

# Mind the gap: Space scientists uncover causes of gap in Van Allen belts

September 26 2006

---

A team of British and US scientists have discovered that the gap in the Van Allen radiation belts is formed by natural wave turbulence in space, not by lightning. The discovery settles years of controversy among space scientists about the mechanisms responsible for causing the gap and has important implications for space weather forecasting.

High above the Earth's atmosphere, energetic charged particles are trapped in the Earth's magnetic field where they form the Van Allen radiation belts. Energetic electrons, travelling close to the speed of light, occupy two doughnut shaped zones, usually separated by a gap known as the slot region.

The underlying mechanism that clears the slot region of electrons has been the subject of intense scientific debate. Now, based on analysis of wave data collected over 13 months by the CRRES satellite, Dr Nigel Meredith of British Antarctic Survey and colleagues from BAS, the University of California, Los Angeles and the University of Iowa, believe that the gap is most likely formed by natural wave turbulence in space, rather than by lightning as the alternative theory suggests. Their results are published in the *Journal of Geophysical Research* this week.

According to lead author, Dr Nigel Meredith:

"Last year NASA scientists suggested that lightning-generated radio waves leaking out into space are responsible for the gap between the two belts by dumping particles into the atmosphere. Since lightning occurs

far more often over land than water, waves in space should also occur more over land. However, after analysing satellite data we found that there is no land-ocean variation at frequencies less than 1 kiloHertz where the waves are most intense. Instead, wave activity increases during geomagnetic disturbances driven by the Sun, suggesting that natural wave turbulence is responsible for the gap."

"The results are important, because a better understanding of the radiation belts will help modellers forecast space weather more accurately, helping to protect both astronauts and satellites from radiation hazards."

The paper 'Origins of plasmaspheric hiss' (doi: 10.1029/2006JA011707) is published today in the *Journal of Geophysical Research*. Two related items were also published in the journal this month: 'Comment on "On the origin of whistler mode radiation in the plasmasphere" by Green et al' (doi: 10.1029/2005JA011477) by Thorne and BAS scientists Horne and Meredith, and 'Reply to comment on "On the origin of whistler mode radiation in the plasmasphere" by Green et al' (doi: 10.1029/2006JA011622) by the NASA group.

Source: British Antarctic Survey

Citation: Mind the gap: Space scientists uncover causes of gap in Van Allen belts (2006, September 26) retrieved 20 April 2024 from <https://phys.org/news/2006-09-mind-gap-space-scientists-uncover.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.