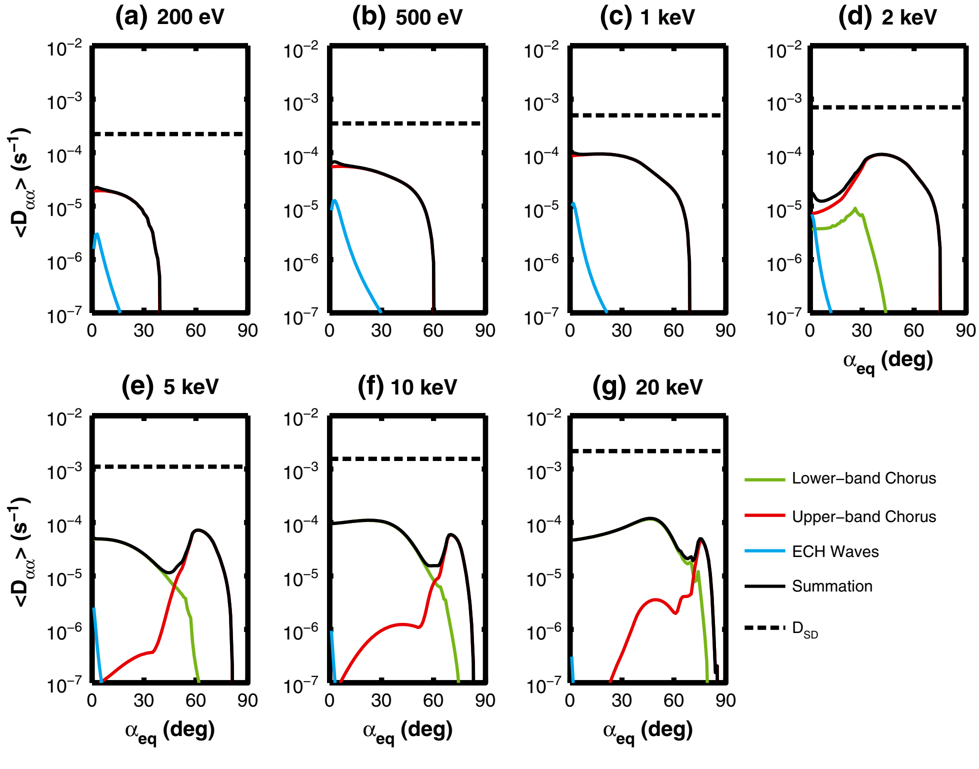

Figure 1. Corrected version of Figure 8 in *Ni et al.* [2011b] of the bounce-averaged pitch angle scattering coefficients $\langle D_{\alpha\alpha}\rangle$ as a function of equatorial pitch angle for electrons interacting with ECH waves and upper and lower band chorus at $L = 6$ for energies from 200 eV to 20 keV, under geomagnetically moderate conditions ($100\,\mathrm{nT} < AE^* < 300\,\mathrm{nT}$). The horizontal dashed line in each plot represents the strong diffusion rate D_{SD} for comparison.

