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Magnetic Local Time dependency in modeling of the Earth radiation belts

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For many years, ONERA has been at the forefront of the modeling of the Earth radiation belts thanks to the Salammbô model, which accurately reproduces their dynamics over a time scale of the particles' drift period. This implies that we implicitly assume an homogeneous repartition of the trapped particles along a given drift shell. However, radiation belts are inhomogeneous in Magnetic Local Time (MLT). So, we need to take this new coordinate into account to model rigorously the dynamical structures, particularly induced during a geomagnetic storm. For this purpose, we are working on both the numerical resolution of the Fokker-Planck diffusion equation included in the model and on the MLT dependency of physic-based processes acting in the Earth radiation belts. The aim of this talk is first to present the 4D-equation used and the different steps we used to build Salammbô 4D model before focusing on physical processes taken into account in the Salammbô code, specially transport due to convection electric field.

Firstly, we will briefly introduce the Salammbô 4D code developped by talking about its numerical scheme and physic-based processes modeled. Then, we will focus our attention on the impact of the outer boundary condition (localisation and spectrum) at lower L^* shell by comparing modeling performed with geosynchronous data from LANL-GEO satellites. Finally, we will discuss the prime importance of the convection electric field to the radial and drift transport of low energy particles around the Earth.