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Effects of the plasmasphere and the plasmapause on the radiation belts in Salammbo code

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The plasmasphere constitutes an important tank of cold plasma surrounding the Earth which plays a key role in the shape of the radiation belts. Its spatial extension is delimited by the plasmapause where convection become predominant over corotation. Cold plasma is no more ‘trapped’ above this dynamic boundary and strong gradients of density are observed. The properties of the environment encountered by relativistic particles are consequently different inside and outside the plasmasphere, leading to different kind of interactions. As the plasmapause location is function of the magnetic activity, it becomes a proxy of primal importance in the modeling of the dynamic of radiation belts.

In a first part, we aim at presenting the direct effects of the plasmasphere and the plasmapause on the radiation belt taken into account in Salammbo code (coulombian and particles-waves interactions, frictions). Then, in a second part we will focus on the indirect effects induced by the plasmasphere dynamic during storm-time periods (enhanced penetration of relativistic particles, moving trapping boundaries and Chorus waves interactions). Finally, we will conclude on the limitations of the actual modeling and the perspectives that could lead to improvements in Salammbo code.