# RELATIVISTIC ELECTRON LOSS TIMESCALES IN THE SLOT REGION

NIGEL P. MEREDITH 1, Richard B. Horne 1, Sarah A. Glauert 1, Daniel N. Baker 2, Shrikanth G. Kanekal 2, Jay M. Albert 3

British Antarctic Survey, Natural Environment Research Council, Cambridge, UK, email: nmer@bas.ac.uk, r.horne@bas.ac.uk, sagl@bas.ac.uk
Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado, USA, email: daniel.baker@lasp.colorado.edu, shrikanth.kanekal@lasp.colorado.edu
Space Vehicles Directorate, Air Force Research Laboratory, Hanscom Air Force Base, Massachusetts, USA, email: jay.albert@hanscom.af.mil

Recent observations show that the decay rate of relativistic electrons measured at low altitudes in the slot region at L=2 is an order of magnitude shorter than theoretical estimates based on CRRES wave data. Here we compare the decay rates of 2-6 MeV electrons measured at low altitudes by the SAMPEX spacecraft with those derived from CRRES wave observations. We show that pitch angle scattering by plasmaspheric hiss ($0.1 < f < 2$ kHz) is the dominant process responsible for electron loss in the outer slot region ($2.4 < L < 3.0$), but hiss alone cannot account for the observed loss timescales at lower L. Although SAMPEX samples small equatorial pitch angles ($\alpha_{eq} \sim 18^o$), this is not the dominant reason for the different timescales. We find that the decay of 2-6 MeV electrons measured by SAMPEX in the inner slot region ($2.0 < L < 2.4$) is most likely due to the combined effects of hiss and guided whistlers propagating with small wave normal angles. Unguided whistlers have little or no effect on the loss timescales. Magnetosonic waves may be as important as guided whistlers for electron loss under active conditions. Guided whistlers, and fast magnetosonic waves, increase the diffusion rates in a `bottleneck region' near $\alpha_{eq} = 75^o$ enabling electrons with larger pitch angles to diffuse into the loss cone more effectively and hence the entire distribution function decays more rapidly. Even though the power of guided whistlers and magnetosonic waves may be two orders of magnitude less than hiss, they play a very important role in electron loss in the inner slot region.

plasmaspheric hiss, lightning-generated whistlers, magnetosonic waves

Nigel P. Meredith, British Antarctic Survey, Natural Environment Research Council, Madingley Road, Cambridge, CB3 0ET, UK, tel: +44 (0)1223 221299, fax: +44 (0)1223 362616, email: nmer@bas.ac.uk