Forecasting models

SPACECAST uses two research models to forecast the radiation belts. These are:

- The Global Dynamic Radiation Belt model, developed at the British Antarctic Survey, Cambridge, UK
- Salammbo model, developed at the Aerospace Research Laboratory (ONERA) in Toulouse, France

Both models solve a diffusion equation to find the change in the electron phase space density, which is then converted into the electron differential flux. The models include electron transport across the magnetic field by radial diffusion, pitch angle and energy diffusion by wave-particle interactions, and electron loss into the atmosphere via collisions with atmospheric gasses. Both models are based on the conservation of the three adiabatic invariants associated with electron drift, bounce and cyclotron motion around the magnetic field.

These research models have been developed independently and adapted for space weather forecasting. More details are available at

http://www.antarctica.ac.uk/bas_research/models/gdrbm

and

Varotsou, A., D. Boscher, S. Bourdarie, R. B. Horne, S. A. Glauert, and N. P. Meredith (2005), Simulation of the outer radiation belt electrons near geosynchronous orbit including both radial diffusion and resonant interaction with Whistler-mode chorus waves, *Geophys. Res. Lett.*, 32, L19106, doi:10.1029/2005GL023282.