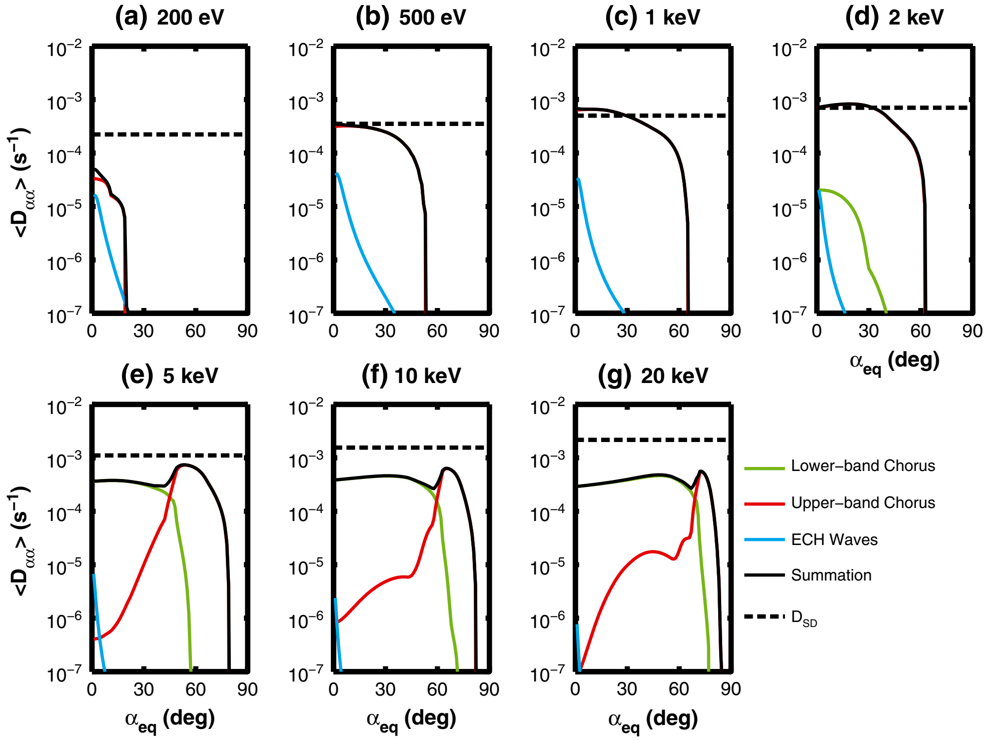

Figure 2. Corrected version of Figure 6 in *Ni et al.* [2011b] of the bounce-averaged pitch angle scattering coefficients for geomagnetically active conditions ($AE^* > 300$ nT).

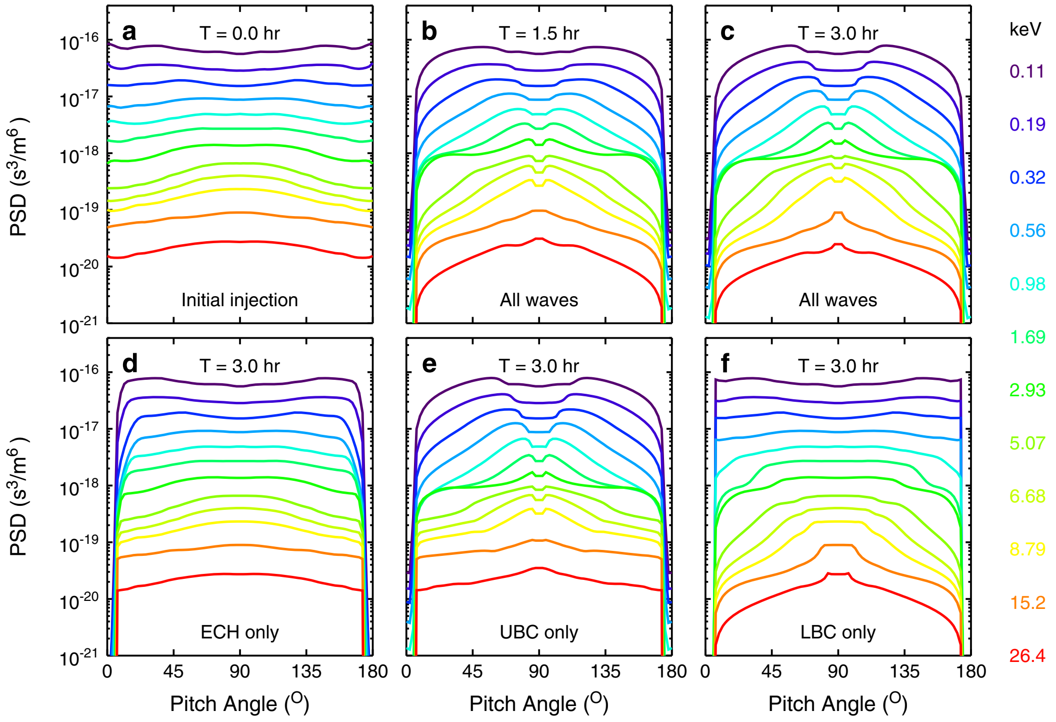

Figure 3. 2D Fokker-Planck diffusion simulation of the temporal evolution of phase space density of plasma sheet electrons at $L = 6$ (corrected version of Figure 3 in *Tao et al.* [2011]) due to resonant wave scattering using a statistical model of nightside plasma waves obtained from CRRES under geomagnetically moderate conditions ($100\,\text{nT} < AE^* < 300\,\text{nT}$). (a) Initial distribution (from measurements on CRRES) at various electron energies following injection from the plasma sheet. Modeled distributions at (b) 1.5 h and (c) 3.0 h due to combined resonant interactions with all three waves. Phase space density evolution after 3 h of scattering by (d) ECH waves alone, (e) upper band chorus alone, and (f) lower band chorus alone.

