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Modelling radiation belts outer boundaries

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Radiation belts can be considered as an open-system whose population is fed by external sources. For trapped electrons and protons of energies below a few MeV, plasmasheet constitutes the main seed population. Acceleration processes inside radiation belts will diffuse plasmasheet population to inner regions and energize them. For trapped protons of more than 10 MeV, the main seed populations are cosmic rays, CRAND process and solar particles. Synchronized with a geomagnetic storm, highly energetic solar particles (> 10 MeV) can access near Earth drift shell and become trapped due to electromagnetic oscillations.
This presentation aims at presenting recent studies performed at ONERA concerning the modelling of these outer-boundaries. First, a ray-tracing method has been developed to characterize storm-time dynamics of the geomagnetic shielding, with inner magnetosphere electric field taken into account. Our results show that when electric field is sufficiently enhanced, geomagnetic shielding does not depend anymore on incoming particles energy. Second, a statistical survey has been conducted using NPOES and THEMIS data in order to characterize near Earth plasmasheet according to Kp index, radial distance and magnetic local time. Interesting features have been highlighted, in particular the unexpected good correlation between low-orbit and equatorial measurements. Such works constitute advances for a better radiation belts modelling.