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Long term evolution of the Earth protons radiation belts from 1990 to 2005 using GOES data and Salammbo code

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The proton radiation belts are a complex system whose evolution is governed by the combination of diffusion and lost processes. Furthermore, they are directly linked to solar activity and are fed by cold protons from the tail of the magnetosphere and by solar protons during flares. Thought, pure physical models cannot reproduce accurately all observations for all storms, and data assimilation may be helpful to compensate inherent modelling inaccuracies.

As it has already been performed for the electron radiation belts, we have simulated a long term evolution of the proton radiation belts from 1990 to 2005 using direct data assimilation. Data from the GOES fleet have been used as boundary conditions. During this period longer than a solar cycle, some very strong magnetic storms occurred such as March 1991, or the Halloween storms (October and November 2003). We present here the induced effects of such extreme events over long time scale. The uncertainties inherent to the modeling of these events will be discussed in order to develop new specification models. A statistical comparison is also performed with AP8 min/max and CRRESPRO to validate this simulation.