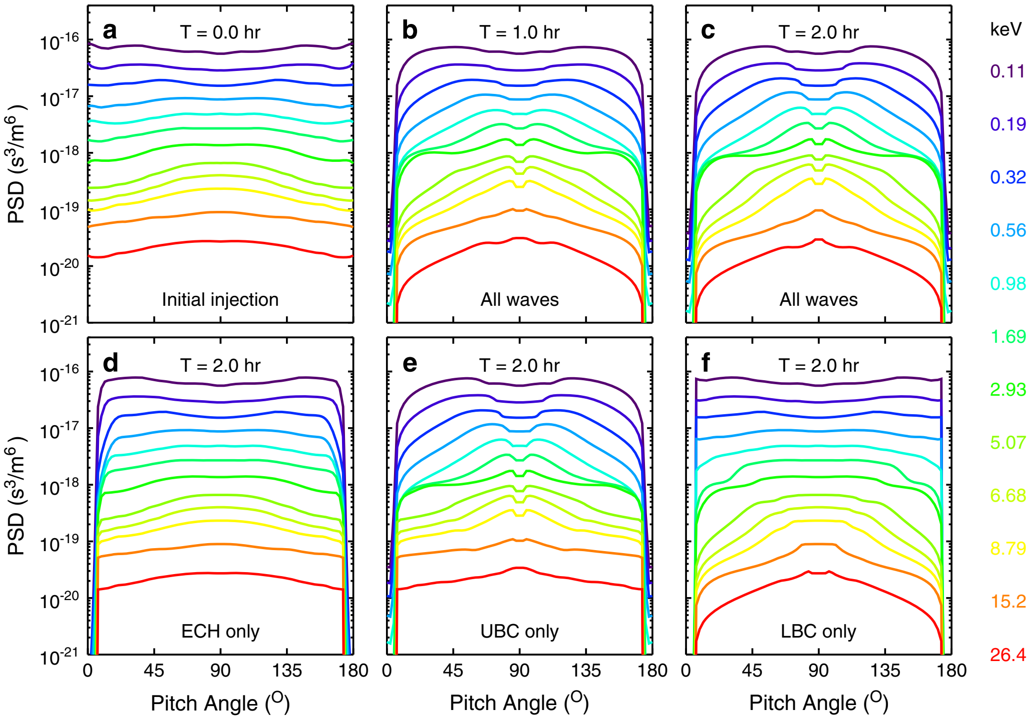

Figure 4. Similar to Figure 3, except for geomagnetically active conditions ($AE^* > 300$ nT) using corrected scattering rates from Figure 5 in *Ni et al.* [2011b]. Notice the much more rapid evolution over a time interval ~1 h, which is much shorter than the electron convective transport time.

within a period of 2–3 h, primarily as a consequence of scattering loss into the atmosphere during interactions with upper band chorus. The anisotropy of more energetic electrons (>10 keV) also increases due primarily to scattering loss from lower band chorus and stochastic energy diffusion by upper band chorus. For active conditions (Figure 4), the evolution of electron phase space density is far more rapid (<1 h), and much faster than transport time scales associated with convection and gradient drift toward the dayside. This suggests that the pitch angle distribution of injected electrons should be dominated by the wave scattering as they drift toward the dayside. Furthermore, since the scattering rates at certain energies can approach the strong diffusion limit, there should be a substantial loss of electrons before they reach the dayside, and the dominant diffuse auroral electron precipitation will be confined to the nightside and dawnside as observed [*Newell et al.*, 2009].

[7] **Acknowledgment.** This research was supported by NSF grant ATM-0802843.

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